

# Memorandum

To : Ms. Barbara McDonnell  
Chief, Division of Environmental Services  
Department of Water Resources

Date : January 31, 2007


From : Department of Fish and Game

Subject: Mitigation Loss Calculations for Four Pumps Agreement

The State Water Project (SWP) mitigation loss calculation for 2006 is complete as required by the Four Pumps Agreement between the Department of Water Resources and the Department of Fish and Game. As previously agreed, loss of striped bass under 21mm is based on the mean loss from 1985 through 1995. The estimated mitigation losses for 2006, which are based on five year mean values, are as follows:

<u>SPECIES</u>	<u>NUMBER OF EQUIVALENTS</u>
Striped bass	173,435 (yearlings)
Chinook salmon	94,423 (smolts)
Steelhead rainbow trout	14,182 (yearlings)

The attached table lists the annual SWP loss estimates for yearling-equivalent striped bass, smolt-equivalent Chinook salmon, and yearling-equivalent steelhead rainbow trout (Table 1). The five year loss running averages are also enclosed (Table 2).



Charles Armor  
Regional Manager  
Bay-Delta Region

Attachment

cc: Department of Water Resources  
Sacramento, California  
Ms. Delores Brown  
Mrs. Laura Flournoy

Department of Fish and Game  
Sacramento, California  
Mr. Carl Wilcox  
Ms. Belloiry Fong  
Mr. Fred Jurick

Stockton, California  
Mr. Bob Fujimura  
Fish Facilities Files

Table 1. Yearling-equivalent losses for striped bass and steelhead rainbow trout and smolt-equivalent losses for Chinook salmon for the State Water Project, 1984-2006.

YEAR	Yearling-Equivalent Striped Bass			Smolt-Equivalent Chinook Salmon			Yearling-Equivalent Steelhead		
	<20 mm	>20 mm	Total Loss	YOY	Yearling	Total Loss	YOY	Yearling	Total Loss
1984		873,853	<b>873,853</b>	290,696	947,503	<b>1,238,199</b>	0	1,713	<b>1,713</b>
1985	65,177	370,976	<b>436,153</b>	472,512	489,713	<b>962,225</b>	0	15,621	<b>15,621</b>
1986	35,315	944,061	<b>979,376</b>	1,147,249	2,300,866	<b>3,448,115</b>	0	15,663	<b>15,663</b>
1987	41,726	954,958	<b>996,684</b>	528,544	713,791	<b>1,242,334</b>	747	21,266	<b>22,013</b>
1988	59,625	874,055	<b>933,680</b>	409,103	747,953	<b>1,157,056</b>	0	25,080	<b>25,080</b>
1989	56,306	579,003	<b>635,309</b>	373,717	246,641	<b>620,358</b>	253	32,571	<b>32,824</b>
1990	7,717	401,353	<b>409,070</b>	90,098	188,228	<b>278,326</b>	0	19,187	<b>19,187</b>
1991	15,117	192,765	<b>207,882</b>	122,127	128,466	<b>250,593</b>	0	38,430	<b>38,430</b>
1992	13,452	299,687	<b>313,139</b>	21,341	224,603	<b>245,944</b>	275	39,931	<b>40,206</b>
1993	25,766	1,194,011	<b>1,219,777</b>	17,547	68,521	<b>86,068</b>	0	47,782	<b>47,782</b>
1994	2,253	122,656	<b>124,909</b>	8,217	25,073	<b>33,290</b>	0	1,738	<b>1,738</b>
1995	3,256	265,225	<b>268,481</b>	26,224	199,012	<b>225,236</b>	0	4,802	<b>4,802</b>
1996*	29,610	214,213	<b>243,823</b>	28,425	121,437	<b>149,862</b>	0	14,240	<b>14,240</b>
1997*	29,610	219,225	<b>248,835</b>	39,792	38,973	<b>78,765</b>	0	1,153	<b>1,153</b>
1998*	29,610	71,980	<b>101,590</b>	10,107	28,683	<b>38,790</b>	0	352	<b>352</b>
1999*	29,610	271,436	<b>301,046</b>	199,537	73,867	<b>273,404</b>	0	4,917	<b>4,917</b>
2000*	29,610	926,501	<b>956,111</b>	173,324	71,333	<b>244,657</b>	74	27,848	<b>27,922</b>
2001*	29,610	262,459	<b>292,069</b>	97,264	80,472	<b>177,736</b>	67	35,146	<b>35,213</b>
2002*	29,610	243,270	<b>272,880</b>	16,914	36,751	<b>53,665</b>	24	9,606	<b>9,630</b>
2003*	29,610	173,492	<b>203,102</b>	43,318	96,780	<b>140,098</b>	0	25,262	<b>25,262</b>
2004*	29,610	161,021	<b>190,631</b>	26,479	84,691	<b>111,170</b>	0	20,321	<b>20,321</b>
2005*	29,610	101,999	<b>131,609</b>	38,600	63,400	<b>102,000</b>	0	9,859	<b>9,859</b>
2006*	29,610	39,341	<b>68,951</b>	26,330	38,851	<b>65,181</b>	0	5,837	<b>5,837</b>

\* After the sampling program was eliminated, YE Striped Bass <20mm estimate is the average of 85-95 loss.

Table 2. Five year running averages for yearling-equivalent losses for striped bass and steelhead rainbow trout and smolt-equivalent losses for chinook salmon for the State Water Project, 1984-2006.

Period	Yearling-Equivalent Striped Bass			Smolt-Equivalent Chinook Salmon			Yearling-Equivalent Steelhead		
	<20 mm	>20 mm	Total Loss	YOY	Yearling	Total Loss	YOY	Yearling	Total Loss
Mean 84-88	50,461	803,581	<b>854,041</b>	569,621	1,039,965	<b>1,609,586</b>	149	15,869	<b>16,018</b>
Mean 85-89	51,630	744,611	<b>796,240</b>	586,225	899,793	<b>1,486,018</b>	200	22,040	<b>22,240</b>
Mean 86-90	40,138	750,686	<b>790,824</b>	509,742	839,496	<b>1,349,238</b>	200	22,753	<b>22,953</b>
Mean 87-91	36,098	600,427	<b>636,525</b>	304,718	405,016	<b>709,733</b>	200	27,307	<b>27,507</b>
Mean 88-92	30,443	469,373	<b>499,816</b>	203,277	307,178	<b>510,455</b>	106	31,040	<b>31,145</b>
Mean 89-93	23,672	533,364	<b>557,035</b>	124,966	171,292	<b>296,258</b>	106	35,580	<b>35,686</b>
Mean 90-94	12,861	442,094	<b>454,955</b>	51,866	126,978	<b>178,844</b>	55	29,414	<b>29,469</b>
Mean 91-95	11,969	414,869	<b>426,838</b>	39,091	129,135	<b>168,226</b>	55	26,537	<b>26,592</b>
Mean 92-96	14,867	419,158	<b>434,026</b>	20,351	127,729	<b>148,080</b>	55	21,699	<b>21,754</b>
Mean 93-97	18,099	403,066	<b>421,165</b>	24,041	90,603	<b>114,644</b>	0	13,943	<b>13,943</b>
Mean 94-98	18,868	178,660	<b>197,528</b>	22,553	82,636	<b>105,189</b>	0	4,457	<b>4,457</b>
Mean 95-99	24,339	208,416	<b>232,755</b>	60,817	92,394	<b>153,211</b>	0	5,093	<b>5,093</b>
Mean 96-00	29,610	340,671	<b>370,281</b>	90,237	66,859	<b>157,096</b>	15	9,702	<b>9,717</b>
Mean 97-01	29,610	350,320	<b>379,930</b>	104,005	58,666	<b>162,670</b>	28	13,883	<b>13,911</b>
Mean 98-02	29,610	355,129	<b>384,739</b>	99,429	58,221	<b>157,650</b>	33	15,574	<b>15,607</b>
Mean 99-03	29,610	375,432	<b>405,042</b>	106,071	71,841	<b>177,912</b>	33	20,556	<b>20,589</b>
Mean 00-04	29,610	353,349	<b>382,959</b>	71,460	74,005	<b>145,465</b>	33	23,637	<b>23,670</b>
Mean 01-05	29,610	188,448	<b>218,058</b>	44,515	72,419	<b>116,934</b>	18	20,039	<b>20,057</b>
Mean 02-06	29,610	143,825	<b>173,435</b>	30,328	64,095	<b>94,423</b>	5	14,177	<b>14,182</b>