

Non-Treaty Storage Agreement

Technical Report: Appendices A - L

APPENDIX H
RESIDENT FISH

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RESIDENT FISH

Part 1
Reservoirs

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Reservoirs

Frequency of end-of-period elevation changes from the No-Action alternative greater than five feet for the contract years 1991, 1993, 1995, 1997, 2001, and 2005. (Libby, Hungry Horse, Grand Coulee, and Dworshak).

Additional reservoir elevation data can be found in Appendix G.

Additional resident fish information on Cumulative Effects can be found in Appendix L and on the Sensitivity Studies in Appendix M.

STUDY KEY

- AMXBAARO - No-Action Alternative (also referred to as the base case on some tables).
- AMXA1ARO - Proposed Alternative used as an opportunity resource.
- IMXA2ARO - Proposed Alternative used as a firm resource.

SAS
FREQUENCY OF END OF PERIOD RESERVOIR ELEVATION
CHANGES FROM BASE CASE GREATER THAN 5 FEET (%)

10:12 FRIDAY, DECEMBER 8, 1989

		HUNGERY HORSE													
TEST CASE	CONTRACT YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	AP1	AP2	MAY	JUNE	JULY	AG1	AG2
		(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)
AIIXBAARO	1991	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	1991	0.5/0.0	0.5/0.0	0.5/0.0	1.0/0.0	1.5/0.0	1.5/0.0	1.5/0.0	1.5/0.5	1.5/0.5	1.5/0.5	1.0/0.0	1.0/0.5	1.0/1.0	1.0/1.0
IIIXAZARO	1991	14.5/3.0	14.5/3.0	14.0/3.5	15.0/3.5	17.0/3.0	18.0/1.5	20.5/2.0	21.5/2.0	19.0/2.0	10.5/1.0	10.0/0.5	9.0/1.0	12.0/1.0	11.5/2.0
AIIXBAARO	1993	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	1993	1.5/0.0	1.5/0.0	1.5/0.0	1.5/0.0	2.0/0.0	3.0/0.5	3.0/1.0	3.0/1.0	2.5/1.0	2.0/0.5	2.0/0.0	1.5/0.0	1.5/0.5	10.5/0.5
IIIXAZARO	1993	10.0/11.5	10.5/10.5	10.0/9.0	10.0/8.0	9.5/4.5	10.0/3.0	11.0/1.0	11.5/1.0	10.5/0.5	8.5/0.0	11.5/0.0	11.0/0.0	12.0/0.0	17.0/0.0
AIIXBAARO	1995	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	1995	32.0/1.0	33.5/1.0	34.0/1.0	34.5/1.0	25.5/1.0	20.0/1.0	17.5/0.5	20.0/0.5	18.0/0.5	14.0/0.0	12.0/0.5	10.5/0.5	9.5/0.5	17.5/0.5
IIIXAZARO	1995	31.0/2.0	31.0/2.0	29.5/2.0	29.0/2.0	25.5/1.5	22.0/1.5	24.5/1.5	27.5/1.5	26.0/1.5	21.0/1.5	21.5/1.0	20.0/1.0	22.5/1.0	25.0/0.5
AIIXBAARO	1997	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	1997	24.0/1.0	25.0/1.0	25.0/0.5	25.0/0.5	19.0/0.5	13.0/0.0	10.0/0.5	10.0/0.5	8.0/1.0	6.5/0/1.0	7.5/0/1.0	8.0/0.5	9.5/0.5	12.0/0.5
IIIXAZARO	1997	28.0/0.5	28.0/0.5	26.0/0.5	25.5/0.5	21.5/0.5	17.0/0.5	17.0/0.5	18.0/0.5	18.5/0.5	18.0/0.5	20.5/0.5	20.0/0.5	20.0/0.5	24.0/1.0
AIIXBAARO	2001	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	2001	25.0/0.0	24.5/0.0	24.0/0.0	24.0/0.0	22.0/0.0	17.5/0.0	10.0/0.0	9.0/0.0	7.5/0.0	6.5/0.0	6.0/0.0	7.0/0.0	7.0/0.0	10.5/0.0
IIIXAZARO	2001	23.0/1.0	23.5/1.0	22.5/1.0	23.0/1.0	21.5/1.0	18.5/0.5	17.5/1.0	18.5/0.5	18.5/0.5	14.5/0.5	15.5/0.5	15.0/0.5	16.5/0.0	18.5/0.0
AIIXBAARO	2005	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	2005	18.0/0.5	19.0/0.5	20.0/0.5	22.0/0.5	15.5/0.5	14.5/0.5	12.5/0.5	11.5/0.5	12.0/0.5	7.5/0.5	7.5/0.5	8.0/1.0	9.0/1.0	13.0/1.0
IIIXAZARO	2005	18.0/0.0	18.5/0.0	21.0/0.0	20.5/0.0	17.5/0.5	15.5/0.5	15.5/0.5	16.0/0.5	15.5/0.5	12.0/0.5	12.0/1.0	11.0/1.0	11.5/1.0	16.5/0.5

H.1-2

		LIBBY													
TEST CASE	CONTRACT YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	AP1	AP2	MAY	JUNE	JULY	AG1	AG2
		(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)
AIIXBAARO	1991	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	1991	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.5	0.5/0.5	0.5/0.5	0.5/0.5	0.5/0.5	0.5/0.5	0.0/0.5	0.0/0.5	0.0/0.0	0.0/0.0
IIIXAZARO	1991	4.0/0.5	5.5/1.5	5.0/2.5	12.5/5.0	3.0/9.0	2.5/6.0	2.0/6.0	1.5/5.0	1.5/5.0	1.0/2.5	3.0/2.5	4.0/1.0	4.5/1.5	4.5/1.5
AIIXBAARO	1993	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	1993	0.0/0.0	0.0/0.0	0.5/0.0	1.5/0.0	0.5/0.0	1.0/0.0	1.5/0.0	1.5/0.0	1.0/0.0	1.0/0.0	1.0/0.0	0.0/0.0	0.5/0.0	0.0/0.0
IIIXAZARO	1993	7.5/1.0	7.0/1.5	3.5/2.0	3.5/1.5	3.0/4.5	4.0/4.5	4.0/4.0	4.0/4.5	4.0/4.5	3.0/3.0	4.0/1.5	4.0/0.0	7.5/0.0	8.5/0.0
AIIXBAARO	1995	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	1995	7.0/0.0	9.5/0.0	9.0/0.0	12.0/0.0	9.5/0.0	8.0/1.0	7.0/0.5	8.5/0.5	8.0/0.5	5.0/0.5	2.0/0.0	2.0/0.0	1.5/0.0	2.5/0.0
IIIXAZARO	1995	13.0/0.5	13.5/0.5	11.5/3.5	13.5/2.5	8.5/4.5	7.0/3.0	7.0/1.5	8.5/1.5	8.0/1.5	6.0/1.0	4.5/0.0	8.5/0.0	12.5/0.0	13.0/0.0
AIIXBAARO	1997	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	1997	2.5/0.0	6.0/0.0	6.5/0.0	5.5/0.0	5.5/0.0	6.0/0.0	6.0/0.0	7.0/0.0	6.5/0.0	4.0/0.0	2.0/0.0	1.0/0.0	1.0/0.0	1.5/0.0
IIIXAZARO	1997	10.5/0.0	11.0/0.0	8.0/1.5	10.0/0.5	7.5/4.0	7.5/1.5	7.5/1.5	9.0/1.0	8.0/1.0	5.0/0.5	3.5/0.5	4.0/1.5	8.0/0.0	11.0/0.0
AIIXBAARO	2001	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	2001	4.0/0.0	7.5/0.0	9.0/0.0	9.0/0.0	4.5/0.0	4.5/0.0	5.0/0.0	5.0/0.0	4.5/0.0	3.0/0.0	2.0/0.0	2.0/0.0	2.0/0.0	2.0/0.0
IIIXAZARO	2001	9.0/0.0	7.5/0.0	5.0/1.0	6.0/1.5	3.5/3.0	4.0/2.5	4.5/2.0	5.5/2.0	4.5/2.0	3.0/0.5	4.0/0.0	8.5/1.0	9.5/0.0	9.5/0.0
AIIXBAARO	2005	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	2005	3.0/0.0	8.5/0.0	9.0/0.0	7.5/0.0	4.5/0.0	7.0/0.5	6.5/0.5	6.0/0.5	6.0/0.5	5.5/0.0	2.5/0.0	2.5/0.0	2.5/0.0	2.5/0.0
IIIXAZARO	2005	6.5/0.0	5.0/0.0	5.0/1.0	4.5/0.5	1.0/2.5	3.5/1.5	4.5/1.5	5.0/1.5	5.0/1.5	3.0/1.0	5.0/1.0	5.5/0.0	8.0/0.0	8.0/0.0

SAS
FREQUENCY OF END OF PERIOD RESERVOIR ELEVATION
CHANCES FROM BASE CASE GREATER THAN 5 FEET (%)

10:12 FRIDAY, DECEMBER 8, 1989

GRAM COULLE

TEST CASE	CONTRACT YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	AP1	AP2	MAY	JUNE	JULY	AG1	AG2
		(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)
AIIXBAARO	1991	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	1991	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.5/0.5	1.0/1.0	0.5/1.0	0.5/0.5	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0
IIIXA2ARO	1991	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	1.5/1.5	1.5/1.5	2.0/3.0	2.5/3.5	2.0/3.0	1.0/3.0	0.5/0.5	0.0/0.0	0.0/0.0	0.0/0.0
AIIXBAARO	1993	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	1993	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.5/0.0	0.5/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0
IIIXA2ARO	1993	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.5/0.0	0.5/1.0	1.0/1.5	1.5/1.0	0.5/1.0	0.0/0.5	0.5/0.0	0.5/0.0	0.5/0.0	0.5/0.0
AIIXBAARO	1995	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	1995	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	1.0/0.0	3.0/0.0	2.5/0.0	1.0/0.5	1.5/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0
IIIXA2ARO	1995	0.0/0.0	0.5/0.0	0.5/0.0	1.0/0.0	3.5/0.5	4.5/0.0	5.5/1.0	3.0/0.5	2.0/0.0	1.5/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0
AIIXBAARO	1997	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	1997	0.0/0.0	0.0/0.0	0.0/0.0	0.5/0.0	1.5/0.0	2.0/0.0	1.0/0.0	1.5/0.0	0.5/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0
IIIXA2ARO	1997	0.0/0.0	0.5/0.0	0.5/0.0	0.5/0.0	2.0/0.5	2.5/0.5	3.0/0.5	1.5/0.0	1.0/0.0	0.5/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0
AIIXBAARO	2001	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	2001	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	1.0/0.0	2.0/0.0	1.0/0.0	0.5/0.0	0.5/0.0	0.5/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0
IIIXA2ARO	2001	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	1.5/1.0	2.0/0.0	2.0/0.0	0.5/0.0	0.5/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0
AIIXBAARO	2005	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	2005	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.5/0.0	0.0/0.0	2.0/0.0	1.5/0.0	0.0/0.0	0.5/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0
IIIXA2ARO	2005	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.5/0.5	0.5/0.0	4.0/0.5	1.0/0.0	0.0/0.0	0.0/1.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0

DHORSHAK

TEST CASE	CONTRACT YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	AP1	AP2	MAY	JUNE	JULY	AG1	AG2
		(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)
AIIXBAARO	1991	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	1991	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	1.0/0.0	1.0/0.5	1.0/1.0	0.5/0.0	0.5/0.5	0.5/0.5	0.5/0.5	0.5/0.5
IIIXA2ARO	1991	9.5/0.5	8.5/0.5	7.5/0.5	16.0/2.0	11.5/1.5	7.0/1.5	6.5/3.0	5.5/3.0	4.0/2.0	4.0/2.5	6.0/1.0	9.0/1.0	9.5/1.5	12.0/1.5
AIIXBAARO	1993	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	1993	0.5/0.0	0.5/0.0	1.0/0.0	5.0/0.5	4.0/0.5	3.5/0.0	3.0/0.5	1.5/0.0	1.5/0.0	1.5/0.0	0.0/0.0	1.0/0.0	1.0/0.0	10.5/0.0
IIIXA2ARO	1993	9.5/3.5	9.5/4.0	8.0/2.5	11.5/3.0	8.5/2.0	6.5/3.0	7.5/2.5	5.5/1.5	5.0/1.0	3.5/0.5	7.5/0.0	10.0/0.0	10.5/1.0	16.5/1.5
AIIXBAARO	1995	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	1995	21.0/1.0	19.5/1.0	11.5/1.0	18.5/0.5	14.0/0.5	11.0/0.5	9.0/0.5	7.5/0.5	8.0/0.0	6.5/0.0	5.5/0.5	5.5/0.0	5.0/0.0	15.0/0.0
IIIXA2ARO	1995	23.0/1.5	24.0/1.5	19.0/1.5	23.5/2.5	16.5/2.5	10.0/3.0	13.0/2.5	10.5/1.5	9.0/0.5	8.0/0.5	12.5/0.0	17.0/0.5	17.5/1.0	23.0/1.5
AIIXBAARO	1997	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	1997	15.0/1.0	13.0/1.0	7.0/0.5	10.0/0.0	10.0/0.0	9.5/0.0	8.5/0.5	6.0/0.0	4.5/0.0	3.0/0.0	4.0/0.0	4.5/0.0	4.0/0.0	8.5/0.0
IIIXA2ARO	1997	18.0/0.5	18.0/0.5	16.0/0.5	18.0/1.0	15.5/0.5	9.5/1.5	10.0/0.5	8.5/0.0	7.5/0.0	6.0/0.5	10.0/0.0	13.0/0.0	14.0/0.5	18.5/2.0
AIIXBAARO	2001	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	2001	12.0/0.0	12.0/0.0	9.0/0.0	13.0/0.0	11.5/0.0	9.5/0.0	8.0/0.5	6.0/0.5	5.0/0.5	4.0/0.0	2.5/0.0	3.5/0.0	3.0/0.0	8.5/0.0
IIIXA2ARO	2001	19.0/0.5	18.5/0.0	13.0/0.0	20.5/1.0	12.5/0.5	6.5/2.5	8.0/3.0	7.0/2.0	4.5/2.0	3.0/1.0	6.5/1.0	11.0/0.0	12.5/0.0	17.0/0.0
AIIXBAARO	2005	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
AIIXA1ARO	2005	11.0/0.0	9.5/0.0	6.5/0.0	12.5/0.0	7.5/0.0	10.0/0.5	6.0/1.0	5.5/0.5	4.5/0.0	4.5/0.5	5.5/0.0	3.5/0.0	4.0/0.0	7.0/0.0
IIIXA2ARO	2005	11.5/0.0	12.0/0.0	9.0/0.0	13.5/0.5	10.5/0.0	6.5/2.5	8.5/2.0	4.5/0.0	3.5/0.0	2.5/0.0	5.5/1.0	12.5/0.0	11.0/0.0	17.5/0.0

H.1-3

**APPENDIX H
RESIDENT FISH**

Part 2
Streams

APPENDIX H

Part 2 Streams

The average change in flow at Columbia Falls from the No-Action alternative for contract years 1991, 1993, 1995, 1997, 2001, and 2005.

The frequency of monthly average flows at Columbia Falls that are less than 4.5 kcfs and less than 3.5 kcfs for contract years 1991, 1993, 1995, 1997, 2001, and 2005 (absolute values).

The average change in flow at Libby from the No-Action alternative for contract years 1991, 1993, 1995, 1997, 2001, and 2005.

The frequency of monthly average flows at Libby that are less than 4.0 kcfs for contract years 1991, 1993, 1995, 1997, 2001, and 2005 (absolute values).

Additional resident fish information on Cumulative Effects can be found in Appendix L and on the Sensitivity Studies in Appendix M.

STUDY KEY

AMXBAARO - No-Action Alternative (also referred to as the base case on some tables).

AMXA1ARO - Proposed Alternative used as an opportunity resource.

IMXA2ARO - Proposed Alternative used as a firm resource.

COMPARISONS FOR PLANT, COLUMBIA FALLS
MEAN CHANGE IN END OF PERIOD FLOWS, KCF/S

STUDY	YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR1	APR2	MAY	JUNE	JULY	AUG1	AUG2
AMXBAARO	1991	8.0	4.6	4.5	4.3	8.1	8.4	7.3	7.7	13.9	23.9	23.4	11.2	6.1	4.6
AIIXA1ARO	1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.1
IHXAZARO	1991	0.1	0.0	-0.1	0.1	0.2	0.0	0.1	0.0	0.2	0.1	-0.2	-0.1	0.0	0.2
AMXBAARO	1993	7.1	4.5	4.1	4.1	7.9	8.2	6.9	7.0	15.6	23.4	23.2	11.0	6.4	5.4
AIIXA1ARO	1993	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.0	0.0	-0.4	-0.4
IHXAZARO	1993	0.8	0.0	0.0	0.0	-0.2	-0.3	-0.1	-0.2	0.0	0.0	-0.1	0.0	-0.2	-0.3
AMXBAARO	1995	7.8	5.2	4.7	4.4	7.9	7.9	7.0	8.2	14.0	23.2	23.1	10.3	6.5	5.6
AIIXA1ARO	1995	-0.4	0.0	0.0	0.0	0.3	0.2	0.1	-0.2	-0.1	0.0	0.1	0.1	-0.4	-0.6
IHXAZARO	1995	0.3	-0.1	0.0	0.1	0.2	0.0	0.0	-0.3	-0.1	0.0	0.0	0.2	-0.2	-0.2
AMXBAARO	1997	6.7	4.7	4.3	4.1	8.0	8.6	7.4	8.0	12.7	22.4	26.0	11.3	6.5	5.2
AIIXA1ARO	1997	-0.7	0.0	0.1	0.1	0.4	0.3	0.4	0.0	0.2	0.0	-0.1	0.0	-0.3	-0.2
IHXAZARO	1997	-0.3	0.0	0.1	0.1	0.4	0.3	0.1	-0.2	-0.2	0.1	-0.1	0.1	-0.2	0.0
AMXBAARO	2001	6.8	4.6	4.2	4.1	7.6	7.9	6.5	7.2	13.7	21.4	24.7	11.6	7.2	5.8
AIIXA1ARO	2001	-0.7	0.0	0.0	0.0	0.1	0.2	0.4	0.1	0.1	0.0	-0.1	0.1	-0.1	-0.1
IHXAZARO	2001	-0.4	0.0	0.1	0.0	0.0	0.3	0.3	-0.3	-0.1	0.0	-0.1	0.2	-0.1	-0.4
AMXBAARO	2005	5.8	4.7	4.2	4.0	7.6	8.1	6.6	7.0	14.2	22.3	23.4	10.6	6.3	5.1
AIIXA1ARO	2005	-0.6	0.0	-0.1	-0.1	0.4	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	-0.1
IHXAZARO	2005	-0.6	0.0	-0.1	0.0	0.4	0.0	0.1	0.0	0.1	0.0	0.0	0.2	0.0	-0.2

THE FREQUENCY OF FLOWS LESS THAN 4.5 KCFS (%)
COMPARISONS FOR PROJECT, COLUMBIA FALLS

YEAR	STUDY	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR1	APR2	MAY	JUNE	JULY	AUG1	AUG2
1991	AMXBAARO	9.2	23.1	46.2	47.7	35.4	26.2	26.2	30.8	0.0	0.0	0.0	9.2	24.6	60.0
	AMXA1ARO	7.7	23.1	46.2	46.2	33.8	26.2	26.2	30.8	0.0	0.0	0.0	9.2	24.6	50.5
	AMXA2ARO	7.7	29.2	50.8	35.4	29.2	24.6	23.1	27.7	1.5	0.0	0.0	9.2	21.5	56.9
1993	AMXBAARO	13.8	26.2	55.4	49.2	36.9	20.0	20.0	23.1	6.2	0.0	0.0	10.8	18.5	53.8
	AMXA1ARO	13.8	26.2	60.0	50.8	36.9	20.0	21.5	23.1	6.2	0.0	0.0	10.8	23.1	60.0
	AMXA2ARO	4.6	29.2	56.9	52.3	35.4	21.5	23.1	24.6	6.2	0.0	0.0	9.2	15.4	56.9
1995	AMXBAARO	10.8	24.6	49.2	52.3	40.0	33.8	36.9	24.6	3.1	0.0	0.0	0.0	16.9	44.6
	AMXA1ARO	10.8	29.2	52.3	50.8	33.8	27.7	38.5	23.1	6.2	0.0	0.0	0.0	24.6	60.0
	AMXA2ARO	6.2	26.2	49.2	46.2	38.5	52.3	36.9	26.2	6.2	0.0	0.0	1.5	16.9	47.7
1997	AMXBAARO	23.1	30.8	56.9	61.5	30.8	23.1	23.1	30.8	9.2	0.0	0.0	3.1	16.9	56.9
	AMXA1ARO	26.2	33.8	55.4	55.4	24.6	23.1	20.0	30.8	7.7	0.0	0.0	3.1	21.5	60.0
	AMXA2ARO	16.9	33.8	58.5	52.3	26.2	20.0	23.1	29.2	9.2	0.0	0.0	3.1	12.3	52.3
2001	AMXBAARO	24.6	43.1	60.0	56.9	43.1	33.8	36.9	18.5	9.2	0.0	0.0	3.1	6.3	43.8
	AMXA1ARO	27.7	50.8	60.0	58.5	36.9	30.8	29.2	16.9	9.2	0.0	0.0	3.1	6.3	43.8
	AMXA2ARO	21.5	41.5	55.4	58.5	41.5	27.7	30.8	24.6	9.2	0.0	0.0	3.1	4.7	43.8
2005	AMXBAARO	32.8	43.8	57.8	65.6	35.9	28.1	35.9	28.1	4.7	0.0	0.0	7.8	23.4	60.9
	AMXA1ARO	51.6	46.9	68.8	71.9	26.6	26.6	32.8	25.0	4.7	0.0	0.0	7.8	26.6	68.8
	AMXA2ARO	37.5	50.0	68.8	67.2	28.1	28.1	31.3	26.6	4.7	0.0	0.0	6.3	21.9	64.1

THE FREQUENCY OF FLOWS LESS THAN 3.5 KCFS (%)
COMPARISONS FOR PROJECT, COLUMBIA FALLS

YEAR	STUDY	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR1	APR2	MAY	JUNE	JULY	AUG1	AUG2
1991	AMXBAARO	0.0	0.0	0.0	0.0	0.0	1.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	AMXA1ARO	0.0	0.0	0.0	0.0	0.0	1.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	AMXA2ARO	0.0	0.0	0.0	0.0	0.0	1.5	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	AMXBAARO	0.0	0.0	0.0	0.0	0.0	1.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	AMXA1ARO	0.0	0.0	0.0	0.0	0.0	1.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	AMXA2ARO	0.0	0.0	0.0	0.0	0.0	1.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	AMXBAARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	AMXA1ARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	AMXA2ARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	AMXBAARO	0.0	0.0	0.0	0.0	0.0	1.5	1.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0
	AMXA1ARO	0.0	0.0	0.0	0.0	0.0	1.5	1.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0
	AMXA2ARO	0.0	0.0	0.0	0.0	0.0	1.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	AMXBAARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	AMXA1ARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	AMXA2ARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005	AMXBAARO	0.0	0.0	0.0	0.0	0.0	1.6	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	AMXA1ARO	0.0	0.0	0.0	0.0	0.0	1.6	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	AMXA2ARO	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0

COMPARISONS FOR PLANT LIBBY
MEAN CHANGE IN END OF PERIOD FLOWS, KCFS

STUDY	YEAR	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR1	APR2	MAY	JUNE	JULY	AUG1	AUG2
AHXBAARO	1991	9.6	11.7	17.2	17.2	19.4	15.8	5.7	4.5	4.7	8.5	7.6	13.0	10.1	7.3
AHX1ARO	1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IHX2ARO	1991	-0.2	0.3	0.6	-0.7	0.6	-0.1	0.0	0.0	0.0	-0.1	-0.2	-0.2	-0.2	0.1
AHXBAARO	1993	9.4	10.1	16.1	19.5	18.6	15.3	5.6	4.5	4.6	9.0	7.9	12.9	10.7	7.5
AHX1ARO	1993	0.0	-0.1	-0.1	-0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.2
IHX2ARO	1993	0.1	0.2	0.7	-0.7	0.3	0.0	0.0	0.0	0.0	0.0	-0.2	-0.2	-0.6	-0.1
AHXBAARO	1995	9.6	8.8	16.0	20.8	17.2	14.7	5.6	4.6	4.8	8.3	7.3	12.4	10.9	7.7
AHX1ARO	1995	-0.5	-0.1	0.1	-0.2	0.3	0.0	0.0	-0.1	0.0	0.2	0.1	0.0	-0.5	-0.3
IHX2ARO	1995	-0.2	0.3	0.9	-0.7	0.7	-0.1	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.9	-0.2
AHXBAARO	1997	8.7	9.1	16.1	21.4	17.9	15.4	5.6	4.7	5.0	8.0	7.3	12.4	11.0	7.6
AHX1ARO	1997	-0.2	-0.2	0.0	0.4	0.0	0.1	0.0	-0.1	0.0	0.1	0.1	0.1	-0.4	-0.2
IHX2ARO	1997	0.0	0.2	0.6	-0.5	0.4	0.0	0.0	-0.1	0.0	0.1	0.0	0.0	-0.9	-0.3
AHXBAARO	2001	8.8	8.0	15.7	21.8	18.5	15.4	5.4	4.4	4.9	9.1	7.3	12.9	10.3	7.4
AHX1ARO	2001	-0.3	-0.2	-0.1	0.4	0.2	0.1	0.0	-0.1	0.0	0.1	0.0	0.0	-0.3	-0.1
IHX2ARO	2001	-0.2	0.2	0.8	-0.4	0.4	-0.1	-0.1	-0.1	0.0	0.0	-0.1	-0.2	-0.5	-0.2
AHXBAARO	2005	8.1	7.9	15.1	22.8	18.4	14.8	5.6	4.4	4.4	8.6	7.3	13.2	10.3	7.1
AHX1ARO	2005	-0.2	-0.3	0.0	0.3	0.1	-0.2	0.0	0.0	0.0	0.2	0.2	0.1	-0.2	-0.1
IHX2ARO	2005	0.0	-0.1	1.0	-0.5	0.4	-0.2	0.0	0.0	0.0	0.1	-0.1	-0.2	-0.5	-0.1

THE FREQUENCY OF FLOWS LESS THAN 4 KCFS (%)
COMPARISONS FOR PROJECT, LIBBY

YEAR	STUDY	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR1	APR2	MAY	JUNE	JULY	AUG1	AUG2
1991	AMXBAARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.5	14.5	12.0	0.0	0.0
	AMXA1ARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.0	15.0	12.5	0.0	0.0
	IHXAZARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	18.0	14.0	0.0	0.0
1993	AMXBAARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.0	12.5	10.0	0.0	0.0
	AMXA1ARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.5	12.5	10.5	0.0	0.0
	IHXAZARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.0	15.5	14.5	0.0	0.0
1995	AMXBAARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.0	19.0	16.5	0.0	0.0
	AMXA1ARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.0	19.5	16.0	0.0	0.0
	IHXAZARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.5	21.5	17.5	0.0	0.0
1997	AMXBAARO	0.0	0.0	0.0	0.0	0.5	0.5	0.5	1.0	0.0	25.5	16.0	18.0	0.0	0.0
	AMXA1ARO	0.0	0.0	0.0	0.0	0.0	0.5	0.0	1.0	0.0	23.5	14.5	17.5	0.0	0.0
	IHXAZARO	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	22.0	17.5	19.0	0.0	0.0
2001	AMXBAARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.5	17.0	15.5	0.0	0.0
	AMXA1ARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0	17.5	15.0	0.0	0.0
	IHXAZARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.5	18.0	17.0	0.0	0.0
2005	AMXBAARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.5	12.5	10.0	0.0	0.0
	AMXA1ARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0	10.0	11.0	0.0	0.0
	IHXAZARO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.5	13.0	12.5	0.0	0.0

APPENDIX I
ANADROMOUS FISH

APPENDIX I
ANADROMOUS FISH

Part 1

Water Budget/Flow and Vernita Bar

**APPENDIX I
ANADROMOUS FISH**

Part 1
Water Budget/Flow and Vernita Bar

The frequency of water budget flows less than 134 kcfs at Priest Rapids during the month of May based on SAM study results.

The frequency of flows greater than 125 kcfs in October and November at Priest Rapids.

The frequency of flows less than 70 kcfs December through April at Priest Rapids.

Additional flow data can be found in Appendix G.

NOTE - Additional anadromous fish information can be found on Cumulative Effects in Appendix L and on the Sensitivity Studies in Appendix M.

Overgeneration Spill

Overgeneration spill tables can be found in Appendix G.

STUDY KEY

- AMXBAARO - No-Action Alternative (also referred to as the base case on some tables).
- AMXA1ARO - Proposed Alternative used as an opportunity resource.
- IMXA2ARO - Proposed Alternative used as a firm resource.

OPPORTUNITY STORAGE

BASE CASE

 BPAHYSUM Summary
 Base Study: AMXBAARO : NTS : TE3AC : 1.0 MAF : ALT RESOURCE ORDER Date: 28-MAR-89 17:23:39
 Incr Study: AMXALARO : NTS : TE3AC : 2.5 MAF : ALT RESOURCE ORDER Date: 13-MAR-89 15:51:49
 Difference = (Incr Study) - (Base Study)
 Number of Games: 200
 All Water Years

Frequency Distribution

Year	Num	Grand Coulee Elev LT 1240 feet			Priest Rapids Discharge GE 125 kcfs				Priest Rapids Discharge LT 134 kcfs				
		(Base)	(Incr)	(Diff)	(Base)		(Incr)		(Diff)	(Base)	(Incr)	(Diff)	
		May	May	May	Oct	Nov	Oct	Nov	Oct	Nov	May	May	May
1989	200	34	34	0	1	1	1	1	0	0	4	4	0
1990	200	34	34	0	6	11	6	11	0	0	6	6	0
1991	200	42	42	0	9	13	8	8	-1	-5	2	2	0
1992	200	35	35	0	7	5	7	5	0	0	3	3	0
1993	200	38	38	0	8	10	3	8	-5	-2	6	7	1
1994	200	37	37	0	1	2	0	3	-1	1	8	8	0
1995	200	38	38	0	0	0	0	0	0	0	5	5	0
1996	200	32	32	0	0	0	0	3	0	3	4	3	-1
1997	200	37	37	0	1	1	0	1	-1	0	6	6	0
1998	200	43	43	0	6	6	2	3	-4	-3	6	6	0
1999	200	30	30	0	3	2	0	1	-3	-1	9	9	0
2000	200	41	41	0	0	0	0	0	0	0	1	1	0
2001	200	45	45	0	1	2	0	2	-1	0	3	3	0
2002	200	33	33	0	5	7	3	7	-2	0	6	6	0
2003	200	40	40	0	3	3	0	1	-3	-2	5	5	0
2004	200	40	40	0	1	1	0	0	-1	-1	2	2	0
2005	200	31	31	0	1	0	0	0	-1	0	7	7	0
2006	200	36	36	0	1	2	0	2	-1	0	3	3	0
2007	200	23	23	0	0	0	0	0	0	0	8	8	0
2008	200	49	49	0	0	0	0	0	0	0	7	7	0

FIRM USE

BASE CASE

 BPAHYSUM Summary
 Base Study: AMXBAARO : NTS : TE3AC : 1.0 MAF : ALT RESOURCE ORDER Date: 28-MAR-89 17:23:39
 Incr Study: IMXA2ARO : NTS : TE3AC : 2.5 MAF : FIRM USE : Date: 18-OCT-89 16:35:50
 Difference = (Incr Study) - (Base Study)
 Number of Games: 200
 All Water Years

Frequency Distribution

Year	Num	Grand Coulee Elev LT 1240 feet			Priest Rapids Discharge GE 125 kcfs						Priest Rapids Discharge LT 134 kcfs		
		(Base)	(Incr)	(Diff)	(Base)		(Incr)		(Diff)		(Base)	(Incr)	(Diff)
		May	May	May	Oct	Nov	Oct	Nov	Oct	Nov	May	May	May
1989	200	34	34	0	1	1	2	8	1	7	4	4	0
1990	200	34	34	0	6	11	7	13	1	2	6	6	0
1991	200	42	42	0	9	13	11	12	2	-1	2	2	0
1992	200	35	35	0	7	5	8	7	1	2	3	3	0
1993	200	38	38	0	8	10	8	12	0	2	6	6	0
1994	200	37	37	0	1	2	1	6	0	4	8	8	0
1995	200	38	38	0	0	0	0	0	0	0	5	5	0
1996	200	32	32	0	0	0	0	1	0	1	4	3	-1
1997	200	37	37	0	1	1	1	1	0	0	6	6	0
1998	200	43	43	0	6	6	6	4	0	-2	6	5	-1
1999	200	30	30	0	3	2	2	4	-1	2	9	8	-1
2000	200	41	41	0	0	0	0	0	0	0	1	1	0
2001	200	45	45	0	1	2	1	2	0	0	3	3	0
2002	200	33	33	0	5	7	4	7	-1	0	6	6	0
2003	200	40	40	0	3	3	3	1	0	-2	5	4	-1
2004	200	40	40	0	1	1	0	0	-1	-1	2	2	0
2005	200	31	31	0	1	0	0	0	-1	0	7	7	0
2006	200	36	36	0	1	2	1	2	0	0	3	2	-1
2007	200	23	23	0	0	0	0	1	0	1	8	8	0
2008	200	49	49	0	0	0	0	1	0	1	7	7	0

I.1-3

OPPORTUNITY STORAGE

BASE CASE

 BPAHYSUM Summary
 Base Study: AMXBAARO : NTS : TE3AC : 1.0 MAF : ALT RESOURCE ORDER Date: 28-MAR-89 17:23:39
 Incr Study: AMXALARO : NTS : TE3AC : 2.5 MAF : ALT RESOURCE ORDER Date: 13-MAR-89 15:51:49
 Difference = (Incr Study) - (Base Study)
 Number of Games: 200
 All Water Years

Frequency Distribution

Priest Rapids Discharge
 LT 70 kcfs

Year	Num	--- (Base) ---						--- (Incr) ---						--- (Diff) ---					
		Dec	Jan	Feb	Mar	Apr	Apr	Dec	Jan	Feb	Mar	Apr	Apr	Dec	Jan	Feb	Mar	Apr	Apr
1989	200	0	0	4	2	0	0	0	0	4	2	0	0	0	0	0	0	0	0
1990	200	0	0	3	2	0	4	0	0	0	0	0	4	0	0	-3	-2	0	0
1991	200	0	0	2	3	0	0	0	0	1	2	0	0	0	0	-1	-1	0	0
1992	200	0	0	4	4	1	1	0	0	1	2	1	1	0	0	-3	-2	0	0
1993	200	0	0	1	3	0	0	0	0	1	2	0	0	0	0	0	-1	0	0
1994	200	0	0	5	4	3	1	0	0	4	5	3	1	0	0	-1	1	0	0
1995	200	0	0	5	3	1	0	0	0	5	3	1	0	0	0	0	0	0	0
1996	200	1	0	0	2	0	0	2	0	0	1	0	0	1	0	0	-1	0	0
1997	200	0	0	1	5	2	2	0	0	1	3	2	0	0	0	0	-2	0	-2
1998	200	0	0	3	4	1	0	0	0	1	1	1	0	0	0	-2	-3	0	0
1999	200	0	1	4	7	4	3	0	1	3	6	4	3	0	0	-1	-1	0	0
2000	200	0	0	0	3	0	0	0	0	0	2	0	0	0	0	0	-1	0	0
2001	200	1	0	2	2	0	1	0	0	0	2	0	0	-1	0	-2	0	0	-1
2002	200	0	0	1	1	1	1	0	0	0	1	1	1	0	0	-1	0	0	0
2003	200	0	0	2	5	0	1	0	0	1	5	0	1	0	0	-1	0	0	0
2004	200	0	0	0	3	0	1	0	0	0	3	0	2	0	0	0	0	0	1
2005	200	0	0	1	0	0	1	0	0	0	0	0	1	0	0	-1	0	0	0
2006	200	0	0	2	4	0	0	0	0	0	3	0	0	0	0	-2	-1	0	0
2007	200	0	0	1	4	0	4	0	0	0	4	1	1	0	0	-1	0	1	-3
2008	200	0	0	1	2	2	5	0	0	0	1	1	2	0	0	-1	-1	-1	-3

I.1-4

FIRM USE

BASE CASE

 BPAHYSUM Summary
 Base Study: AMXBAARO : NTS : TE3AC : 1.0 MAF : ALT RESOURCE ORDER Date: 28-MAR-89 17:23:39
 Incr Study: IMXA2ARO : NTS : TE3AC : 2.5 MAF : FIRM USE : Date: 18-OCT-89 16:35:50
 Difference = (Incr Study) - (Base Study)
 Number of Games: 200
 All Water Years

Frequency Distribution

Priest Rapids Discharge
 LT 70 kcfs

Year	Num	(Base)						(Incr)						(Diff)					
		Dec	Jan	Feb	Mar	Ap1	Ap2	Dec	Jan	Feb	Mar	Ap1	Ap2	Dec	Jan	Feb	Mar	Ap1	Ap2
1989	200	0	0	4	2	0	0	0	0	3	2	0	0	0	0	-1	0	0	0
1990	200	0	0	3	2	0	4	0	0	0	0	0	0	0	-3	-2	0	-4	
1991	200	0	0	2	3	0	0	0	0	2	1	0	0	0	0	0	-2	0	
1992	200	0	0	4	4	1	1	0	0	0	2	1	1	0	0	-4	-2	0	
1993	200	0	0	1	3	0	0	0	0	1	4	0	0	0	0	0	1	0	
1994	200	0	0	5	4	3	1	0	0	5	3	2	1	0	0	0	-1	-1	
1995	200	0	0	5	3	1	0	0	0	5	3	0	0	0	0	0	0	-1	
1996	200	1	0	0	2	0	0	1	0	0	2	0	0	0	0	0	0	0	
1997	200	0	0	1	5	2	2	0	0	1	2	1	1	0	0	0	-3	-1	
1998	200	0	0	3	4	1	0	0	0	1	3	1	0	0	0	-2	-1	0	
1999	200	0	1	4	7	4	3	0	0	1	2	6	2	3	1	0	-1	-2	
2000	200	0	0	0	3	0	0	0	0	0	0	3	0	0	0	0	0	0	
2001	200	1	0	2	2	0	1	0	0	1	2	0	0	0	-1	0	0	-1	
2002	200	0	0	1	1	1	1	0	0	0	2	1	1	0	0	-1	1	0	
2003	200	0	0	2	5	0	1	0	0	1	5	0	0	0	0	0	0	-1	
2004	200	0	0	0	3	0	1	0	0	0	6	0	0	0	0	0	3	0	
2005	200	0	0	1	0	0	1	0	0	1	0	0	2	1	0	-1	1	0	
2006	200	0	0	2	4	0	0	0	0	1	3	0	0	0	0	-1	-1	0	
2007	200	0	0	1	4	0	4	0	0	1	3	0	1	0	0	0	-1	0	
2008	200	0	0	1	2	2	5	0	0	0	3	1	1	0	0	-1	1	-1	

**APPENDIX I
ANADROMOUS FISH**

Part 2
Survival

APPENDIX I

Part 2 Survival

The relative change in mean survival for the contract years 1991, 1993, 1995, 1997, 2001, and 2005. (The difference in mean survival between the proposal and the No-Action alternatives divided by the No-Action alternative survival).

The frequency of relative survival increases and decreases greater than 1 and 5 percent for the contract years 1991, 1993, 1995, 1997, 2001, and 2005.

NOTE - Additional anadromous fish information can be found on Cumulative Effects in Appendix L and on the Sensitivity Studies in Appendix M.

STUDY KEY

- AMXBAARO - No-Action Alternative (also referred to as the base case on some tables).
- AMXA1ARO - Proposed Alternative used as an opportunity resource.
- IMXA2ARO - Proposed Alternative used as a firm resource.

OPPORTUNITY STORAGE

RELATIVE CHANGES IN SYSTEM STOCK SURVIVAL
ANXAIAARO VS ANMBAARO (BASE CASE)

FREQUENCY OF RELATIVE SURVIVAL CHANGES
EXCEEDING ONE AND FIVE PERCENT

PROGRAM = DSH=PJI.PF400.RNR.FISHPASS.SAS.REPORTS(FSUM56)
FILES: PJI.PF400.RNR.FISH.PASS.DATA.MIDCOLFG
PJI.PF400.RNR.FISH.PASS.DATA.MIDCOLFG

RUN DATE: AUG/04/89
RUN DATE: MAR/21/89

PROGRAM = DSH=PJI.PF400.RNR.SAS.REPORTS(FSUM)
FILE: PJI.PF400.RNR.FISH.PASS.DATA.MIDCOLFG
FILE: PJI.PF400.RNR.FISH.PASS.DATA.MIDCOLFG

POOL	YEAR	YEARLING			SUBYEARLING			STEELHEAD			SOCKEYE			YEARLING			SUBYEARLING			STEELHEAD			SOCKEYE		
		MB	MA	RII	MB	MA	RII	MB	MA	RII	MB	MA	RII	F11/F15	FD1/FD5	F11/F15	FD1/FD5	F11/F15	FD1/FD5	F11/F15	FD1/FD5	F11/F15	FD1/FD5		
WELLS	1991	30.9	30.9	0.0	18.9	18.7	-0.8	35.5	35.5	0.0	26.2	26.2	-0.1	3/0	0/0	5/0	0/0	10/0	0/0	3/0	0/0	3/0	0/0	3/0	0/0
	1993	40.1	34.2	0.1	20.0	20.0	0.0	47.7	47.7	0.0	34.4	34.4	0.0	3/0	0/0	5/0	0/0	10/0	0/0	3/0	0/0	3/0	0/0	3/0	0/0
	1995	40.1	40.0	0.0	20.0	20.0	0.0	47.7	47.7	0.0	34.4	34.4	0.0	3/0	0/0	5/0	0/0	10/0	0/0	3/0	0/0	3/0	0/0	3/0	0/0
	1997	41.7	42.0	0.8	21.7	21.7	0.0	47.7	47.7	0.0	34.4	34.4	0.0	3/0	0/0	5/0	0/0	10/0	0/0	3/0	0/0	3/0	0/0	3/0	0/0
	2001	40.7	40.8	0.5	20.7	20.8	0.0	47.7	47.7	0.0	34.4	34.4	0.0	3/0	0/0	5/0	0/0	10/0	0/0	3/0	0/0	3/0	0/0	3/0	0/0
	2005	41.0	41.1	0.1	20.7	20.9	0.3	47.7	47.6	-0.2	34.4	34.5	0.4	3/0	0/0	5/0	0/0	10/0	0/0	3/0	0/0	3/0	0/0	3/0	0/0
RRECH	1991	33.1	33.2	0.2	24.3	24.2	-0.2	37.6	37.6	0.0	0.0	0.0	0.0	13/0	0/0	8/0	0/0	13/0	0/0	3/0	0/0	3/0	0/0	3/0	0/0
	1993	36.9	37.1	0.4	25.5	25.1	-0.1	41.3	41.4	0.1	0.0	0.0	0.0	13/0	0/0	5/0	0/0	13/0	0/0	3/0	0/0	3/0	0/0	3/0	0/0
	1995	45.1	45.8	1.5	33.4	33.4	0.0	50.6	50.7	0.0	0.0	0.0	0.0	40/0	10/0	5/0	0/0	15/0	0/0	1/0	0/0	0/0	0/0	0/0	0/0
	1997	46.3	46.3	1.1	33.3	33.3	0.0	50.2	50.3	0.0	0.0	0.0	0.0	40/0	10/0	5/0	0/0	15/0	0/0	1/0	0/0	0/0	0/0	0/0	0/0
	2001	45.3	45.6	0.7	33.3	34.4	1.0	49.9	49.8	-0.1	0.0	0.0	0.0	28/0	3/0	5/0	0/0	23/0	1/0	1/0	0/0	0/0	0/0	0/0	0/0
	2005	45.9	46.3	0.8	34.2	34.4	0.6	49.9	50.0	0.2	0.0	0.0	0.0	30/0	5/0	13/0	0/0	18/0	15/0	18/0	3/0	0/0	0/0	0/0	0/0
RISL	1991	40.5	40.6	0.2	26.4	26.6	0.5	42.1	42.1	0.0	34.1	34.1	0.0	8/0	0/0	0/0	0/0	13/0	0/0	3/0	0/0	3/0	0/0	3/0	0/0
	1993	41.1	41.1	0.4	26.4	26.6	0.5	42.1	42.1	0.0	34.1	34.1	0.0	8/0	0/0	0/0	0/0	13/0	0/0	3/0	0/0	3/0	0/0	3/0	0/0
	1995	49.9	50.2	1.1	37.7	37.7	0.0	53.9	53.9	0.0	44.4	44.4	0.0	11/0	0/0	0/0	0/0	20/0	0/0	13/0	0/0	13/0	0/0	13/0	0/0
	1997	49.9	50.0	0.6	37.7	37.7	0.0	53.9	53.9	0.0	44.4	44.4	0.0	11/0	0/0	0/0	0/0	20/0	0/0	13/0	0/0	13/0	0/0	13/0	0/0
	2001	49.9	50.0	0.6	37.7	37.7	0.0	53.9	53.9	0.0	44.4	44.4	0.0	11/0	0/0	0/0	0/0	20/0	0/0	13/0	0/0	13/0	0/0	13/0	0/0
	2005	50.2	50.6	0.8	36.6	36.6	0.4	53.9	53.9	0.0	44.4	44.4	0.0	11/0	0/0	0/0	0/0	20/0	0/0	13/0	0/0	13/0	0/0	13/0	0/0
LWG	1991	83.0	83.0	-0.0	59.8	59.8	-0.0	85.7	85.6	-0.0	65.5	65.5	-0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	1993	82.2	82.2	-0.0	60.1	60.0	-0.1	85.6	85.6	0.0	65.5	65.5	0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	1995	88.1	88.1	0.0	70.2	70.1	-0.0	88.9	88.9	0.0	74.5	74.5	0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	1997	88.1	88.1	0.0	70.2	70.1	-0.0	88.9	88.9	0.0	74.5	74.5	0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	2001	88.7	88.7	0.0	70.8	70.7	-0.0	89.7	89.7	0.0	74.8	74.8	0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	2005	87.7	87.7	0.0	70.1	70.1	-0.0	89.3	89.3	0.0	74.3	74.3	0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
LMI	1991	33.3	33.3	-0.1	27.7	27.6	-0.9	40.2	40.3	-0.1	0.0	0.0	0.0	18/0	0/0	10/0	0/0	5/0	0/0	20/0	0/0	10/0	0/0	0/0	0/0
	1993	33.5	33.6	0.4	27.7	27.7	0.0	44.4	44.6	0.0	0.0	0.0	0.0	18/0	0/0	10/0	0/0	5/0	0/0	20/0	0/0	10/0	0/0	0/0	0/0
	1995	33.5	33.3	-0.1	27.7	27.7	0.0	44.4	44.6	0.0	0.0	0.0	0.0	18/0	0/0	10/0	0/0	5/0	0/0	20/0	0/0	10/0	0/0	0/0	0/0
	1997	33.5	33.3	-0.1	27.7	27.7	0.0	44.4	44.6	0.0	0.0	0.0	0.0	18/0	0/0	10/0	0/0	5/0	0/0	20/0	0/0	10/0	0/0	0/0	0/0
	2001	33.8	33.9	0.6	27.7	27.7	0.0	44.4	44.6	0.0	0.0	0.0	0.0	18/0	0/0	10/0	0/0	5/0	0/0	20/0	0/0	10/0	0/0	0/0	0/0
	2005	33.8	33.9	0.7	27.7	27.7	0.0	44.4	44.6	0.0	0.0	0.0	0.0	18/0	0/0	10/0	0/0	5/0	0/0	20/0	0/0	10/0	0/0	0/0	0/0
HCN	1991	59.7	59.9	0.5	42.7	42.6	-0.3	67.5	67.5	0.1	0.0	0.0	0.0	15/0	8/0	5/0	0/0	5/0	0/0	18/0	0/0	0/0	0/0	0/0	0/0
	1993	64.8	64.8	0.0	42.4	42.3	-0.2	66.6	66.6	0.0	0.0	0.0	0.0	10/0	0/0	0/0	0/0	10/0	0/0	18/0	0/0	0/0	0/0	0/0	0/0
	1995	64.7	64.4	-0.2	42.4	42.3	-0.2	66.6	66.6	0.0	0.0	0.0	0.0	10/0	0/0	0/0	0/0	10/0	0/0	18/0	0/0	0/0	0/0	0/0	0/0
	1997	66.6	67.2	1.0	42.2	42.3	0.1	74.1	74.5	0.4	0.0	0.0	0.0	20/0	0/0	0/0	0/0	10/0	0/0	10/0	0/0	0/0	0/0	0/0	0/0
	2001	64.6	65.3	0.6	42.3	42.3	0.0	72.8	73.3	0.5	0.0	0.0	0.0	20/0	0/0	0/0	0/0	10/0	0/0	10/0	0/0	0/0	0/0	0/0	0/0
	2005	64.6	65.3	1.1	42.3	42.6	0.4	73.1	73.3	0.3	0.0	0.0	0.0	20/0	10/0	10/0	0/0	20/0	0/0	15/0	0/0	15/0	0/0	0/0	0/0
JDAY	1991	54.8	54.7	-0.1	45.1	45.3	0.0	60.2	60.2	0.0	0.0	0.0	0.0	8/0	0/0	10/0	0/0	15/0	0/0	18/0	0/0	5/0	0/0	5/0	0/0
	1993	54.4	54.5	0.1	44.4	44.4	0.0	59.9	59.9	0.0	0.0	0.0	0.0	8/0	0/0	10/0	0/0	15/0	0/0	18/0	0/0	5/0	0/0	5/0	0/0
	1995	54.4	54.2	-0.4	44.4	44.4	0.0	59.9	59.9	0.0	0.0	0.0	0.0	8/0	0/0	10/0	0/0	15/0	0/0	18/0	0/0	5/0	0/0	5/0	0/0
	1997	55.6	55.6	0.0	44.4	44.4	0.0	59.9	59.9	0.0	0.0	0.0	0.0	8/0	0/0	10/0	0/0	15/0	0/0	18/0	0/0	5/0	0/0	5/0	0/0
	2001	55.6	55.6	0.0	44.4	44.4	0.0	59.9	59.9	0.0	0.0	0.0	0.0	8/0	0/0	10/0	0/0	15/0	0/0	18/0	0/0	5/0	0/0	5/0	0/0
	2005	55.6	55.6	0.0	44.4	44.4	0.0	59.9	59.9	0.0	0.0	0.0	0.0	8/0	0/0	10/0	0/0	15/0	0/0	18/0	0/0	5/0	0/0	5/0	0/0
DALS	1991	66.0	65.9	-0.2	55.0	54.8	-0.3	65.9	65.8	-0.1	0.0	0.0	0.0	5/0	0/0	15/0	0/0	5/0	0/0	13/0	0/0	8/0	0/0	8/0	0/0
	1993	66.0	65.9	-0.1	55.0	54.8	-0.3	65.9	65.8	-0.1	0.0	0.0	0.0	5/0	0/0	15/0	0/0	5/0	0/0	13/0	0/0	8/0	0/0	8/0	0/0
	1995	65.9	66.5	0.8	55.5	55.5	0.0	66.6	66.6	0.0	0.0	0.0	0.0	40/0	0/0	0/0	0/0	10/0	0/0	10/0	0/0	1/0	0/0	0/0	0/0
	1997	69.4	69.3	-0.0	56.6	56.6	0.0	68.9	68.8	-0.1	0.0	0.0	0.0	10/0	0/0	10/0	0/0	10/0	0/0	10/0	0/0	0/0	0/0	0/0	0/0
	2001	68.8	69.7	1.0	56.6	56.6	0.0	69.1	69.0	-0.1	0.0	0.0	0.0	5/0	0/0	13/0	0/0	20/0	0/0	20/0	0/0	10/0	0/0	0/0	0/0
	2005	69.1	69.1	0.0	56.6	56.6	0.0	69.0	68.9	-0.1	0.0														

FIRM USE

RELATIVE CHANGES IN SYSTEM STOCK SURVIVAL
IHXAZARO VS AIIXBAARO (BASE CASE)

FREQUENCY OF RELATIVE SURVIVAL CHANGES
EXCEEDING ONE AND FIVE PERCENT

PROGRAM = DSN=PJI.PF400.RNR.FISH.PASS.SAS.REPORTS(FSUM56)
FILES: PJI.PF400.RNR.FISH.PASS.DATA.HIDCOLFG
PJI.PF400.RNR.FISH.PASS.DATA.HIDCOLFG

RUN DATE: AUG/04/89
RUN DATE: OCT/20/89

PROGRAM = DSN=PJI.PF400.RNR.SAS.REPORTS(FSUM)
FILE: PJI.PF400.RNR.FISH.PASS.DATA.HIDCOLFG
PJI.PF400.RNR.FISH.PASS.DATA.HIDCOLFG

POOL	YEAR	YEARLING			SUBYEARLING			STEELHEAD			SOCKEYE			YEARLING			SUBYEARLING			STEELHEAD			SOCKEYE		
		MB	MA	RM	MB	MA	RM	MB	MA	RM	MB	MA	RM	F11/F15	FD1/FD5	F11/F15	FD1/FD5	F11/F15	FD1/FD5	F11/F15	FD1/FD5	F11/F15	FD1/FD5		
HELLS	1991	30.9	31.1	0.7	18.9	18.8	-0.6	35.5	35.7	0.5	26.2	26.3	0.4	18/3	8/0	20/0	28/8	13/3	5/0	10/0	3/0	5/0	0/0	0/0	
	1993	34.1	34.4	0.3	20.4	20.2	-0.1	39.9	39.5	-0.4	27.7	27.7	0.0	18/0	5/0	39/3	23/0	18/0	3/0	10/0	3/0	5/0	0/0	0/0	
	1995	40.3	40.5	0.4	29.3	29.4	0.1	47.7	47.1	-0.6	44.4	44.4	0.0	25/0	13/0	13/0	15/0	20/0	0/0	10/0	0/0	0/0	0/0	0/0	
	1997	41.6	41.7	0.2	29.7	29.8	0.1	47.7	48.0	0.3	44.3	44.3	0.0	18/3	0/0	28/0	30/0	29/0	0/0	8/0	0/0	0/0	0/0	0/0	0/0
	2001	40.7	40.7	0.0	28.9	28.8	-0.1	47.7	47.3	-0.4	44.1	44.2	0.1	13/0	0/0	35/10	18/0	15/0	0/0	13/0	0/0	0/0	0/0	0/0	0/0
	2005	41.0	41.1	0.1	27.8	27.9	0.1	47.7	47.7	0.0	44.4	44.5	0.1	18/0	10/0	38/8	23/0	18/0	3/0	18/0	0/0	3/0	0/0	18/0	0/0
RRECH	1991	33.1	33.3	0.7	24.5	24.5	-0.1	37.6	37.7	0.4	0.0	0.0	0.0	23/3	10/3	25/0	23/5	10/3	3/0	0/0	0/0	0/0	0/0	0/0	
	1993	36.9	37.0	0.1	25.8	25.8	0.0	41.3	41.4	0.1	0.0	0.0	0.0	23/3	13/3	28/5	25/5	5/3	3/0	0/0	0/0	0/0	0/0	0/0	
	1995	45.1	45.4	0.5	33.8	33.4	-0.4	49.0	49.6	0.6	0.0	0.0	0.0	23/3	13/3	33/5	10/0	15/3	5/0	0/0	0/0	0/0	0/0	0/0	
	1997	46.8	47.0	0.5	33.3	33.7	0.4	49.2	49.3	0.1	0.0	0.0	0.0	28/3	13/3	8/0	8/0	3/0	3/0	0/0	0/0	0/0	0/0	0/0	0/0
	2001	45.3	45.5	0.2	32.0	32.9	0.9	49.7	49.8	0.1	0.0	0.0	0.0	18/3	8/0	18/0	5/3	13/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	2005	45.9	46.1	0.3	34.2	34.4	0.2	49.9	49.0	-0.9	0.0	0.0	0.0	20/3	15/0	18/5	8/0	13/3	0/0	0/0	0/0	0/0	0/0	0/0	0/0
RISL	1991	40.5	40.7	0.5	26.4	26.3	-0.4	42.1	42.3	0.4	34.1	34.2	0.1	15/3	8/3	18/0	33/0	20/5	10/3	15/0	3/0	10/0	3/0	0/0	0/0
	1993	40.9	40.9	0.0	26.6	26.6	0.0	42.6	42.6	0.0	44.2	44.2	0.0	18/3	8/0	35/0	30/0	18/5	10/0	10/0	0/0	0/0	0/0	0/0	
	1995	49.6	49.9	0.6	31.3	31.3	0.0	48.9	48.9	0.0	44.2	44.2	0.0	15/3	8/0	20/0	10/0	15/0	0/0	10/0	0/0	0/0	0/0	0/0	0/0
	1997	45.9	46.2	0.9	27.7	27.7	0.0	48.9	48.9	0.0	44.2	44.2	0.0	15/3	8/0	20/0	10/0	15/0	0/0	10/0	0/0	0/0	0/0	0/0	0/0
	2001	45.9	45.9	0.0	27.7	27.7	0.0	48.9	48.9	0.0	44.2	44.2	0.0	15/3	8/0	20/0	10/0	15/0	0/0	10/0	0/0	0/0	0/0	0/0	0/0
	2005	50.2	50.4	0.4	30.1	30.6	0.5	48.9	48.9	0.0	44.2	44.2	0.0	25/3	8/0	28/0	15/0	20/0	0/0	18/0	0/0	13/0	0/0	0/0	0/0
LWG	1991	83.0	83.0	0.0	59.8	59.8	-0.0	85.7	85.6	-0.0	65.5	65.5	-0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	1993	82.2	82.2	0.0	60.0	60.0	0.0	85.6	85.6	0.0	65.5	65.5	0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	1995	82.2	82.2	0.0	70.1	70.1	0.0	89.9	89.4	-0.5	74.4	74.4	0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	1997	83.5	83.5	0.0	70.4	70.4	0.0	89.9	89.5	-0.4	74.4	74.4	0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	2001	87.7	88.8	1.1	70.7	70.7	0.0	89.9	89.5	-0.4	74.4	74.4	0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	2005	87.7	88.8	1.1	70.1	70.1	0.0	89.3	89.3	0.0	74.3	74.3	-0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
LMI	1991	33.3	33.3	0.0	27.7	27.7	-0.0	40.0	40.0	0.0	0.0	0.0	0.0	18/3	10/0	20/0	30/0	13/3	8/0	0/0	0/0	0/0	0/0	0/0	
	1993	36.8	36.8	0.0	27.7	27.7	-0.0	44.4	44.4	0.0	0.0	0.0	0.0	15/3	8/0	20/0	18/0	13/3	3/0	0/0	0/0	0/0	0/0	0/0	
	1995	38.8	38.8	0.0	27.7	27.7	-0.0	46.6	46.6	0.0	0.0	0.0	0.0	15/3	8/0	20/0	18/0	13/3	3/0	0/0	0/0	0/0	0/0	0/0	
	1997	38.8	38.8	0.0	27.7	27.7	-0.0	46.6	46.6	0.0	0.0	0.0	0.0	15/3	8/0	20/0	18/0	13/3	3/0	0/0	0/0	0/0	0/0	0/0	
	2001	38.8	38.8	0.0	27.7	27.7	-0.0	47.7	47.7	0.0	0.0	0.0	0.0	15/3	8/0	20/0	18/0	13/3	3/0	0/0	0/0	0/0	0/0	0/0	
	2005	38.7	38.9	0.4	27.7	27.7	-0.0	47.7	48.0	0.3	0.0	0.0	0.0	15/3	8/0	20/0	18/0	13/3	3/0	0/0	0/0	0/0	0/0	0/0	
HCN	1991	59.7	59.7	0.0	42.7	42.6	-0.2	67.6	67.6	0.0	0.0	0.0	0.0	13/0	8/3	10/0	15/0	8/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1993	62.8	62.8	0.0	42.7	42.7	0.0	67.6	67.6	0.0	0.0	0.0	0.0	15/0	10/3	18/0	15/0	10/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1995	66.7	66.7	0.0	42.7	42.7	0.0	73.3	73.3	0.0	0.0	0.0	0.0	13/0	18/3	13/0	5/0	20/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1997	66.6	66.6	0.0	42.7	42.7	0.0	74.1	74.4	0.3	0.0	0.0	0.0	20/0	8/3	13/0	0/0	10/0	0/0	0/0	0/0	0/0	0/0	0/0	
	2001	64.6	64.6	0.0	42.7	42.7	0.0	73.3	73.3	0.0	0.0	0.0	0.0	13/0	8/3	10/0	0/0	13/0	0/0	0/0	0/0	0/0	0/0	0/0	
	2005	64.6	65.0	0.5	42.7	42.7	0.0	73.3	73.3	0.0	0.0	0.0	0.0	23/0	8/3	23/0	3/0	15/0	5/0	0/0	0/0	0/0	0/0	0/0	
JDAY	1991	54.8	55.0	0.4	45.1	45.0	-0.2	60.0	60.2	0.2	0.0	0.0	0.0	18/5	8/3	25/5	35/3	8/3	0/0	0/0	0/0	0/0	0/0	0/0	
	1993	54.6	54.3	-0.4	44.4	44.3	-0.1	59.9	59.9	0.0	0.0	0.0	0.0	20/0	5/3	18/0	33/0	10/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1995	55.3	55.3	0.0	46.6	46.6	0.0	61.1	61.1	0.0	0.0	0.0	0.0	20/0	20/3	5/0	23/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1997	66.0	66.0	0.0	44.4	44.4	0.0	61.1	61.1	0.0	0.0	0.0	0.0	15/0	10/3	10/0	20/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	2001	67.7	67.7	0.0	45.5	45.5	0.0	61.1	61.1	0.0	0.0	0.0	0.0	5/0	10/3	15/0	8/0	13/0	0/0	0/0	0/0	0/0	0/0	0/0	
	2005	66.6	66.7	0.1	44.4	44.4	0.0	61.1	62.1	1.0	0.0	0.0	0.0	20/3	0/0	18/8	8/0	13/0	0/0	0/0	0/0	0/0	0/0	0/0	
DALS	1991	66.0	66.1	0.1	55.0	54.9	-0.1	65.9	66.0	0.1	0.0	0.0	0.0	8/3	13/0	5/0	13/0	15/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1993	66.0	66.0	0.0	55.0	55.0	0.0	66.0	66.0	0.0	0.0	0.0	0.0	15/0	10/3	20/0	13/0	10/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1995	66.6	66.6	0.0	55.0	55.0	0.0	66.6	66.6	0.0	0.0	0.0	0.0	5/0	20/3	8/0	8/0	10/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1997	68.8	68.9	0.1	55.0	55.0	0.0	69.0	69.0	0.0	0.0	0.0	0.0	13/0	8/3	15/0	13/0	5/0	0/0	0/0	0/0	0/0	0/0	0/0	
	2001	69.1	69.2	0.1	55.0	55.0	0.0	69.0	69.0	0.0	0.0	0.0	0.0	13/3	0/0	15/0	8/0	10/0	0/0	0/0	0/0	0/0	0/0	0/0	
	2005	69.1	69.2	0.2	54.8	54.9	0.1	69.0	69.0	0.0	0.0	0.0	0.0	15/3	5/0	20/0	8/0	10/0	0/0	0/0	0/0	0/0	0/0	0/0	
BOHN	1991	87.5	87.6	0.1	79.5	79.6	0.1	83.4																	

**APPENDIX I
ANADROMOUS FISH**

Part 3

FISHPASS Sensitivity Studies

APPENDIX I
Part 3
FISHPASS Sensitivity Studies

The relative change in mean survival using a 50% increase and decrease in reservoir mortality for contract years 1991, 1993, 1995, 1997, 2001, and 2005.

The frequency of relative survival increases or decreases of greater than 1 and 5 percent using a 50% increase and decrease in reservoir mortality for the contract years 1991, 1993, 1995, 1997, 2001, and 2005.

STUDY KEY

- AMXBAARO - No-Action Alternative (also referred to as the base case on some tables).
- AMXA1ARO - Proposed Alternative used as an opportunity resource.
- IMXA2ARO - Proposed Alternative used as a firm resource.

FISHPASS SENSITIVITY
50% INCREASE IN RESERVIOR MORTALITY OPPORTUNITY USE

RELATIVE CHANGES IN SYSTEM STOCK SURVIVAL
AMXA1ARO VS AMXBAARO (BASE CASE)

FREQUENCY OF RELATIVE SURVIVAL CHANGES
EXCEEDING ONE AND FIVE PERCENT

PROGRAM = DSN=PJI.PF400.RNR.FISHPASS.SAS.REPORTS(FSUM56)
FILES: PJI.PF400.RNR.FISH.PASS.DATA.HIDCOLFG.HI
PJI.PF400.RNR.FISH.PASS.DATA.HIDCOLFG.HI

RUN DATE: SEP/26/89
RUN DATE: SEP/26/89

PROGRAM = DSN=PJI.PF400.RNR.SAS.REPORTS(FSUM)
FILE: PJI.PF400.RNR.FISH.PASS.DATA.HIDCOLFG.HI
PJI.PF400.RNR.FISH.PASS.DATA.HIDCOLFG.HI

POOL	YEAR	YEARLING			SUBYEARLING			STEELHEAD			SOCKEYE			YEARLING			SUBYEARLING			STEELHEAD			SOCKEYE		
		MB	MA	RM	MB	MA	RM	MB	MA	RM	MB	MA	RM	FI1/FI5	FD1/FD5	FI1/FI5	FD1/FD5	FI1/FI5	FD1/FD5	FI1/FI5	FD1/FD5	FI1/FI5	FD1/FD5		
WELLS	1991	22.8	22.8	0.1	12.3	12.2	-1.2	27.8	27.8	0.0	19.1	19.1	-0.0	10/0	8/0	13/3	45/5	8/0	0/0	3/0	0/0	8/0	0/0	5/0	0/0
	1993	25.0	25.0	0.3	13.3	13.2	-1.0	30.5	30.6	0.1	20.0	20.0	0.0	10/0	3/0	38/8	33/13	10/0	5/0	5/0	0/0	10/0	0/0	3/0	0/0
	1995	30.5	30.4	0.7	20.6	20.4	-1.2	37.2	37.3	0.4	26.0	26.1	0.1	33/3	8/0	25/8	50/8	23/0	8/0	8/0	0/0	23/0	0/0	10/0	0/0
	1997	31.4	31.8	1.3	20.5	20.3	-1.2	38.0	38.2	0.4	26.0	26.1	0.1	35/10	3/0	28/10	53/10	23/0	0/0	0/0	0/0	15/3	8/0	8/0	0/0
	2001	30.3	30.5	0.7	20.1	20.2	0.3	37.3	37.4	0.4	25.8	25.9	0.5	33/0	0/0	35/20	40/8	18/0	0/0	8/0	0/0	30/0	0/0	3/0	0/0
	2005	30.7	30.8	0.4	19.1	19.2	0.3	37.7	37.8	0.4	26.1	26.2	0.3	35/0	13/0	40/13	35/3	23/0	0/0	3/0	0/0	25/0	0/0	10/0	0/0
RRECH	1991	25.0	25.1	0.4	16.9	16.9	-0.0	29.4	29.4	0.0	0.0	0.0	0.0	20/3	8/0	18/3	15/0	5/0	0/0	3/0	0/0	0/0	0/0	0/0	0/0
	1993	27.7	27.9	0.6	17.9	17.9	-0.2	32.1	32.2	0.1	0.0	0.0	0.0	15/5	5/0	18/3	8/0	5/0	0/0	10/0	0/0	0/0	0/0	0/0	0/0
	1995	34.5	35.2	1.8	25.7	25.8	0.3	39.3	39.4	0.2	0.0	0.0	0.0	33/15	13/0	18/5	15/0	25/0	10/0	0/0	0/0	0/0	0/0	0/0	
	1997	34.6	36.6	1.5	24.9	25.0	0.0	39.9	40.0	0.3	0.0	0.0	0.0	43/13	5/0	20/5	23/0	15/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	2001	34.5	34.9	1.0	25.1	25.0	-0.1	39.3	39.5	0.5	0.0	0.0	0.0	33/10	8/0	28/15	10/0	28/0	0/0	3/0	0/0	0/0	0/0	0/0	0/0
	2005	35.3	35.7	1.0	25.3	25.5	1.0	39.6	39.8	0.4	0.0	0.0	0.0	45/10	13/3	20/18	20/3	23/0	0/0	3/0	0/0	0/0	0/0	0/0	0/0
RISL	1991	31.2	31.3	0.3	18.2	18.1	-0.6	32.8	32.8	0.0	25.7	25.7	0.0	15/0	3/0	15/5	40/3	10/0	0/0	8/0	0/0	8/0	0/0	5/0	0/0
	1993	30.0	30.1	0.4	18.2	18.2	-0.4	33.2	33.2	0.0	25.4	25.4	0.1	23/5	5/0	25/5	20/10	10/0	0/0	8/0	0/0	25/5	0/0	0/0	0/0
	1995	36.6	37.3	1.4	27.7	27.7	-0.1	43.3	43.3	0.0	33.1	33.1	0.1	40/13	13/0	20/5	5/0	10/0	0/0	8/0	0/0	22/3	9/0	20/0	0/0
	1997	36.6	39.9	0.9	27.7	27.7	-0.1	41.4	41.5	0.4	33.2	33.2	0.4	45/13	3/0	23/3	5/0	25/5	0/0	13/0	0/0	25/5	0/0	3/0	0/0
	2001	36.6	39.9	0.9	27.7	27.7	-0.1	41.4	41.5	0.4	33.2	33.2	0.4	45/13	3/0	23/3	5/0	25/5	0/0	13/0	0/0	25/5	0/0	3/0	0/0
	2005	39.0	39.7	1.2	26.1	26.2	0.5	42.6	42.8	0.3	33.3	33.4	0.4	43/5	10/0	35/18	33/3	30/0	0/0	13/0	0/0	28/0	0/0	10/0	0/0
LIIG	1991	80.8	80.8	0.0	55.3	55.3	-0.0	84.0	84.0	0.0	61.7	61.7	-0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	1993	79.9	79.9	0.0	55.3	55.3	-0.0	83.8	83.8	0.0	61.7	61.7	0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	1995	86.8	86.8	0.0	66.3	66.2	-0.0	88.4	88.4	0.0	71.5	71.5	0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	1997	87.3	87.3	0.0	66.5	66.5	-0.0	88.4	88.4	0.0	71.4	71.4	0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	2001	87.0	87.0	0.0	67.0	67.0	-0.0	88.8	88.8	0.0	71.9	71.9	0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	2005	86.3	86.4	0.0	66.2	66.2	-0.1	88.2	88.2	0.0	71.3	71.3	0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
LHM	1991	21.7	21.7	0.1	17.9	17.7	-1.1	29.1	29.1	-0.1	0.0	0.0	0.0	13/0	0/0	10/0	25/5	5/0	0/0	10/0	0/0	0/0	0/0	0/0	0/0
	1993	23.3	23.3	0.6	18.6	18.5	-0.6	31.1	31.1	0.0	0.0	0.0	0.0	20/0	0/0	13/0	23/3	15/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	1995	24.0	24.0	1.4	19.0	18.9	-0.4	33.3	33.3	0.0	0.0	0.0	0.0	43/18	3/0	20/0	13/0	40/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1997	25.1	25.1	1.7	20.0	20.0	-0.7	33.3	33.3	0.0	0.0	0.0	0.0	50/10	3/0	15/0	20/0	30/0	0/0	0/0	0/0	0/0	0/0	0/0	
	2001	25.1	25.1	1.2	20.0	20.0	-0.7	33.3	33.3	0.0	0.0	0.0	0.0	43/10	3/0	30/5	15/0	30/0	0/0	0/0	0/0	0/0	0/0	0/0	
	2005	28.2	28.5	1.2	23.1	23.1	-0.4	34.1	34.1	0.8	0.0	0.0	0.0	35/5	10/0	30/5	20/0	28/0	0/0	3/0	0/0	0/0	0/0	0/0	
MCN	1991	48.6	48.9	0.7	32.7	32.6	-0.4	58.5	58.6	0.1	0.0	0.0	0.0	15/8	10/0	10/0	20/0	10/0	0/0	3/0	0/0	0/0	0/0	0/0	
	1993	47.6	47.8	0.5	32.7	32.6	-0.3	57.4	57.5	0.2	0.0	0.0	0.0	15/5	18/0	8/0	20/0	10/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1995	53.7	53.7	0.1	43.1	43.2	0.1	64.4	64.7	0.4	0.0	0.0	0.0	28/5	13/5	20/0	15/0	20/0	0/0	5/0	0/0	0/0	0/0	0/0	
	1997	55.5	56.3	1.4	43.2	43.3	0.2	65.6	66.0	0.7	0.0	0.0	0.0	38/10	5/0	25/0	25/0	33/0	0/0	0/0	0/0	0/0	0/0	0/0	
	2001	53.3	53.7	0.8	43.1	43.3	0.5	64.0	64.3	0.5	0.0	0.0	0.0	28/5	5/0	30/3	18/0	28/0	0/0	10/0	0/0	0/0	0/0	0/0	
	2005	53.4	54.2	1.6	42.2	42.5	0.8	64.4	64.7	0.4	0.0	0.0	0.0	43/10	13/0	25/10	8/0	25/0	0/0	10/0	0/0	0/0	0/0	0/0	
JDAY	1991	44.3	44.3	-0.1	33.8	33.8	-0.0	49.9	49.9	0.1	0.0	0.0	0.0	8/3	13/0	20/5	18/3	13/0	0/0	3/0	0/0	0/0	0/0	0/0	
	1993	44.1	44.1	-0.1	33.8	33.8	-0.0	49.9	49.9	0.1	0.0	0.0	0.0	8/0	13/0	10/5	18/0	5/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1995	43.6	43.6	-0.3	33.5	33.5	-0.1	49.3	49.4	0.2	0.0	0.0	0.0	25/3	23/0	20/13	28/8	18/0	0/0	10/0	0/0	0/0	0/0		
	1997	45.0	44.4	-0.1	33.5	33.5	-0.1	51.2	51.2	0.1	0.0	0.0	0.0	10/0	23/0	25/15	28/8	15/3	0/0	0/0	0/0	0/0	0/0		
	2001	44.6	44.4	-0.3	33.5	33.5	-0.1	51.1	51.1	0.7	0.0	0.0	0.0	10/0	23/0	33/15	20/8	18/10	0/0	0/0	0/0	0/0	0/0		
	2005	45.5	45.3	-0.6	33.9	34.1	0.6	51.2	51.6	0.8	0.0	0.0	0.0	30/0	0/0	30/18	29/3	30/10	5/0	0/0	0/0	0/0	0/0		
DALS	1991	56.8	56.6	-0.2	43.3	43.1	-0.4	56.3	56.2	-0.2	0.0	0.0	0.0	5/3	18/0	8/0	28/0	13/0	0/0	15/0	0/0	0/0	0/0	0/0	
	1993	56.9	56.9	-0.1	42.9	42.8	-0.3	56.2	56.1	-0.2	0.0	0.0	0.0	8/3	10/0	13/0	15/0	5/0	0/0	13/0	0/0	0/0	0/0	0/0	
	1995	57.0	57.1	0.0	44.1	43.8	-0.6	56.7	56.6	-0.2	0.0	0.0	0.0	18/3	20/0	18/0	40/0	20/0	0/0	30/0	0/0	0/0	0/0		
	1997	59.7	59.7	-0.0	44.8	44.5	-0.7	59.0	58.9	-0.2	0.0	0.0	0.0	15/0	0/0	18/0	43/3	13/0	0/0	18/0	0/0	0/0	0/0	0/0	
	2001	59.0	58.9	-0.2	44.7	44.7	0.1	59.2	59.1	-0.1	0.0	0.0	0.0	13/0	0/0	28/8	23/0	15/0	0/0	13/0	0/0	0/0	0/0	0/0	
	2005	59.3	59.4	0.0	43.0	43.0	0.0	59.0	58.9	-0.1	0.0	0.0	0.0	15/3	15/0	23/3	23/0	15/0	0/0	13/0	0/0	0/0	0/0		

FISHPASS SENSITIVITY

50% DECREASE IN RESERVIOR MORTALITY OPPORTUNITY USE
 RELATIVE CHANGES IN SYSTEM STOCK SURVIVAL FREQUENCY OF RELATIVE SURVIVAL CHANGES EXCEEDING ONE AND FIVE PERCENT
 AMXA1ARO VS AMXBAARO (BASE CASE)

PROGRAM = DSN=PJI.PF400.RNR.FISHPASS.SAS.REPORTS(FSUM56)
 FILES: PJI.PF400.RNR.FISH.PASS.DATA.MIDCOLFG.LO
 PJI.PF400.RNR.FISH.PASS.DATA.MIDCOLFG.LO
 RUN DATE: SEP/26/89
 RUN DATE: SEP/23/89

PROGRAM = DSN=PJI.PF400.RNR.SAS.REPORTS(FSUM)
 FILE: PJI.PF400.RNR.FISH.PASS.DATA.MIDCOLFG.LO
 FILE: PJI.PF400.RNR.FISH.PASS.DATA.MIDCOLFG.LO

POOL	YEAR	YEARLING			SUBYEARLING			STEELHEAD			SOCKEYE			YEARLING			SUBYEARLING			STEELHEAD			SOCKEYE		
		MB	MA	RM	MB	MA	RM	MB	MA	RM	MB	MA	RM	FI1/FI5	FD1/FD5	FI1/FI5	FD1/FD5	FI1/FI5	FD1/FD5	FI1/FI5	FD1/FD5	FI1/FI5	FD1/FD5		
HELLS	1991	41.8	41.8	-0.1	29.5	29.4	-0.5	45.4	45.3	-0.1	36.0	36.0	-0.2	0/0	0/0	10/0	23/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1993	46.4	46.4	0.0	32.0	31.8	-0.1	50.0	50.0	0.0	498.4	498.4	-0.1	3/0	0/0	15/0	28/3	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1995	53.7	53.8	0.1	42.1	41.9	-0.1	60.0	60.0	0.0	455.3	455.3	-0.1	13/0	10/0	10/0	25/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1997	55.0	55.2	0.2	41.0	41.7	0.4	59.0	59.1	0.1	45.3	45.3	-0.1	13/0	8/0	18/0	38/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	2001	54.3	54.4	0.2	40.9	41.7	0.4	59.0	59.6	0.1	45.3	45.3	-0.1	3/0	3/0	28/3	18/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
	2005	54.6	54.6	-0.1	40.9	41.0	0.2	59.8	59.8	0.0	45.5	45.5	-0.2	3/0	18/0	23/3	18/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
RRECH	1991	43.5	43.5	0.1	35.4	35.2	-0.3	48.1	48.1	-0.0	0.0	0.0	0.0	10/0	0/0	8/0	15/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1993	48.9	49.0	0.2	37.8	37.7	-0.1	53.2	53.2	0.0	0.0	0.0	0.0	10/0	0/0	8/0	13/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1995	58.6	59.0	0.8	47.3	47.2	-0.1	62.3	62.3	0.0	0.0	0.0	0.0	20/0	8/0	10/0	13/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1997	60.2	60.6	0.6	46.5	46.4	0.6	62.9	62.3	-0.1	0.0	0.0	0.0	25/0	0/0	8/3	15/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	2001	59.1	59.9	0.4	46.5	46.7	0.5	62.6	62.7	0.1	0.0	0.0	0.0	18/0	0/0	18/5	5/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	2005	59.4	59.7	0.4	46.7	46.7	0.2	62.7	62.8	0.1	0.0	0.0	0.0	18/3	3/0	18/0	10/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
RISL	1991	52.3	52.4	0.0	39.0	38.9	-0.3	53.8	53.8	0.0	45.3	45.2	-0.1	5/0	0/0	10/0	20/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1993	63.3	63.3	0.0	51.1	51.0	-0.3	66.8	66.8	0.0	45.6	45.6	-0.0	8/0	0/0	10/0	18/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1995	63.2	63.3	0.1	51.1	51.4	0.6	66.8	66.9	0.1	54.5	54.5	-0.0	20/0	3/0	18/0	10/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1997	64.9	65.4	0.7	50.9	50.8	-0.2	67.4	67.5	0.2	54.4	54.4	-0.1	23/0	0/0	13/0	25/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	2001	63.6	63.8	0.3	50.6	50.8	0.4	67.6	67.7	0.1	54.5	54.5	-0.1	15/0	0/0	25/3	15/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	2005	63.9	64.2	0.4	50.2	50.3	0.2	67.2	67.3	0.1	54.5	54.5	-0.1	10/0	0/0	20/0	8/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
LHG	1991	85.5	85.4	-0.0	66.4	66.4	-0.0	87.5	87.5	-0.0	70.4	70.4	-0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1993	85.3	85.3	0.0	66.6	66.6	0.0	87.7	87.7	0.0	70.2	70.2	-0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1995	85.9	85.9	0.0	66.6	66.6	0.0	87.5	87.5	0.0	78.2	78.2	-0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1997	89.0	89.0	0.0	75.7	75.4	-0.0	90.0	90.0	0.0	78.2	78.2	-0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	2001	89.1	89.8	0.0	75.7	75.7	-0.0	90.0	90.0	0.0	78.4	78.4	-0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	2005	89.4	89.4	0.0	75.3	75.2	-0.0	90.5	90.5	-0.0	78.1	78.1	-0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
LHM	1991	49.5	49.4	-0.1	41.7	41.4	-0.8	54.9	54.9	-0.2	0.0	0.0	0.0	5/0	0/0	10/0	15/5	0/0	0/0	0/0	0/0	0/0	0/0	0/0	
	1993	53.4	53.5	0.2	41.5	41.3	-0.5	60.4	60.5	0.1	0.0	0.0	0.0	10/0	0/0	0/0	10/0	0/0	0/0	0/0	0/0	0/0	0/0		
	1995	56.1	56.3	0.4	47.5	47.3	-0.4	63.3	63.5	0.3	0.0	0.0	0.0	18/0	0/0	3/0	13/0	0/0	0/0	0/0	0/0	0/0	0/0		
	1997	56.9	57.7	0.7	47.9	47.5	-0.7	63.8	64.1	0.4	0.0	0.0	0.0	20/0	3/0	8/0	23/0	0/0	0/0	0/0	0/0	0/0	0/0		
	2001	56.5	56.7	0.4	47.9	48.0	0.2	63.4	64.0	0.3	0.0	0.0	0.0	10/0	0/0	18/0	3/0	0/0	0/0	0/0	0/0	0/0	0/0		
	2005	56.9	57.0	0.3	46.5	46.5	-0.1	64.4	64.5	0.2	0.0	0.0	0.0	13/0	0/0	13/0	13/0	0/0	0/0	0/0	0/0	0/0	0/0		
MCN	1991	72.6	72.8	0.3	56.9	56.8	-0.3	77.8	77.8	0.0	0.0	0.0	0.0	8/0	0/0	3/0	13/0	0/0	0/0	0/0	0/0	0/0	0/0		
	1993	72.0	72.7	0.2	56.6	56.6	0.0	77.2	77.2	0.1	0.0	0.0	0.0	8/0	0/0	0/0	8/0	0/0	0/0	0/0	0/0	0/0			
	1995	72.0	72.1	0.1	56.6	56.6	0.0	82.3	82.3	0.0	0.0	0.0	0.0	8/0	0/0	5/0	3/0	0/0	0/0	0/0	0/0	0/0			
	1997	78.8	79.3	0.6	65.0	65.0	0.0	82.5	82.5	0.0	0.0	0.0	0.0	18/0	0/0	10/0	8/0	0/0	0/0	0/0	0/0	0/0			
	2001	77.4	77.7	0.3	65.0	65.0	0.0	82.6	82.7	0.2	0.0	0.0	0.0	10/0	0/0	18/0	0/0	0/0	0/0	0/0	0/0	0/0			
	2005	77.3	77.8	0.6	65.3	65.5	0.2	82.7	82.9	0.2	0.0	0.0	0.0	10/8	8/3	18/0	5/0	0/0	0/0	0/0	0/0				
JDAY	1991	67.4	67.3	-0.1	59.4	59.3	-0.2	71.9	71.8	-0.0	0.0	0.0	0.0	5/0	0/0	13/0	15/0	0/0	0/0	0/0	0/0	0/0	0/0		
	1993	67.1	67.1	-0.1	59.7	59.6	-0.1	71.3	71.4	-0.0	0.0	0.0	0.0	3/0	0/0	3/0	8/0	0/0	0/0	0/0	0/0	0/0			
	1995	66.5	66.5	-0.1	59.7	59.6	-0.2	71.3	71.3	-0.0	0.0	0.0	0.0	3/0	0/0	13/0	10/0	0/0	0/0	0/0	0/0				
	1997	69.4	69.4	-0.0	58.4	58.2	-0.4	73.9	73.9	-0.0	0.0	0.0	0.0	5/0	0/0	8/0	18/0	0/0	0/0	0/0	0/0				
	2001	69.2	69.1	-0.1	58.8	59.0	0.4	73.9	74.1	0.2	0.0	0.0	0.0	0/0	0/0	18/0	5/0	0/0	0/0	0/0	0/0				
	2005	69.9	69.7	-0.2	58.3	58.4	0.1	74.0	74.2	0.2	0.0	0.0	0.0	3/0	0/0	20/3	18/0	0/0	0/0	0/0					
DALS	1991	75.8	75.7	-0.2	68.2	68.1	-0.2	76.3	76.2	-0.1	0.0	0.0	0.0	5/0	0/0	0/0	8/0	0/0	0/0	0/0	0/0	0/0			
	1993	75.7	75.6	-0.1	67.9	67.8	-0.1	76.2	76.1	-0.1	0.0	0.0	0.0	3/0	0/0	0/0	9/0	0/0	0/0	0/0	0/0				
	1995	75.3	75.3	0.0	68.3	68.1	-0.3	76.1	76.1	-0.1	0.0	0.0	0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0					
	1997	79.6	79.6	0.0	69.1	68.9	-0.1	79.6	79.5	-0.1	0.0	0.0	0.0	0/0	0/0	0/0	3/0	0/0	0/0	0/0					
	2001	79.3	79.3	0.0	69.0	69.0	0.0	79.6	79.6	0.0	0.0	0.0	0.0	0/0	0/0	10/0	10/0	0/0	0/0						
	2005	79.5	79.5	-0.1	68.3	68.3	-0.0	79.6	79.6	-0.1	0.0	0.0	0.0	3/0	0/0	5/0	5/0	0/0	0/0						
BONN	1991	91.3	91.3	-0.0	84.9	84.9	-0.0	88.9	89.0	0.0	0.0	0.0	0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0				
	1993	91.3	91.3	0.0	84.9	84.9	-0.0	88.9	88.9	0.0	0.0	0.0	0.0	0/0	0/0	0/0	0/0	0/0	0/0	0/0					
	1995	90.8	90.8	0.0	84.9	84.9	-0.0	89.5	88.6	-0.0	0.0	0.0	0.0	0/0	0/0	0/0	0/0	0/0	0/0						
	1997	91.0	91.0	-0.0	83.7	83.7	-0.0	87.9	87.9	0.0	0.0	0.0	0.0	0/0	0/0	0/0	0/0	0/0	0/0						
	2001	90.9	90.9	0.0	83.6	83.5	-0.0																		

**APPENDIX I
ANADROMOUS FISH**

Part 4

Stock Assessment

APPENDIX I
Part 4
Stock Assessment

List of stocks potentially impacted by the proposed agreement.

Description of the current status of potentially impacted stocks.

NOTE - Additional anadromous fish information can be found on Cumulative Effects in Appendix L and on the Sensitivity Studies in Appendix M.

**Stocks Potentially Impacted by Non-Treaty Storage Alternatives
(Including Sensitivity Studies)
Critical and Non-Critical Stocks**

Wells Pool

Subyearlings: Methow River Summer Chinook*
Okanogan - Similkameen River Summer Chinook*

Rocky Reach Pool

Yearlings: Entiat River Spring Chinook
Subyearlings: Wells Hatchery Summer Chinook*

Rock Island Pool

Yearlings: Wenatchee River Spring Chinook
Rocky Reach - Turtle Rock Complex Coho
Subyearlings: Wenatchee River Summer Chinook
Rocky Reach - Turtle Rock Complex Fall Chinook

Lower Monumental Pool

Subyearlings: Lyon's Ferry Hatchery Fall Chinook

McNary Pool

Yearlings: Yakima River Spring Chinook
Yakima River Coho

John Day Pool

Yearlings: John Day River Spring Chinook
Umatilla River Spring Chinook
Umatilla River Coho
Subyearlings: Umatilla River URB Fall Chinook

The Dalles Pool

Yearlings: Deschutes River Spring Chinook
WSNFH, RBH Spring Chinook
Subyearlings: Deschutes River Fall Chinook

Stocks were flagged for inclusion in the stock assessment based on results of the FISHPASS model. Stocks were flagged when one of the following occurred: (1) a relative decrease in mean survival of one percent or greater in any year, (2) a decrease in relative survival of one percent in 30 percent of the games in a year, or (3) a decrease in relative survival of 5 percent in 5 percent of the games in a year.

* Indicates a critical stock. Critical stocks are those stocks which are substantially below escapement goals, are not increasing on a clear trend, and for which harvest and production management actions reflect the stock's critical condition.

The FISHPASS model was used to compare the two proposed uses of the NTSA resource. The first alternative used non Treaty storage as an opportunity resource and the second used it as a firm resource. Each alternative examined a base case and five sensitivities: high Northwest loads; high Southwest loads and gas prices; the signed Spill Agreement; non-Treaty storage expiring in 2003; and an alternative dispatch criteria.

Stocks were flagged as incurring potential impacts when an alternative or its sensitivity when compared to the base case caused a (1) decrease in the mean survival in a given year of 1.0 percent or greater; (2) a relative decrease in survival of 1 percent or greater, in more than thirty percent of the games; or (3) a relative decrease in survival of 5 percent or greater, in more than five percent of the games. There were 40 SAM games made for each of the six water years studied.

WELLS POOL

Subyearling Stocks

The FISHPASS model flagged subyearling chinook originating in the Wells Pool for both opportunity and firm use alternatives and their sensitivities. The two stocks identified in this pool are the Methow River summer chinook, and the Okanogan - Similkameen River summer chinook. Both are considered critical stocks. The decrease in relative system survival is not expected to significantly impact these stocks. Bypass improvements at mid-Columbia and mainstem projects are expected to improve survival of these stocks approximately 47 percent between the years of 1991 and 2005.

There is currently no terminal sport or Treaty Indian fisheries targeting the summer chinook in these subbasins. There are no lower river fisheries that target summer chinook but incidental harvest of summer chinook does occur and is limited to jacks, during the steelhead sport fishery and the lower river gill-net sockeye fishery; adults and jacks, in the treaty set-net sockeye fishery; and handling only in the lower river shad gill-net fishery. In 1988, out of a run of 31,000 adults, a harvest of 1,200 adults occurred in the Zone 6 commercial and ceremonial and subsistence fisheries. It is assumed that insignificant numbers of summer chinook from the Wells Pool are taken in any fishery.

Methow River Summer Chinook: Spawning ground surveys show a decreasing trend for Methow River summer chinook from a high in 1979 of 2,433 adults to 630 in 1985. This trend should show a turn around with the implementation of the Rock Island Dam Agreement which will increase the present production of 400,000 smolts by an additional 400,000 smolts. It is possible that an additional production of 410,000 smolts will come from the Wells Settlement agreement and will depend on the success of the sockeye net pen rearing project. The stock is managed as a potentially critical supplemented natural stock.

Okanogan - Similkameen River Summer Chinook: The natural escapement has shown a slight rebound to a high of 2,244 adults in 1984 from a low of 526 in 1982. The 1977-85 average is 1,149 adults, with 1984 and 1985 showing a increase over the average. This stock has had no direct supplementation, but returns to Wells Hatchery may have entered the subbasin. As part of the Rock Island settlement, 560,000 smolts will be released into the subbasin. The stock has been managed for natural production but will be enhanced with the above supplementation. The stock is managed as a potentially critical supplemented natural stock.

ROCKY REACH POOL

Yearlings Stocks

The FISHPASS model flagged potential impacts for yearling chinook originating in the Rocky Reach Pool. Yearling chinook were flagged in only one out of the six water years under the firm resource alternative for the high Northwest and high Southwest load sensitivities. There is only one yearling stock originating in the Rocky Reach Pool, the Entiat River spring chinook. This is not a critical stock. No significant impacts are expected as a result of the Non-Treaty Storage Agreement.

In 1986 a sport fishery opened in the subbasin and an estimated 100 spring chinook were harvested. Poaching has been a problem in the basin with an estimated 450-500 spring chinook taken illegally in 1985.

Upriver spring chinook are harvested incidental to the Lower Columbia River winter gill-net, sport and Zone 6 (above Bonneville Dam) Treaty Indian fisheries. Seasons are regulated to minimize the number of upriver spring chinook harvested. As part of the U.S. vs Oregon agreement, Treaty Indian Commercial and Ceremonial and Subsistence fisheries are allowed to harvest 7 percent of the upriver spring chinook run, up to 10,000 fish. The 1988 Treaty Indian Zone 6 harvest was an estimated 6,500 adults.

Entiat River Spring Chinook: The Entiat River spring chinook stock is comprised of natural returns and returns to the Entiat National Fish Hatchery. The hatchery returns have ranged from a low of 242 adults in 1982 to a high of 959 in 1986. Natural returns have been variable ranging from a high of 3,844 in 1978 to a low of 517 in 1982, but since then the returns have showed an increasing trend, with a return of 3,671 in 1985. The production goal for the Entiat NFH is 800,000 smolts, in 1988, 839,000 spring chinook smolts (Entiat River stock) were released into the Entiat River. The stock is managed for terminal harvest and is considered a viable natural/hatchery stock.

Subyearling Stocks

The FISHPASS flagged potential impacts for subyearling chinook originating in the Rocky Reach pool. Subyearling stocks were flagged in only one out of the six water years under the firm resource alternative for the base case, high

Southwest loads and gas prices, and when the NTSA expires in 2003 sensitivities. There is one subyearling stock that has been identified in the Rocky Reach Pool, Wells Hatchery summer chinook. This stock is currently managed as a potentially critical hatchery stock. Significant impacts are not expected to occur result of the NTSA if bypass improvements are completed.

There is presently no terminal sport or Treaty Indian fisheries targeting the returns to the hatchery. There are no lower river fisheries that target summer chinook but incidental harvest of summer chinook does occur and is limited to jacks during the steelhead sport fishery and the lower river gill-net sockeye fishery; adults and jacks in the treaty set-net sockeye fishery; and handling only in the lower river shad gill-net fishery. In 1988, out of a run of 31,000 adults, a harvest of 1,200 adults occurred in the Zone 6 commercial, and ceremonial and subsistence fisheries. It is assumed that insignificant numbers of summer chinook from the Wells Hatchery are taken in any fishery.

Wells Hatchery Summer Chinook: The hatchery traps brood stock for its rearing program from the fish ladder at Wells Dam. The only information available for stock returns are dam counts at Wells Dam. A high count of 6,696 adults occurred in 1979, the recent low of 1,975 adults was in 1983, and a slight decreasing trend is seen with returns of 2,772 adults in 1987. The dam counts include brood stock trapped and summer chinook bound for subbasins above Wells Dam. Wells Hatchery plans include production of 1,440,000 fingerlings and 250,000 yearlings for on station release. The hatchery also will produce 400,000 fingerlings for release into the Methow River, and possibly an additional 400,000 fingerlings for release into the Methow and Okanogan Rivers. The 1988 releases on station were 390,000 yearlings, and 1,963,000 fingerlings. This stock is managed as a potentially critical hatchery stock.

ROCK ISLAND POOL

Yearling Stocks

The FISHPASS model flagged Rock Island yearling chinook in only one out of the six water years, under the firm resource alternative for the high Northwest load sensitivity. There are two yearling stocks originating in this pool, the Wenatchee River spring chinook, and the Rocky Reach - Turtle Rock Complex coho. Neither is managed as a critical stock. The later of the two was not identified as a stock in the Final IDU EIS, but was identified in the NPPC's draft System Subbasin Planning report. These stocks should not be significantly impacted as a result of the NTSA.

There is a terminal sport fishery that targets surplus hatchery returns to Icicle Creek and the Leavenworth Hatchery, some incidental harvest of wild fish does occur. Tribal harvest in recent years has concentrated on the hatchery stock. In 1985 the sport harvest was 4,280 adults, in 1986, the sport harvest was 4,717 adults.

Upriver spring chinook are harvested incidental to the Lower Columbia River winter gill-net, sport and Zone 6 (above Bonneville Dam) Treaty Indian fisheries. Seasons are regulated to minimize the number of upriver spring chinook harvested. As part of the U.S. vs Oregon agreement, Treaty Indian Commercial and Ceremonial and Subsistence fisheries are allowed to harvest 7 percent of the upriver spring chinook run, up to 10,000 fish. The 1988 Treaty Indian Zone 6 harvest was an estimated 6,500 adults.

In the 1970s a sport fishery targeting the coho returns produced by a new coho program at Rock Island Dam had several annual harvests exceeding 3,000 fish. Presently, pressure is very light, and the sport harvest of coho in the mid-Columbia is not available, but is assumed to be less than 50 fish. The coho returning to the Rock Island Pool are the early race of coho, which use to predominate in the areas above Priest Rapids. There is a major lower Columbia River fishery in the fall on returning coho salmon, mainly concentrating on stock originating in the lower river below Bonneville Dam. There is a Treaty Indian fishery in Zone 6 above Bonneville Dam, but this is minor and limited by season and gear restrictions to protect upriver steelhead, and by the fact that most of the run is limited to returns to Bonneville Pool hatcheries. In 1987, the Zone 6 Treaty harvest was 2,300 adults, and in 1988 the harvest was 7,000 adults. This is the second highest harvest since 1973, record harvest was 16,800 adults in 1986. Under U.S. vs Oregon, the management goal is to increase harvests in tributary fisheries.

Wenatchee River Spring Chinook: This run consists of wild and Leavenworth National Fish hatchery returns, some straying of hatchery fish does occur. The Leavenworth NFH production goal is to release 2,300,000 smolts into Icicle Creek. The 1988 release was 2,337,500 smolts and 348,500 presmolts (greater than 30 to the pound). There is the possibility of a future release sight in the subbasin for release of 670,000 smolts as part of the Rock Island Settlement agreement. Total returns (hatchery, wild and sport harvest), increased in 1985 and 1986 to 18,998 and 20,345 adults respectively from a low of 4,097 in 1981. The greatest increase coming in the wild portion of the run. This stock is managed as a viable natural population and is not in critical condition, but consistent high returns are needed to allow a terminal fishery on the natural portion of the run. The hatchery portion of the run is managed for hatchery production, and in recent years the hatchery returns have shown an increasing trend, which is illustrated by the increased harvest opportunities below the hatchery.

Rocky Reach - Turtle Rock Complex Coho: The hatchery program at Rocky Reach was started in the 1970s after coho stocking programs for the Wenatchee, Entiat, and Methow rivers were discontinued in the 1960s. Lower river stocks are used to supplement hatchery returns which have been highly variable in the past. Returns have ranged from 260 in 1983 to 2,179 in 1984, and show a decreasing trend to 503 in 1986. The hatchery has used eggs from a number of sources: Lower Kalama, Elokomina, Washougal and Cowlitz hatcheries. Current production goal is to release 500,000 yearlings, the 1988 release was 417,000. This stock is managed for hatchery production, and is in a depressed, but not critical condition.

Subyearling Stocks

The FISHPASS model flagged subyearling chinook originating in Rock Island Pool for both the opportunity and the firm resource alternatives for a majority of the sensitivities. There are two subyearling stocks originating in the Rock Island Pool, Wenatchee River summer chinook, and Rocky Reach - Turtle Rock Complex fall chinook, the latter was not listed as a stock in the Final IDU EIS, but was identified in the NPPC's draft System Subbasin Planning report. These stocks are not managed as critical stocks and are not expected to be significantly impacted as a result of the NTSA and should overtime show an increase in relative survival with the completion of bypass systems.

There are presently no terminal sport or Treaty Indian fisheries targeting the returns to the subbasin. There are no lower river fisheries that target summer chinook but incidental harvest of summer chinook does occur, and is limited to jacks during the steelhead sport fishery and the lower river gill-net sockeye fishery; adults and jacks in the treaty set-net sockeye fishery; and handling only, in the lower river shad gill-net fishery. In 1988, out of a run of 31,000, a harvest of 1,200 adults occurred in the Zone 6 commercial, and ceremonial and subsistence fisheries.

Columbia River fall chinook salmon stocks are divided into three groups: Lower river, Bonneville Pool hatchery (BPH), and upriver brights (URB). All three groups are targeted in the mainstem Columbia River, by sport, commercial and Treaty Indian fisheries and by ocean commercial fisheries. The URB portion of the run has set record returns with an estimated 400,000 in 1988, and a record high of 419,000 in 1987. Harvests of URB have also set records with 254,800 taken in the Commercial fishery and 14,500 taken in the sport fishery. Annual passage goals of 40,000 URB at McNary Dam have been exceeded since 1983. Commercial gill-net harvests occurred in 1986 and 1987 in the area between Priest Rapids and Wanapum Dams, with the 1987 harvest totaling 2,215 chinook, in 1988 the harvest was an estimated 2,300 adults. URB runs also have benefited from ocean and in river harvest regulations set to protect depressed returns of BPH stocks.

Wenatchee River Summer Chinook: The stock is a wild run of fish with no hatchery supplementation. Returns to the subbasin have shown an increasing trend from a low in 1983 of 4,169 chinook to 10,609 in 1986. A possible facility as part of the Rock Island Settlement would produce 864,000 smolts from adults collected at Dryden Dam. This stock has been managed as natural stock but this will change if the facility is built. Presently it is an improving and viable stock.

Rocky Reach - Turtle Rock Fall Chinook: This is an URB hatchery stock, with production goals of 200,000 yearling fall chinook, the 1988 release was 230,000 yearling fall chinook. URB fall chinook mainly spawn in the Hanford Reach area below Priest Rapids Dam, but spawning has been observed below Wells and Wanapum Dams. This is assumed to be a viable hatchery stock, managed for harvest in the mainstem Columbia River.

LOWER MONUMENTAL POOL

Subyearling Stocks

The FISHPASS model flagged subyearling chinook originating in Lower Monumental Pool. Subyearling stocks were flagged for both the opportunity and firm resource alternatives. The base case and NTSA expiring in 2003, sensitivities were flagged under for both alternatives and the high southwest load sensitivity was flagged under the firm resource alternative. There is only one subyearling stock identified in the Lower Monumental Pool, the Lyon's Ferry Hatchery fall chinook. It is not managed as a critical stock. No significant impacts are expected as a result of the NTSA.

Columbia River fall chinook salmon stocks are divided into three groups: Lower river, Bonneville Pool hatchery (BPH), and upriver brights (URB). All three groups are targeted in the mainstem Columbia River, by sport, commercial and Treaty Indian fisheries and by ocean commercial fisheries. The URB portion of the run has set record returns with an estimated 400,000 in 1988, and a record high of 419,000 in 1987. Harvests of URB have also set records with 254,800 taken in the Commercial fishery and 14,500 taken in the sport fishery. Annual passage goals of 40,000 URB at McNary Dam have been exceeded since 1983. Commercial gill-net harvests occurred in 1986 and 1987 in the area between Priest Rapids and Wanapum Dams, with the 1987 harvest totaling 2,215 chinook, in 1988 the harvest was an estimated 2,300 adults. URB runs also have benefited from ocean and in river harvest regulations set to protect depressed returns of BPH stocks.

Lyon's Ferry Fall Chinook: Lyon's Ferry Hatchery fall chinook are part of the Snake River Egg-Bank Program. Since 1977 fall chinook adults have been trapped at Ice Harbor Dam, reared at Kalama Hatchery then released at the hatchery and above Lower Granite Dam. In 1984 fall chinook returning to Kalama and trapped at Ice Harbor were reared and released at Lyon's Ferry Hatchery. Returns to the hatchery have increased from zero in 1984 to 1,654 adults in 1987. Fall chinook are still being trapped at Ice Harbor with 1,613 adults taken in 1987. As of 1987 returns to the Kalama hatchery have ended. The production goal for the hatchery is to release 9,162,000 subyearlings to produce a return of 18,300 adults to the Snake River. In 1988, 5,784,500 subyearlings were released. Returns to the hatchery and trapping at Ice Harbor Dam have not met egg-take goals. The stock was considered to be critical in the IDU EIS because it was a building hatchery stock that had not had proven returns. The stock now, is not critical, but is considered a building hatchery stock.

MCNARY POOL

Yearling Stocks

The FISHPASS model flagged yearling chinook originating in McNary Pool.

Yearling stocks were flagged in one out of the six years under the opportunity resource alternative for the base case, NTSA expiring in 2003, and the signed Spill Agreement sensitivities. The firm resource alternative, caused the yearling stocks to be flagged for a majority of the sensitivities. There are two yearling stocks that have been identified in the McNary Pool, Yakima River spring chinook, and Yakima River coho. Neither is managed as a critical stock and are not expected to be significantly impacted by the NTSA.

There is currently a tribal subsistence fishery with in the basin, with a future goal of increasing the tribal exploitation rate to 25 percent of the run. Upriver spring chinook are harvested incidental to the Lower Columbia River winter gill-net, sport and Zone 6 (above Bonneville Dam) Treaty Indian fisheries. Seasons are regulated to minimize the number of upriver spring chinook harvested. As part of the U.S. vs Oregon agreement, Treaty Indian Commercial and Ceremonial and Subsistence fisheries are allowed to harvest 7 percent of the upriver spring chinook run up to 10,000 fish. The 1988 Treaty Indian Zone 6 harvest was an estimated 6,500 adults.

There is a major lower Columbia river fishery in the fall on returning coho salmon, mainly concentrating on stock originating in the lower river below Bonneville Dam. There is a Treaty Indian fishery in Zone 6 above Bonneville Dam, but this is minor and limited by season and gear restrictions to protect upriver steelhead, and by the fact that most of the run is limited to returns to Bonneville Pool hatcheries. In 1987, the Zone 6 Treaty harvest was 2,300 adults, and in 1988 the harvest was 7,000 adults, this is the second highest harvest since 1973, the record harvest was 16,800 adults in 1986. Under U.S. vs Oregon, the management goal is to increase harvests in tributary fisheries.

Yakima River Spring Chinook: Returns have varied in the past few years from a low of 1,324 in 1983 to a high of 9,452 in 1986, dropping to 4,390 adults in 1987. An estimated return of 6,000 adults is needed to meet hatchery and harvest goals. Supplementation has occurred since 1958 using Leavenworth NFH, Carson NFH, and Yakima River stocks. Supplementation will increase with the completion of the Yakima/Klickitat Production Facility, where production will be 1.6 million smolts annually. Two stocks will be used, Naches River and Upper Yakima, and management will try to insulate the American River stock from supplementation. This stock is managed as a hatchery supplemented stock.

Yakima River Coho: This stock was not listed in the Final IDU EIS because it is a recent re-introduction to the basin. No harvest of coho has occurred since the 1930s, and there are presently no estimates on returns. Under U.S. vs Oregon, 700,000 coho smolts will be released into the Yakima annually for five years (1988-1992) to diversify fishing opportunities. Future studies will determine if natural production is warranted. The Yakima/Klickitat facility will release 2,009,250 smolts using 2,350 spawners, with the goal of producing a total return of 40,000 natural/hatchery adults. This stock is presently managed as a building hatchery stock. In 1988, 508,500 smolts from the Cascade Hatchery, 125,000 from the Grays River hatchery, 75,000 from the Lower Kalama hatchery, and 200,000 from the Yakima hatchery were released into the Yakima.

JOHN DAY POOL

Yearling Stocks

The FISHPASS model flagged yearling stocks originating in the John Day Pool. Yearling stocks were flagged in only one of the six water years studied under both alternatives for the base case, and signed Spill Agreement sensitivities, and for the high Southwest load and gas prices, as well as the expiring in 2003 sensitivities when used as a firm resource. There are three yearling stocks that originate in the John Day Pool, John Day River spring chinook, Umatilla River spring chinook, and Umatilla River coho. None of these stocks are managed as critical stocks, and they are not expected to be significantly impacted by the NTSA.

Upriver spring chinook are harvested incidental to the Lower Columbia River winter gill-net, sport and Zone 6 (above Bonneville Dam) Treaty Indian fisheries. Seasons are regulated to minimize the number of upriver spring chinook harvested. As part of the U.S. vs Oregon agreement, Treaty Indian Commercial and Ceremonial and Subsistence fisheries are allowed to harvest 7 percent of the upriver spring chinook run up to 10,000 fish. The 1988 Treaty Indian Zone 6 harvest was an estimated 6,500 adults.

There is a major lower Columbia river fishery in the fall on returning coho salmon, mainly concentrating on stock originating in the lower river below Bonneville Dam. There is a Treaty Indian fishery in Zone 6 above Bonneville Dam but this is minor and limited by season and gear restrictions to protect upriver steelhead, and by the fact that most of the run is limited to returns to Bonneville Pool hatcheries. In 1987, the Zone 6 Treaty harvest was 2,300 adults, and in 1988 the harvest was 7,000 adults, this is the second highest harvest since 1973, the record harvest was 16,800 adults in 1986. Under U.S. vs Oregon, the management goal is to increase harvests in tributary fisheries.

John Day River Spring Chinook: Returns have increased from a recent low of 918 in 1980 to a high of 4,637 in 1987. The sport fishery has been closed since 1978, but there is a small harvest by Umatilla and Warm Springs tribal members. The tribal harvest in 1986 was 31, and in 1987 was 41 adults. The goal for the basin is to harvest 15 percent of the run in sport and tribal fisheries, when the run at the mouth is over 5,000 adults, a smaller percentage when the run size is lower. There has been no supplementation of the John Day River spring chinook stock, and no future supplementation is planned. The stock will be managed as a wild stock, and is not in critical condition.

Umatilla River Spring Chinook: There are no run size records at present for this stock that is being re-introduced into the basin. No harvest has occurred in recent years. There is a planned Umatilla Hatchery that will produce 1.29 million smolts annually, plus an additional 939,000 smolts will come from other sources (Carson, Lookingglass, Yakima, Rapid River, and Bonneville hatcheries). In 1988, Bonneville Hatchery released 540,00 smolts

into the Umatilla basin. The planning goal is to get a return of 11,000 adults to the basin. This stock is managed as a building hatchery stock.

Umatilla River Coho: Smolt releases first occurred in 1966-69 with no results, supplementation resumed in 1987 as part of the U.S. vs Oregon with an annual release of 1.0 million smolts. Coho are stocked to support terminal and mainstem fisheries. In 1987, 29 jacks returned, and in 1988, a tribal dip net harvest occurred with very few coho taken. In 1988, 996,500 smolts from the Cascade Hatchery were released into the Umatilla River. This stock is managed as a hatchery supplemented stock to enhance tribal and mainstem fisheries.

Subyearling Stocks

The FISHPASS model flagged subyearling chinook originating in the John Day Pool. Subyearling stocks were flagged in one out of the six water years studied under both the opportunity and firm resource alternatives for the signed Spill Agreement sensitivity, and in two out of the six years under the firm resource alternative for the base case, and the NTSA expiring in 2003 sensitivities. Two subyearling stocks have been identified as originating in the John Day Pool, John Day River fall chinook, and Umatilla River upriver bright (URB) fall chinook. The John Day River fall chinook stock was identified as a critical stock in the Final IDU EIS, but was not listed as a stock in the NPPC's System Subbasin Planning draft report, so it will not be included here. The Umatilla River stock is not managed as a critical stock and is not expected to be significantly impacted by the NTSA.

Columbia River fall chinook salmon are generally divided into three groups: Lower river, Bonneville Pool hatchery (BPH), and upriver brights (URB). All three groups are targeted in the mainstem Columbia River, by sport, commercial and Treaty Indian fisheries and ocean commercial fisheries. The URB portion of the run has set record returns with an estimated 400,000 in 1988, and a record high of 419,000 in 1987. Harvests of URB have also set records with 254,800 taken in the Commercial fishery and 14,500 taken in the sport fishery. Annual passage goals of 40,000 URB over McNary Dam have been exceeded since 1983. Commercial gill-net harvests occurred in 1986 and 1987 in the area between Priest Rapids and Wanapum Dams, with the 1987 harvest totaling 2,215 chinook, in 1988 the harvest was an estimated 2,300 adults. URB runs also have benefited from ocean and in river harvest regulations set to protect depressed returns of BPH stocks.

Umatilla River Fall Chinook: Returns have been improving since releases started in 1982. The 1985 Three Mile Dam and carcass counts were 85 adults, in 1986, 435, and in 1987, 461, showing an improving trend. The Umatilla/Irrigon facility will produce 5.94 million subyearlings and an additional 1.06 million subyearlings will come from the Bonneville Hatchery. Presently URB being released from Irrigon hatchery, the 1988 released was 3,350,000 subyearlings, and 160,000 yearlings (12 fish to the pound). An additional 200,000 yearling fall chinook (7 fish to the pound) from the Bonneville hatchery were released in 1988. The master plan goal is to achieve a return of 21,000 adults of which 10,000 will be hatchery fish and 11,000 will be naturally spawning fish. This is managed as a building hatchery/natural stock.

THE DALLES POOL

Yearling Stocks

The FISHPASS flagged yearling chinook originating in the The Dalles Pool. Yearling stocks were flagged in only one year out of the six under the firm resource alternative for the signed Spill Agreement sensitivity. There are two yearling stocks originating in The Dalles Pool, Deschutes River spring chinook, and Warm Springs National Fish Hatchery (WSNFH), Round Butte Hatchery (RBH) spring chinook. Neither is a critical stock and significant impacts are not expected to occur as a result of the NTSA.

Upriver spring chinook are harvested incidental to the Lower Columbia River winter gill-net, sport and Zone 6 (above Bonneville Dam) Treaty Indian fisheries. Seasons are regulated to minimize the number of upriver spring chinook harvested. As part of the U.S. vs Oregon agreement, Treaty Indian Commercial and Ceremonial and Subsistence fisheries are allowed to harvest 7 percent of the upriver spring chinook run up to 10,000 fish. The 1988 Treaty Indian Zone 6 harvest was an estimated 6,500 adults. Sport and Tribal harvest of both stocks occur at Sherars falls.

Deschutes River Spring Chinook: This is a natural/wild stock that spawns naturally only in the Warm Springs River and in Shitike Creek. WSNFH passes natural/wild fish above the hatchery to spawn naturally. Estimated escapement of natural/wild fish consistently above 1,000 since 1980, with 1987 escapement estimated to be 1,783 adults and jacks. The planning goal for the basin is to have a natural run escapement of 1,300 adults. Some hatchery spawners may have been allowed to pass upstream from 1982 to 1986 diluting the wild stock. In 1985, the sport and Tribal harvest was 648 jacks and adults, in 1987, it was estimated that 911 were harvested. This stock is assumed to be a viable natural/wild stock, subject to a terminal fishery.

WSNFH, RBH Spring Chinook: RBH is part of the PGE mitigation for Round Butte and Pelton Dams. Returns to WSNFH have fluctuated from a high of 1,079 in 1985 to a low of 346 in 1986, but showed an increase to 725 in 1987. RBH hatchery returns have shown better improvements increasing from a low of 453 in 1981 to high of 1,820 in 1986, with 1987 returns of 1,348 adults and jacks. Excess adult returns to the Pelton Trap are given to the Warm Springs Tribes or recycled to the Sherars falls fishery. In 1985, an estimated 1,656 hatchery jacks and adults were harvested by the sport and tribal fishery at Sherars Falls, in 1987, the harvest was 1,135. RBH releases 60,000 smolts at the hatchery, and 210,000 subyearlings into the Pelton Fish Ladder, this is used for additional rearing capacity. WSNFH currently produces 700,000 smolts with a design capacity of 1.3 million smolts. In 1988, the WSNFH released 950,000 smolts. RBH released 54,000 smolts directly from the hatchery and 210,000 smolts reared in the Pelton Fish Ladder. The stock is assumed to be a viable hatchery stock.

Subyearling Stocks

The FISHPASS model flagged subyearling chinook originating in the The Dalles Pool. Subyearling stocks were flagged only under the opportunity resource alternative for the base case, signed Spill Agreement high Northwest load, and NTSA expiring in 2003 sensitivities. There is only one subyearling stock originating in the The Dalles Pool, the Deschutes River fall chinook. It is not managed as a critical stock and is not expected to be significantly impacted by the NTSA.

Columbia River fall chinook salmon are generally divided into three groups: Lower river, Bonneville Pool hatchery (BPH), and upriver brights (URB). All three groups are targeted in the mainstem Columbia River, by sport, commercial and Treaty Indian fisheries and ocean commercial fisheries. The URB portion of the run has set record returns with an estimated 400,000 in 1988, and a record high of 419,000 in 1987. Harvests of URB have also set records with 254,800 taken in the Commercial fishery and 14,500 taken in the sport fishery. Annual passage goals of 40,000 URB over McNary Dam have been exceeded since 1983. Commercial gill-net harvests occurred in 1986 and 1987 in the area between Priest Rapids and Wanapum Dams, with the 1987 harvest totaling 2,215 chinook, in 1988 the harvest was an estimated 2,300 adults. URB runs also have benefited from ocean and in river harvest regulations set to protect depressed returns of BPH stocks. There are recreational and Tribal fisheries that harvest Deschutes River Fall Chinook. Harvest occurs in a area from Sherars Falls to a point one mile down stream. In 1988, the Tribal and recreational harvests (adults and jacks) was 1,884 and 619 respectively.

Deschutes River Fall Chinook: The Deschutes River fall chinook stock is a wild stock the was supplemented by releases from the WSNFH in 1958, 1967, and 1968 with no success. No supplementation is presently anticipated and the stock will be managed for wild fish. Escapement reached a high of 9,673 adults and jacks in 1986, with escapement in 1988 dropping to 5,612 adults and jacks. Total run size has varied from a low of 5,291 adults and jacks to a high of 12,254 in 1986. The subbasin goal is to achieve a return of 10-12,000 adults to allow for a 4-5,000 adult harvest and 6-7,000 adult escapement. This a viable wild stock managed for mainstem and terminal harvest.