M e m o r a n d u m

Date: May 28, 2010

To: Delta Fish Agreement Advisory Committee

From: **Department of Water Resources**

Subject: Meeting Announcement

The next meeting of the Delta Pumping Plant Fish Protection Agreement Advisory Committee will be held on **Wednesday, June 9, 2010** from **1 p.m.** to **4 p.m.** in **Room 215** of the Department of Water Resources Office located on the Second Floor at 3500 Industrial Boulevard, West Sacramento, California. For those needing to call into the meeting, the conference call number is **(916) 574-2008**. If you plan to call into the meeting later than 1p.m., please let me know in advance so that we can keep the line open for your call.

A proposed meeting agenda and supporting documents are attached. If you have any questions, please contact me at (916) 376-9730 or by e-mail at lflourno@water.ca.gov.

Laura J. Flournoy, Staff Environmental Scientist
Mitigation and Restoration Branch
Division of Environmental Services

Attachment

cc: Distribution List

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PROPOSED AGENDA
FISH ADVISORY COMMITTEE MEETING

June 9, 2010
1pm – 4pm

ROOM 215, DES WEST SACRAMENTO OFFICE BUILDING

NEXT MEETING – TBD
ROOM 215, DES West Sacramento Office Building
3500 Industrial Blvd., West Sacramento

State of California
Department of Fish and Game

Memorandum

Date: October 21, 2009

To: Ms. Dale Hoffman-Floerke, Division Chief
Department of Water Resources
Division of Environmental Services
3500 Industrial Boulevard
West Sacramento, California 95691-6521

From: C. Catalano
Charles Armor, Regional Manager
Department of Fish and Game - Bay Delta Region
Post Office Box 47
Yountville, California 94599

Subject: Mitigation Loss Calculations for the Four Pumps Agreement

The State Water Project (SWP) mitigation loss calculation for 2008 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 21 mm is based on the mean loss from 1985 through 1995. The estimated mitigation losses for 2008, which are based on five-year mean values, are as follows:

SPECIES	NUMBER OF EQUIVALENTS
Striped bass	119,721 (yearlings)
Chinook salmon	66,922 (smolts)
Steelhead rainbow trout	10,321 (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 attached (Table 2).

If you have any questions, please contact Bob Fujimura, Senior Fisheries Biologist, at (209) 948-7097.

cc: Ms. Stephani Spaar, Branch Chief
Ms. Delores Brown, Office Chief
Mrs. Laura Flournoy, Staff Environmental Scientist
Department of Water Resources
West Sacramento, California

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

Mr. Bob Fujimura
Department of Fish and Game
Stockton, California

Table 1. Yearling-equivalent losses for striped bass and steelhead rainbow trout and smolt-equivalent losses for Chinook salmon for the State Water Project, 1984-2008.

	Yearling-Equivalent Striped Bass			Smolt-Equivalent Chinook Salmon			Yearling-Equivalent Steelhead		
YEAR	<20 mm	>20 mm	**Total Loss**	YOY	Yearling	**Total Loss**	YOY	Yearling	**Total Loss**
1984		873,853	**873,853**	290,696	947,503	**1,238,199**	0	1,713	**1,713**
1985	65,177	370,976	**436,153**	472,512	489,713	**962,225**	0	15,621	**15,621**
1986	35,315	944,061	**979,376**	1,147,249	2,300,866	**3,448,115**	0	15,663	**15,663**
1987	41,726	954,958	**996,684**	528,544	713,791	**1,242,334**	747	21,266	**22,013**
1988	59,625	874,055	**933,680**	409,103	747,953	**1,157,056**	0	25,080	**25,080**
1989	56,306	579,003	**635,309**	373,717	246,641	**620,358**	253	32,571	**32,824**
1990	7,717	401,353	**409,070**	90,098	188,228	**278,326**	0	19,187	**19,187**
1991	15,117	192,765	**207,882**	122,127	128,466	**250,593**	0	38,430	**38,430**
1992	13,452	299,687	**313,139**	21,341	224,603	**245,944**	275	39,931	**40,206**
1993	25,766	1,194,011	**1,219,777**	17,547	68,521	**86,068**	0	47,782	**47,782**
1994	2,253	122,656	**124,909**	8,217	25,073	**33,290**	0	1,738	**1,738**
1995	3,256	265,225	**268,481**	26,224	199,012	**225,236**	0	4,802	**4,802**
1996*	29,610	214,213	**243,823**	28,425	121,437	**149,862**	0	14,240	**14,240**
1997*	29,610	219,225	**248,835**	39,792	38,973	**78,765**	0	1,153	**1,153**
1998*	29,610	71,980	**101,590**	10,107	28,683	**38,790**	0	352	**352**
1999*	29,610	271,436	**301,046**	199,537	73,867	**273,404**	0	4,917	**4,917**
2000*	29,610	926,501	**956,111**	173,324	71,333	**244,657**	74	27,848	**27,922**
2001*	29,610	262,459	**292,069**	97,264	80,472	**177,736**	67	35,146	**35,213**
2002*	29,610	243,270	**272,880**	16,914	36,751	**53,665**	24	9,606	**9,630**
2003*	29,610	173,492	**203,102**	43,318	96,780	**140,098**	0	25,262	**25,262**
2004*	29,610	161,021	**190,631**	26,479	84,691	**111,170**	0	20,321	**20,321**
2005*	29,610	101,999	**131,609**	38,600	63,400	**102,000**	0	9,859	**9,859**
2006*	29,610	39,341	**68,951**	26,330	38,851	**65,181**	0	5,837	**5,837**
2007*	29,610	85,342	**114,952**	4,862	10,904	**15,766**	11	6,855	**6,866**
2008*	29,610	62,853	**92,463**	12,876	27,618	**40,494**	0	8,721	**8,721**

* After the sampling program was eliminated, the yearling-equivalent estimate for striped bass < 20 mm is the average of the 1985-1995 losses.

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, 1984-2008.

	Yearling-Equivalent Striped Bass			Smolt-Equivalent Chinook Salmon			Yearling-Equivalent Steelhead		
Period	<20 mm	>20 mm	**Total Loss**	YOY	Yearling	**Total Loss**	YOY	Yearling	**Total Loss**
Mean 84-88	50,461	803,581	**854,041**	569,621	1,039,965	**1,609,586**	149	15,869	**16,018**
Mean 85-89	51,630	744,611	**796,240**	586,225	899,793	**1,486,018**	200	22,040	**22,240**
Mean 86-90	40,138	750,686	**790,824**	509,742	839,496	**1,349,238**	200	22,753	**22,953**
Mean 87-91	36,098	600,427	**636,525**	304,718	405,016	**709,733**	200	27,307	**27,507**
Mean 88-92	30,443	469,373	**499,816**	203,277	307,178	**510,455**	106	31,040	**31,145**
Mean 89-93	23,672	533,364	**557,035**	124,966	171,292	**296,258**	106	35,580	**35,686**
Mean 90-94	12,861	442,094	**454,955**	51,866	126,978	**178,844**	55	29,414	**29,469**
Mean 91-95	11,969	414,869	**426,838**	39,091	129,135	**168,226**	55	26,537	**26,592**
Mean 92-96	14,867	419,158	**434,026**	20,351	127,729	**148,080**	55	21,699	**21,754**
Mean 93-97	18,099	403,066	**421,165**	24,041	90,603	**114,644**	0	13,943	**13,943**
Mean 94-98	18,868	178,660	**197,528**	22,553	82,636	**105,189**	0	4,457	**4,457**
Mean 95-99	24,339	208,416	**232,755**	60,817	92,394	**153,211**	0	5,093	**5,093**
Mean 96-00	29,610	340,671	**370,281**	90,237	66,859	**157,096**	15	9,702	**9,717**
Mean 97-01	29,610	350,320	**379,930**	104,005	58,666	**162,670**	28	13,883	**13,911**
Mean 98-02	29,610	355,129	**384,739**	99,429	58,221	**157,650**	33	15,574	**15,607**
Mean 99-03	29,610	375,432	**405,042**	106,071	71,841	**177,912**	33	20,556	**20,589**
Mean 00-04	29,610	353,349	**382,959**	71,460	74,005	**145,465**	33	23,637	**23,670**
Mean 01-05	29,610	188,448	**218,058**	44,515	72,419	**116,934**	18	20,039	**20,057**
Mean 02-06	29,610	143,825	**173,435**	30,328	64,095	**94,423**	5	14,177	**14,182**
Mean 03-07	29,610	112,239	**141,849**	27,918	58,925	**86,843**	2	13,627	**13,629**
Mean 04-08	29,610	90,111	**119,721**	21,829	45,093	**66,922**	2	10,319	**10,321**

State of California
Department of Fish and Game

Flex your POWER

Memorandum

Date: March 30, 2010

To: Mr. Dean Messer, Division Chief
Department of Water Resources
Division of Environmental Services
3500 Industrial Boulevard
West Sacramento, California 95691-6521

From: Charles Armor, Regional Manager, Department of Fish and Game, Post Office Box 47, Yountville, California 94599

Subject: Mitigation Loss Calculations for the Four Pumps Agreement

The State Water Project (SWP) mitigation loss calculation for 2009 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 21 mm is based on the mean loss from 1985 through 1995. The estimated mitigation losses for 2009, which are based on five-year mean values, are as follows:

SPECIES	NUMBER OF EQUIVALENTS
Striped bass	96,481 (yearlings)
Chinook salmon	48,126 (smolts)
Steelhead rainbow trout	6,845 (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 attached (Table 2).

If you have any questions, please contact Geir Aasen, Associate Biologist, at (209) 948-7086, or Bob Fujimura, Senior Fisheries Biologist, at (209) 948-7097

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Ms. Delores Brown, Office Chief
Mrs. Laura Flournoy, Staff Environmental Scientist ✓

Department of Fish and Game
Mr. Carl Wilcox, Sacramento
Mr. Fred Jurick, Sacramento
Mr. Bob Fujimura, Stockton

Table 1. Yearling-equivalent losses for striped bass and steelhead rainbow trout and smolt-equivalent losses for Chinook salmon for the State Water Project, 1984-2009.

	Yearling-Equivalent Striped Bass			Smolt-Equivalent Chinook Salmon			Yearling-Equivalent Steelhead		
YEAR	<20 mm	>20 mm	**Total Loss**	YOY	Yearling	**Total Loss**	YOY	Yearling	**Total Loss**
1984		873,853	**873,853**	290,696	947,503	**1,238,199**	0	1,713	**1,713**
1985	65,177	370,976	**436,153**	472,512	489,713	**962,225**	0	15,621	**15,621**
1986	35,315	944,061	**979,376**	1,147,249	2,300,866	**3,448,115**	0	15,663	**15,663**
1987	41,726	954,958	**996,684**	528,544	713,791	**1,242,334**	747	21,266	**22,013**
1988	59,625	874,055	**933,680**	409,103	747,953	**1,157,056**	0	25,080	**25,080**
1989	56,306	579,003	**635,309**	373,717	246,641	**620,358**	253	32,571	**32,824**
1990	7,717	401,353	**409,070**	90,098	188,228	**278,326**	0	19,187	**19,187**
1991	15,117	192,765	**207,882**	122,127	128,466	**250,593**	0	38,430	**38,430**
1992	13,452	299,687	**313,139**	21,341	224,603	**245,944**	275	39,931	**40,206**
1993	25,766	1,194,011	**1,219,777**	17,547	68,521	**86,068**	0	47,782	**47,782**
1994	2,253	122,656	**124,909**	8,217	25,073	**33,290**	0	1,738	**1,738**
1995	3,256	265,225	**268,481**	26,224	199,012	**225,236**	0	4,802	**4,802**
1996*	29,610	214,213	**243,823**	28,425	121,437	**149,862**	0	14,240	**14,240**
1997*	29,610	219,225	**248,835**	39,792	38,973	**78,765**	0	1,153	**1,153**
1998*	29,610	71,980	**101,590**	10,107	28,683	**38,790**	0	352	**352**
1999*	29,610	271,436	**301,046**	199,537	73,867	**273,404**	0	4,917	**4,917**
2000*	29,610	926,501	**956,111**	173,324	71,333	**244,657**	74	27,848	**27,922**
2001*	29,610	262,459	**292,069**	97,264	80,472	**177,736**	67	35,146	**35,213**
2002*	29,610	243,270	**272,880**	16,914	36,751	**53,665**	24	9,606	**9,630**
2003*	29,610	173,492	**203,102**	43,318	96,780	**140,098**	0	25,262	**25,262**
2004*	29,610	161,021	**190,631**	26,479	84,691	**111,170**	0	20,321	**20,321**
2005*	29,610	101,999	**131,609**	38,600	63,400	**102,000**	0	9,859	**9,859**
2006*	29,610	39,341	**68,951**	26,330	38,851	**65,181**	0	5,837	**5,837**
2007*	29,610	85,342	**114,952**	4,862	10,904	**15,766**	11	6855	**6,866**
2008*	29,610	62,853	**92,463**	12,876	27,618	**40,494**	0	8,721	**8,721**
2009*	29,610	44,822	**74,432**	7,563	9,627	**17,190**	0	2,942	**2,942**

* 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, 1984-2009.

	Yearling-Equivalent Striped Bass			Smolt-Equivalent Chinook Salmon			Yearling-Equivalent Steelhead		
Period	<20 mm	>20 mm	**Total Loss**	YOY	Yearling	**Total Loss**	YOY	Yearling	**Total Loss**
Mean 84-88	50,461	803,581	**854,041**	569,621	1,039,965	**1,609,586**	149	15,869	**16,018**
Mean 85-89	51,630	744,611	**796,240**	586,225	899,793	**1,486,018**	200	22,040	**22,240**
Mean 86-90	40,138	750,686	**790,824**	509,742	839,496	**1,349,238**	200	22,753	**22,953**
Mean 87-91	36,098	600,427	**636,525**	304,718	405,016	**709,733**	200	27,307	**27,507**
Mean 88-92	30,443	469,373	**499,816**	203,277	307,178	**510,455**	106	31,040	**31,145**
Mean 89-93	23,672	533,364	**557,035**	124,966	171,292	**296,258**	106	35,580	**35,686**
Mean 90-94	12,861	442,094	**454,955**	51,866	126,978	**178,844**	55	29,414	**29,469**
Mean 91-95	11,969	414,869	**426,838**	39,091	129,135	**168,226**	55	26,537	**26,592**
Mean 92-96	14,867	419,158	**434,026**	20,351	127,729	**148,080**	55	21,699	**21,754**
Mean 93-97	18,099	403,066	**421,165**	24,041	90,603	**114,644**	0	13,943	**13,943**
Mean 94-98	18,868	178,660	**197,528**	22,553	82,636	**105,189**	0	4,457	**4,457**
Mean 95-99	24,339	208,416	**232,755**	60,817	92,394	**153,211**	0	5,093	**5,093**
Mean 96-00	29,610	340,671	**370,281**	90,237	66,859	**157,096**	15	9,702	**9,717**
Mean 97-01	29,610	350,320	**379,930**	104,005	58,666	**162,670**	28	13,883	**13,911**
Mean 98-02	29,610	355,129	**384,739**	99,429	58,221	**157,650**	33	15,574	**15,607**
Mean 99-03	29,610	375,432	**405,042**	106,071	71,841	**177,912**	33	20,556	**20,589**
Mean 00-04	29,610	353,349	**382,959**	71,460	74,005	**145,465**	33	23,637	**23,670**
Mean 01-05	29,610	188,448	**218,058**	44,515	72,419	**116,934**	18	20,039	**20,057**
Mean 02-06	29,610	143,825	**173,435**	30,328	64,095	**94,423**	5	14,177	**14,182**
Mean 03-07	29,610	112,239	**141,849**	27,918	58,925	**86,843**	2	13,627	**13,629**
Mean 04-08	29,610	90,111	**119,721**	21,829	45,093	**66,922**	2	10,319	**10,321**
Mean 05-09	29,610	66,871	**96,481**	18,046	30,080	**48,126**	2	6,843	**6,845**

DELTA PUMPING PLANT FISH PROTECTION AGREEMENT
FISH MITIGATION REPORT
MAY 2010

	(Yearling Eq.)	(Smolt Eq.)	(Yearling Eq.)
LOSSES	**STRIPED BASS**	**SALMON**	**STEELHEAD**
1986	544,429	1,973,164	21,884
1987	683,712	1,536,872	11,591
1988	854,041	1,609,586	16,018
1989	796,240	1,486,018	22,240
1990	790,824	1,349,238	22,953
1991	636,525	709,733	27,507
1992	499,816	510,455	31,145
1993	557,035	296,258	35,686
1994	454,955	178,844	29,469
1995	426,838	168,226	26,592
1996	434,026	148,080	21,754
1997	421,165	114,644	13,943
1998	197,528	105,189	4,457
1999	232,755	153,211	5,093
2000	370,281	157,096	9,717
2001	379,930	162,670	13,911
2002	384,739	157,650	15,607
2003	405,042	177,912	20,589
2004	382,959	145,465	23,670
2005	218,058	116,934	20,057
2006	173,435	94,423	14,182
2007	141,849	86,843	13,369
2008	119,721	66,922	10,321
2009[1]	96,481	48,126	6,845
TOTAL LOSSES	**10,202,384**	**11,553,559**	**438,600**
CREDITED[2]			
1988	345,292	0	0
1989	406,458	78,125	0
1990	1,235,787	15,625	53,900
1991	1,765,804	18,522	20,450
1992	0	678,447	0
1993	125,000	352,483	41,500
1994	286,244	673,007	48,320
1995	349,256	801,487	55,688
1996	503,799	871,018	55,050
1997	318,682	979,317	52,860
1998	485,670	1,569,206	248
1999	250,000	4,168,382	48,813
2000	1,097,424	1,089,361	248
2001	974,312	1,423,765	248
2002	250,000	1,749,813	477
2003	250,000	1,595,905	50,248
2004	250,000	1,023,588	248
2005	250,000	1,129,478	50,248
2006	254,452	1,232,204	248
2007	254,452	768,699	50,248
2008	254,452	526,599	248
2009	254,452	466,395	1,746
2010	254,452	469,589	248[3]
TOTAL CREDITED	10,415,988	21,681,015	531,284
REMAINING OBLIGATION	**-213,604**	**-10,127,456**	**-92,684**
PROJECTED LOSSES			
2010	150,000	82,000	13,000
2011	150,000	82,000	13,000
2012	150,000	82,000	13,000
	450,000	246,000	39,000
PROJECTED CREDITS			
2011	254,452[4]	1,100,000[5]	50,000
2012	254,452	1,100,000	50,000
	508,904	2,200,000	100,000
PROJECTED BALANCE 1986 THRU 2010	**-272,508**	**-12,081,456**	**-153,684**[6]

Endnotes:

1. 2010 losses not yet available.

2. Refer to Annual Striped Bass Credit and Annual Salmon Smolt Credit tables (attached).

3. Steelhead Credit Assumptions:
   2003 & 2005 & 2007 release includes 50,000 FRH mitigation fish as Yearling Equivalents (YE); 2009 release includes 1,498 FRH mitigation fish as YE; 2010 estimate is preliminary and needs to be verified with DFG; Mill Creek Water Exchange O&M=248 YE

   No steelhead available from Feather River Hatchery for mitigation for 1998, 2000-2002, 2004, 2006, 2008, 2010.

4. Delta-Bay Enhanced Enforcement Project = 250,000 (Annually);
   SRCD Suisun Marsh Fish Screen O&M Project = 4,452 (Annually)

5. 2011-2012 Salmon Credit Assumptions:
   SJ Basin Spawning Habitat Projects (8) = 41,577;
   Predator Habitat Removal Projects (3) = 33,564 (constant);
   Hills Ferry Barrier = 94,020 (1994-2010 mean credits);
   MRH = 402,105 (1992-2010 mean credits);
   DBEEP = 250,000 annually;
   Spring-Run Increased Protection = 107,255 (1997-2010 mean credits);
   Mill Creek Water Exchange O&M = 86,741 (1999-2010 mean credits);
   Butte Creek Passage Projects = 28,514 (1997-2010 mean credits).

   Total Potential Credits = approximately 1,100,000 annually.

6. Direct replacement of steelhead reared at Feather River Hatchery at an annual amount equal to or greater than the annual loss rate.

DELTA FISH AGREEMENT
ANNUAL STRIPED BASS CREDITS
May 2010

PROJECTS	PROJECT YEARS	YEARLING EQUIVALENTS 1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1988-1997 SUBTOTAL
BAY-DELTA ESTUARY:												
STOCKING PROGRAM	1988-1991	345,292	291,258	933,049	1,531,634							3,101,233
DEMO. GROWOUT	1989-1991		115,200	302,738	181,575							599,513
PRIVATE GROWOUT	1991				52,595							52,595
NET PEN PROJECT	1994-2001							36,244	99,256	253,799	68,682	457,981
D-BEEP	Jul 1993+						125,000	250,000	250,000	250,000	250,000	1,125,000
ANNUAL CREDITS		345,292	406,458	1,235,787	1,765,804	0	125,000	286,244	349,256	503,799	318,682	**5,336,322**

PROJECTS		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	1998 - 2007 SUBTOTAL
BAY-DELTA ESTUARY:												
STOCKING PROGRAM												0
DEMO. GROWOUT												0
PRIVATE GROWOUT												0
NET PEN PROJECT		235,670	0	847,424	724,312							1,807,407
D-BEEP		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	2,500,000
*SUISUN SCREEN O&M	2006-2017									4,452	4,452	8,904
ANNUAL CREDITS		485,670	250,000	1,097,424	974,312	250,000	250,000	250,000	250,000	254,452	254,452	

PROJECTS		2008	2009	2010	2008-2010 SUBTOTAL	GRAND TOTAL
BAY-DELTA ESTUARY:						
STOCKING PROGRAM					0	**3,101,233**
DEMO. GROWOUT					0	**599,513**
PRIVATE GROWOUT					0	**52,595**
NET PEN PROJECT					0	**2,265,388**
D-BEEP		250,000	250,000	250,000	750,000	**4,375,000**
*SUISUN SCREEN O&M	2006-2017	4,452	4,452	4,452	13,356	**22,260**
ANNUAL CREDITS		**254,452**	**254,452**	**254,452**		**10,415,989**

NOTE: Annual production is credited in the calender year that striped bass are released.
Shading indicates pre-project or no project year.

TOTAL CREDIT SINCE AGREEMENT = 10,415,989 YEARLING EQUIVALENT STRIPED BASS

*Starting in 2006 DWR will receive 4,452 striped bass yearling equivalents annually for twelve years (until 2017) for the SCRD Suisun Marsh Fish Screen O&M project.

DELTA FISH AGREEMENT
ANNUAL SALMON SMOLT CREDITS
MAY 2010

** CREDITS - PRELIMINARY, SUBJECT TO CHANGE*

PROJECTS	YEAR COMPLETED	MEAN ANNUAL ESTIMATED CREDITS	SMOLT EQUIVALENTS 1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009*	2010*	TOTAL	MEAN ANNUAL CREDITS
SAN JOAQUIN RIVER SYSTEM:																											
SJR ELECTRICAL BARRIER	1992	116,860						116,860																		**116,860**	------
HILLS FERRY FISH BARRIER*	1993	110,129							32,952	32,952	58,465	91,343	105,660	81,327	38,610	299,081	353,501	234,117	70,364	70,849	54,164	43,331	10,768	12,062	8,796	**1,598,342**	94,020
MERCED RIVER																											
MERCED RIVER GRAVEL I *	1990	21,727				2,897	1,448	7,424	8,329	10,139	2,354	19,554	14,484	6,156	5,794	17,200	11,407	10,501	12,131	7,604	2,354	1,448	724	181	543	**142,673**	7,134
MERCED RIVER GRAVEL II	1991	28,969					**	905	3,078	5,070	1,267	9,415	6,156	7,242	8,329	14,847	5,613	9,234	905	905	1,630	905	724	181	362	**76,768**	4,265
MRFF MODERNIZATION	1991	810,750					598,874	149,169	363,023	416,715	262,465	476,854	664,808	429,265	603,610	610,217	724,713	657,615	410,239	527,170	457,422	165,882	16,346	16,307	89,300	**7,639,993**	402,105
MAGNESON POND ISOLATION	1996	4,396										6,750	6,750	4,939	4,396	7,836	4,939	11,276	5,482	6,207	5,663	5,573	4,758	4,487	4,577	**83,633**	5,914
RATZLAFF PROJECT	1999	20,971													13,460	14,322	14,568	16,415	13,829	14,076	14,076	13,460	13,460	13,706	13,460	**154,831**	14,076
ROBINSON PROJECT	2002	31,279															15,708	44,315	33,089	25,485	22,769	17,156	15,889	15,708	17,519	**207,638**	23,071
LOWER W. STONES PROJECT	2005	8,148																								Not yet constructed	
TUOLUMNE RIVER																											
MJ RUDDY	1993	51,089							0	4,412	1,393	0	3,251	2,554	2,787	8,825	929	464	0	0	0	0	0	0	0	**24,615**	1,448
LA GRANGE, R 1B, 3A,& 3B	1994	27,170								2,090	1,161	3,948	16,256	11,379	18,578	64,790	19,739	3,948	12,076	18,462	6,851	6,618	8,128	9,521	2,322	**205,867**	13,585
STANISLAUS RIVER																											
RIFFLES RM 47.4, 50.4, & 50.9	1994	40,419								1,984	1,488	1,240	4,463	4,711	4,959	10,415	7,439	9,671	15,126	11,654	10,167	11,407	1,736	2,976	1,488	**100,924**	6,308
SACRAMENTO RIVER SYSTEM:																											
MILL CREEK GRAVEL	1988	78,125		78,125	15,625	15,625	78,125	78,125	78,125	78,125	78,125	78,125	78,125													**656,250**	------
MILL CK WATER EXCH O&M	1997	35,915												5,890	26,548	24,249	104,125	207,565	179,368	90,789	139,718	95,996	77,146	55,650	33,845	**1,040,889**	86,741
SPRING-RUN PROTECTION*	1995	66,310									214,300	36,642	22,146	344,931	94,743	82,341	191,319	98,882	0	71,027	216,712	135,082	103,343	66,848	37,557	**1,715,872**	114,391
BUTTE CREEK PASSAGE	1996	5,518										5,446	9,839	78,086	17,548	19,642	45,814	41,903	20,978	35,249	50,679	21,841	23,577	18,769	9,821	**399,190**	28,514
NORTHERN PIKE ERADICATION	1998	2,000,000												2,000,000												**2,000,000**	------
BAY-DELTA ESTUARY:																											
ENHANCED ENFORCEMENT	APR 1994	250,000							187,500	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000	**4,187,500**	250,000
SALMON ACCLIMATION PENS	1998	770,000											387,268	941,901												**1,329,169**	------
MEAN ANNUAL CREDITS: ESTIMATED		1,504,642	0	78,125	15,625	18,522	678,447	352,483	673,007	801,487	871,018	979,317	1,569,206	4,168,382	1,089,361	1,423,765	1,749,813	1,595,905	1,023,588	1,129,478	1,232,204	768,699	526,599	466,395	469,589	21,681,015	1,051,571
(Current Projects ONLY) ACTUAL		1,051,571																									

NOTE: Smolts and yearlings are credited in calender year smolt outmigration occurs.
MRFF releases are credited in year releases are made.
Shading indicates pre-project or no project year.
One time projects excluded from Mean Annual Credits.

* Updated credit formula.
** Included in 1992 Merced River Gravel I credits.

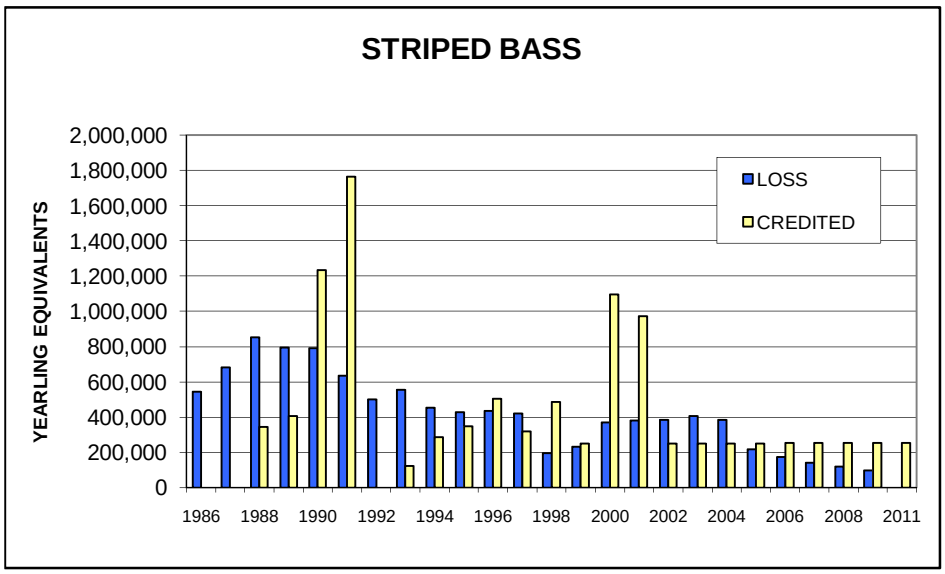
TOTAL CREDIT SINCE AGREEMENT = 21,681,015 SALMON SMOLT EQUIVALENTS

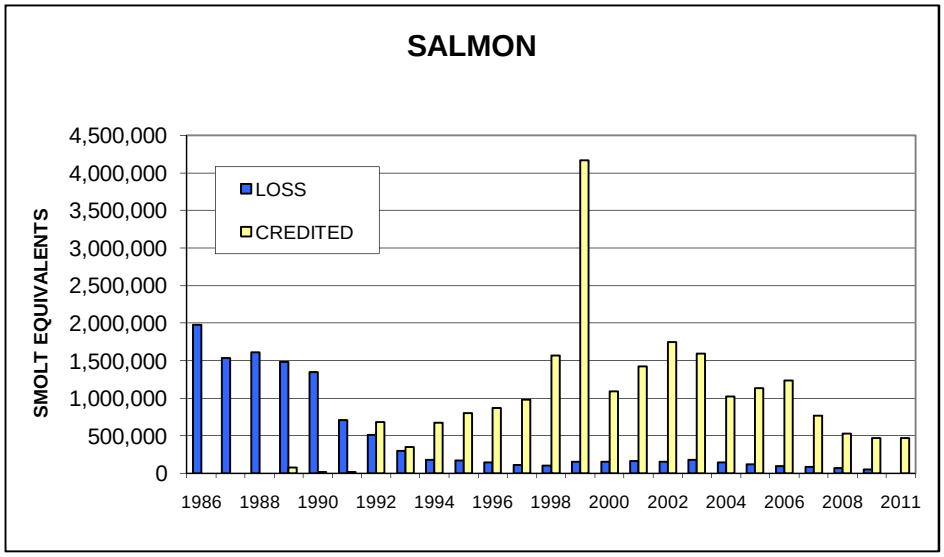
DELTA FISH AGREEMENT
SPAWNING HABITAT PROJECT REDD COUNTS
MAY 2010

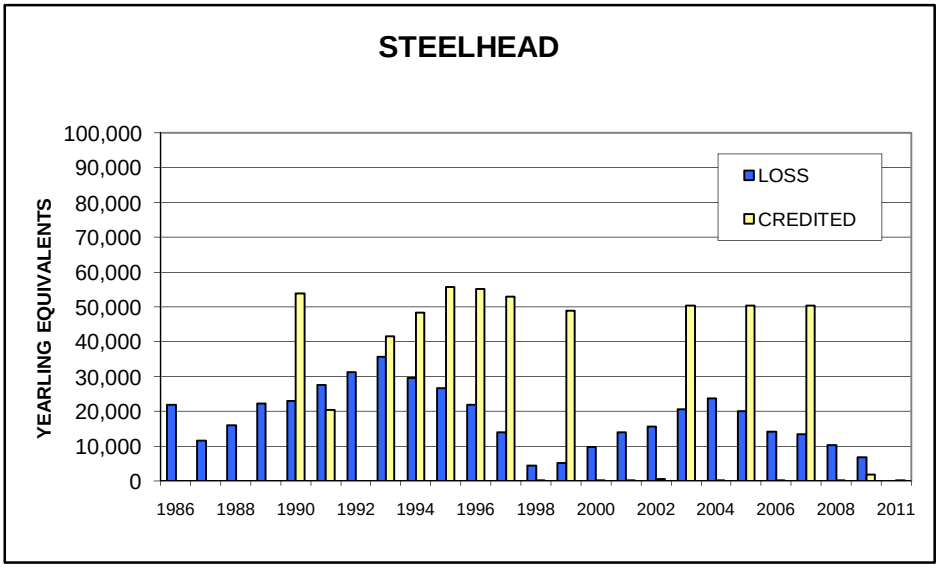
N/A = Data not yet available from DFG.

PROJECTS	YEAR COMPLETED	GRAVEL (SQ YDS)	MEAN ANNUAL ESTIMATED REDDS	REDD COUNTS 1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	TOTAL	MEAN ANNUAL REDDS
SACRAMENTO RIVER SYSTEM:																											
MILL CREEK GRAVEL	1988	300	81	~200	ANNUAL CREDITS NEGOTIATED								LAST YEAR														
SAN JOAQUIN RIVER SYSTEM:																											
MERCED RIVER																											
MERCED RIVER GRAVEL I *	1990	4,200	120			16	8	41	46	56	13	108	80	34	32	95	63	58	67	42	13	8	4	1	3	**788**	39
MERCED RIVER GRAVEL II	1991	5,600	160				**	5	17	28	7	52	34	40	46	82	31	51	5	5	9	5	4	1	2	**424**	24
MAGNESON POND ISOLATION	1996	5,600	Not Est'd									13	13	3	0	19	3	38	6	10	7	7	2	1	1	**122**	9
RATZLAFF PROJECT	1999	7,000	61												0	7	9	24	3	5	5	0	0	2	0	**55**	5
ROBINSON PROJECT	2002	12,045	104														0	158	96	54	39	8	1	0	10	**366**	41
LOWER W. STONES PROJECT	2005	5,200	45																							Not yet constructed	
TUOLUMNE RIVER																											
MJ RUDDY	1993	25,393	220						0	19	6	0	14	11	12	38	4	2	0	0	0	0	0	0	0	**106**	6
LA GRANGE, R 1B, 3A,& 3B	1994	13,500	117							9	5	17	70	49	80	279	85	17	52	80	30	29	35	41	10	**887**	55
STANISLAUS RIVER																											
RIFFLES RM 47.4, 50.4, & 50.9	1994	5,680	163							8	6	5	18	19	20	42	30	39	61	47	41	46	7	12	6	**407**	25
MEAN ANNUAL REDDS: ESTIMATED			945	0	0	16	8	46	63	120	37	195	229	156	190	562	225	387	290	243	144	102	53	58	32	**3,155**	204
(Current Projects ONLY) ACTUAL			300																								

NOTE: Redd counts are made in year fish spawn. Annual production is credited in the calender year that outmigration occurs.
Shading indicates pre-project or no project year.
* Updated using current spawning habitat credit formula. ** Included in 1991 Merced River Gravel I redd count.







Annual loss and replacement of striped bass, salmon, and steelhead under the Delta Pumping Plant Fish Protection Agreement, 1986-2009.

(Note: Data includes fish replaced through 2010.)

DELTA PUMPING PLANT FISH PROTECTION AGREEMENT
ANNUAL REPORT
MITIGATION FUND EXPENDITURES
May 2010

STATE FISCAL YEAR	$15 MILLION LUMP SUM	ANNUAL MITIGATION
FY 1987-1990	$ 404,000	$ 3,513,000
FY 1990-1991	$ 3,050,000	$ 2,603,000
FY 1991-1992	$ 476,000	$ 182,000
FY 1992-1993	$ 718,000	$ 384,000
FY 1993-1994	$ 481,000	$ 1,569,000
FY 1994-1995	$ 328,000	$ 914,000
FY 1995-1996	$ 734,000	$ 1,161,000
FY 1996-1997	$ 1,477,000	$ 1,891,000
FY 1997-1998	$ 999,000	$ 2,727,000
FY 1998-1999	$ 655,000	$ 2,098,000
FY 1999-2000	$ 196,000	$ 2,530,000
FY 2000-2001	$ 382,000	$ 1,825,000
FY 2001-2002	$ 488,000	$ 4,119,000
FY 2002-2003	$ 684,000	$ 1,372,000
FY 2003-2004	$ 379,000	$ 1,831,000
FY 2004-2005	$ 306,000	$1,751,000
FY 2005-2006 *(Through December 2009)*	$ 555,000	$1,963,000
FY 2006-2007 *(Through December 2009)*	$ 308,000	$ 2,279,000
FY 2007-2008 *(Through December 2009)*	$ 509,000	$ 2,390,000
FY 2008-2009 *(Through December 2009)*	$ 213,000	$ 2,627,000
FY 2009-2010 *(Through December 2009)*	$46,000	$872,000
EXPENDITURES TO DATE (COMBINED = $ 53,989,000)	**$13,388,000**	**$40,601,000**

$15 MILLION LUMP SUM ACCOUNT	UNEXPENDED
APPROVED BUT UNEXPENDED (INCLUDES ENCUMBRANCES):	
Deer Creek Water Exchange O&M	$ 764,000
San Joaquin Salmon Spawning & Habitat Projects	$ 849,000
APPROVED BUT UNEXPENDED - SUBTOTAL	**$1,613,000**
TOTAL APPROVED - $15 MILLION ACCOUNT FUNDING	**$15,000,000**

ANNUAL MITIGATION ACCOUNT	UNEXPENDED
APPROVED BUT UNEXPENDED (INCLUDES ENCUMBRANCES):	
San Joaquin River Fish Barrier	$ 74,000
Merced River Salmon Spawning & Habitat Projects	$1,123,000
Merced River Fish Hatchery O&M	$ 3,359,000
Mill Creek Water Exchange O&M	$ 683,000
Deer Creek Water Exchange O&M	$ 1,187,000
Enhanced Enforcement	$ 1,255,000
Suisun Marsh Fish Screen O&M	$ 48,000
Four Pumps Administrative Program Costs	$ 341,000
APPROVED BUT UNEXPENDED - SUBTOTAL	**$8,070,000**
TOTAL APPROVED - ANNUAL MITIGATION ACCOUNT FUNDING	**$ 48,671,000**
TOTAL APPROVED COMBINED FUNDING	**$ 63,671,000**

DELTA PUMPING PLANT FISH PROTECTION AGREEMENT
ANNUAL REPORT
MITIGATION FUND EXPENDITURES
May 2010

$**15 MILLION LUMP SUM PROJECTS** **BUDGET (IN 1,000'S)** (EXPENDITURES THROUGH DECEMBER 2009)			
PROJECTS	**EXPENDED**	**ENCUMBERED or ALLOCATED**	**TOTAL**
1. Grizzly Island Fish Screen	$ 528	$ 0	$ 528
2. Sacramento River Spawning Gravel	2,316	0	2,316
3. Striped Bass Stocking	903	0	903
4. Merced River Hyacinth Control	25	0	25
5. Mill Creek Water Exchange Project	569	0	569
6. Delta-Bay Enhanced Enforcement	1,073	0	1,073
7. Georgiana Slough Barrier	400	0	400
8. Salmon Acclimation Pens	135	0	135
9. Tuolumne River Salmon Restoration Center	598	0	598
10. San Joaquin Salmon Predator Isolation	15	0	15
11. San Joaquin Tributary Diversion Fish Screens	324	0	324
12. Deer Creek Water Exchange (O&M)	2,012	764	2,776
13. Suisun Marsh Fish Screens (7 Screens, O&M)	2,085	0	2,085
14. River Mile 43, Tuolumne River Channel Improvement- Bobcat Flat	311	0	311
15. Stanislaus River Salmon & Steelhead Habitat	536	0	536
16. La Grange Gravel Replenishment - Tuolumne River	366	67	433
17. Robinson/Gallo Preliminary D&E	132	0	132
18. Robinson Reach - Merced River Salmon Habitat Enhancement	551	0	551
19. Merced River Wing Deflector Gravel	35	0	35
20. Expanded Western Stones - Merced River Salmon Habitat Enhancement	199	772	971
21. Upper Robinson Conservation Easement	24	0	24
22. Upper Western Stones- Merced River	213	10	223
** SAP Variance (Legacy SAP)	38	0	38
TOTAL	**$ 13,388**	**$1,613**	**$15,000**

DELTA PUMPING PLANT FISH PROTECTION AGREEMENT
ANNUAL REPORT
MITIGATION FUND EXPENDITURES
May 2010

ANNUAL MITIGATION PROJECTS
BUDGET (IN 1,000'S)
(EXPENDITURES THROUGH DECEMBER 2009)

PROJECTS	EXPENDED	ENCUMBERED or ALLOCATED	TOTAL
1. Mill Creek Spawning Gravel	$ 75	$ 0	$ 75
2. Striped Bass Releases, 1988-1991 (Stocking, Grow-out)	5,097	0	5,097
3. Striped Bass Releases, 1994-2001 (Net Pens)	3,746	0	3,746
4. Merced River Fish Facility Improvements and Hatchery O&M (30 years- through 2019)	1,822	3,359	5,181
5. Steelhead Stocking	58	0	58
6. Merced Gravel, Phase I & II and Maintenance	662	0	662
7. Delta-Bay Enhanced Enforcement, 1994-2011	15,688	1,054	16,742
8. Spring-run Salmon Increased Protection	350	201	551
9. San Joaquin Fish Barrier, 1992-2010 (3) (Electric Barrier, Alaskan Weir – 2 & 15 years)	917	74	991
10. Stanislaus River Salmon Habitat (2) (3 Riffles, Willms Pond)	373	0	373
11. Tuolumne River Salmon Habitat (3) (Riffles 1A, 3A, & 3B, Ruddy, Reed)	606	7	613
12. Magneson Pond Salmon Habitat – Merced River	595	0	595
13. Ratzlaff Reach - Merced River Salmon Habitat Enhancement	2,667	339	3,006
14. Lower Western Stone Reach - Merced River Salmon Habitat Enhancement	142	580	722
15. Robinson Reach - Merced River Salmon Habitat Enhancement	3,557	197	3,754
16. Mill Creek Water Exchange (15-year O&M)	113	683	796
17. Deer Creek Water Exchange (15-year O&M)	150	1,187	1,337
18. Salmon Acclimation Pens	30	0	30
19. Feather River Salmon Projects (2) (Hatchery Expansion, Salmon Passage)	29	0	29
20. Spring-run Salmon Passage Projects (4) (D&E, Parrot-Phelan Fish Ladder, Durham Mutual Ladder & Screen, Northern Pike)	1,594	0	1,594
21. Suisun Marsh Fish Screen O&M	32	48	80
* Delta Fish Agreement- Administrative Program Costs (DWR & DFG)	2,215	341	2,556
** SAP Variance (Legacy SAP)	83	0	83
TOTAL	**$40,601**	**$8,070**	**$ 48,671**

DELTA PUMPING PLANT FISH PROTECTION AGREEMENT
$15 MILLION LUMP SUM FUNDING

REVISED: May 2010

ANTICIPATED SCHEDULE OF REMAINING PROJECTS

PROJECTS	Allocated	Expended	2002 JAN-MAR	2002 APR-JUN	2002 JUL-SEP	2002 OCT-DEC	2003 JAN-MAR	2003 APR-JUN	2003 JUL-SEP	2003 OCT-DEC	2004 JAN-MAR	2004 APR-JUN	2004 JUL-SEP	2004 OCT-DEC	2005 JAN-MAR	2005 APR-JUN	2005 JUL-SEP	2005 OCT-DEC	2006 JAN-MAR	2006 APR-JUN	2006 JUL-SEP	2006 OCT-DEC	2007 JAN-MAR	2007 APR-JUN	2007 JUL-SEP	2007 OCT-DEC	2008 JAN-MAR	2008 APR-JUN	2008 JUL-SEP	2008 OCT-DEC	2009 JAN-MAR	2009 APR-JUN	2009 JUL-SEP	2009 OCT-DEC	2010 JAN-MAR	2010 APR-JUN	2010 JUL-SEP	2010 OCT-DEC	2011 JAN-MAR	2011 APR-JUN	2011 JUL-SEP	2011 OCT-DEC	2012 JAN-MAR	2012 APR-JUN	2012 JUL-SEP	2012 OCT-DEC
Tuolumne River Salmon Restoration Center (Property Transfer)	**$40,000**	**$4,000**	DFG-DWR discussion		DFG Proposal	Director Approvals	Letter of Intent	L&R/W and WCB - PROPERTY DISPOSITION					DGS Approved	**COMPLETED**																																				
Deer Creek Flow Enhancement Project (Water Exchange)	**$2,776,000**	**$764,000**	DRILLING CONTRACT		Finalize Pilot Program, Drill Wells			PILOT PROJECT (90 Days)		Report	Planning	PILOT WELL (Test 2)		Report	Funding Proposals				Negotiating DCID Agreement					DCFEP MOU Agreement Finalized and Approved		CEQA & NEPA Documentation and Necessary Project Permitting & Preparations															Drill & Install Wells- Project Implementation							
San Joaquin Tributary Diversion Fish Screens	**$300,000**	**$324,000**	PREP	DWR/DFG CONTRACT		DFG Pre-screening Report	<PHASE I	<< PHASE II, III >>	Entry Agreements, Legal and D&E Review, Screen Prep & Fabrication					DFG Annual Report	INSTALL & MONITOR (2 screens)		DFG Annual Report	INSTALL & MONITOR 2 screens	Final Report (Contract Ends)	**COMPLETED**																															
Stanislaus River Salmon Habitat - Lovers Leap	**$542,000**	**$536,000**	NCB CONTRACT PREP & PROCESSING (NCB Contract attempt failed)			USFWS-AFRP to act as Contractor (combine with Frymire Ranch)		PLANNING, FINAL DESIGN, & PERMITS			USFWS Contract (Mar 1 start)	FINAL DESIGN & PERMITS >>>>>											Construction and Report				Final Report (Contract Expired)	**COMPLETED**																					
Tuolumne River Channel Restoration, RM 43	**$279,000**	**$311,000**			CONTRACT w/TID - Prep & Processing >>			PLANNING, DESIGN, & PERMITTING					Conceptual Plan & Design Document	Final Design & Permitting		CONSTRUCTION			Monitor & Report			**COMPLETED**																													
Tuolumne River, La Grange Gravel Addition - Phase II	**$433,000**	**$366,000**				PURCHASE GRAVEL			Gravel Addition (1 of 2)					Monitoring Report		Gravel Addition (Delayed by high flows)				Gravel Addition (Delayed by high flows)				Gravel Addition (Delayed by high flows)					Gravel Purchased						Amend Gravel Contract to extend 2010-2012				Gravel Placement Planning & Additions						Planned End of Contract Expenditure		
Merced R. Salmon Habitat - Expanded Western Stone Sites	**$971,000**	**$199,000**			Surveys, Preliminary D&E >>>>>				Landowner Coordination Process >>>>>			Conceptual Design Options																																				
Upper Western Stones-Design Scenarios	**$160,000**	**$213,000**													Funding Proposals >>			Develop and Finalize Design Options >>>																		Design Selection and Funding Proposals			CEQA/NEPA and Permitting				Construction >>>				
Upper Robinson Conservation Easement	**$313,000**	**$24,000**																									Project Funding Proposal to WCB		COMPLETED - WCB purchased easement w/out 4 Pumps funding - Remaining funds will be allocated to another SJ project			**COMPLETED**																			
Merced River Wing Deflector Gravel Replenishment	**$35,000**	**$35,000**		PURCHASE & PLACE (#1)			PURCHASE & PLACE (#2) (Delayed)			PURCHASE & PLACE (#2) (Delayed)					PURCHASE & PLACE (#2) (Delayed due to high flows)				PURCHASE & PLACE (#2) (Delayed due to high flows)				PURCHASE & PLACE (#2) (Delayed)					PURCHASE (Delayed)			Gravel Purchased		**COMPLETED**																	
Suisun Marsh Fish Screen O&M (SRCD Total)	**$100,000**	**$89,295**													Project Approved								Operation and Maintenence of Fish Screens							**COMPLETED**																	

Amendment 2 → **Amendment 3** → **DRAFT Amendment 4** →

DELTA FISH AGREEMENT SAN JOAQUIN SYSTEM PROJECTS MAINTENANCE PLAN

A PROJECT PROPOSAL FOR THE DELTA PUMPING PLANT FISH PROTECTION AGREEMENT (DELTA FISH AGREEMENT) COMMITTEE

By

California Department of Water Resources

California Department of Fish and Game

August 17, 2009

1 Project Synopsis

This proposal outlines the actions and cost necessary to provide Delta Pumping Plant Fish Protection Agreement (Delta Fish Agreement, DFA and previously known as Four Pumps Program) Annual Funding to extended the project life for nine existing priority salmon habitat projects previously constructed on the San Joaquin river systems. The engineered life for all these projects has ended and maintenance is necessary to continue the restoration action into the future. The project sites were critically evaluated by a team of restoration professionals in 2004 (DFG, 2004) and found to have favorable salmon benefits. The evaluation team recommended that these specific projects be continued with modifications. Modification and continued maintenance of these projects will insure the selected projects continue to provide maximum benefits to the struggling San Joaquin Chinook salmon populations within their respective watersheds. In addition to salmon habitat, where possible, project modifications will include construction of habitat elements intended to benefit steelhead trout which are known to be present within those river systems. The total estimated cost to reconstruct seven of the nine projects for a ten year project life is $1,662,000 and the projected cost to maintain and monitor all nine projects is estimated to be $1,643,900 for a total cost of $3,305,900 throughout the extended life of the projects. Based on past spawning use which has occurred at the project sites, the credit expectation for these projects should be approximately 404,690 San Joaquin salmon smolt equivalents. Although the cost-benefit is $8.17/smolt, it is necessary to understand that the calculation is based on historic spawning use data observed at the sites. The actual spawning use observed at these sites over the engineered life of the project amounted to approximately 32% of the original calculated estimate of use when the project was first constructed.

2 Background

The Delta Pumping Plant Fish Protection Agreement (Delta Fish Agreement, DFA) has funded habitat restoration and rehabilitation projects on the San Joaquin River system, including projects on the Merced River, Tuolumne River, and the Stanislaus River. Beginning in 1990, a total of six sites on the Merced River, four on the Tuolumne River, and three on the Stanislaus River have been constructed with funding from DFA.

The projects were undertaken primarily to benefit San Joaquin River fall run Chinook salmon. In the past few years, in recognition of the Endangered Species Act listing of Central Valley steelhead in 1998, the gravel mix used to construct spawning habitat has included gravel sizes that can be used by spawning steelhead, as well as salmon. In June of 2009, the National Marine Fisheries Service published their Biological Opinion on the Long-Term Central Valley Project And State Water Project Operations Criteria And Plan, which places a renewed emphasis on restoration of steelhead in the Central Valley. Because of this, this project will continue to provide for the spawning requirements of steelhead as well as salmon.

The Department of Water Resources and Department of Fish and Game funded all of these projects from the DFA Annual Mitigation Account and received salmon mitigation credits from the projects. During the salmon spawning seasons of 2005 through 2008, all but one of the projects discussed in this proposal had reached their last credited spawning season as a result of the designed 15-year

project life. Without continued DWR/DFG monitoring and maintenance of the project sites, the project would no longer be a credited ongoing mitigation action.

In 2004, a group of restoration professionals participated in two days of field activities to validate and evaluate DFA projects in the San Joaquin Basin (DFG, 2004). The results of the observations and recommendations of the group were published in a report in August, 2004 called the "Delta Pumps Fish Protection Agreement San Joaquin Basin Project Validation and Evaluation" (DFG, 2004). DFA then funded a proposal in 2005 by DFG and DWR to collect data at each site, use it to physically evaluate the sites, and engineer designs for any recommended maintenance actions. During 2005 to 2008, DWR visited each site, collected physical data, and produced engineering and designs for each as recommended. The attached DWR engineering report (DWR, 2009) details each design and reports all monitoring and data collection work that was completed for this effort. The projects will be redesigned to accommodate new habitat objectives which will include the latest restoration knowledge and additional species of concern such as steelhead trout in addition to San Joaquin Chinook salmon.

3 Need for Funding

At the March 10, 2005, the DFA (Four Pumps) Advisory Committee Meeting approved partial funding to allow DFG and DWR to conduct environmental and engineering surveys, develop remodification designs, and facilitate landowner cooperation and access for the following nine existing project sites. Approval of full funding is necessary to move these projects forward with environmental documentation and implementation.

4 Project Description and Benefits

4.1 Goals

The goal of the proposed project is to implement the DWR recommended maintenance actions for each site as detailed in the engineering report (DWR, 2009). Maintenance will ensure that adequate spawning habitat for Chinook salmon and steelhead is maintained in these tributaries as well as continuing credits for sites that DFA has invested significant resources in over the years. Original recommendations as shown in the 2005 proposal follow.

- **Lower Stanislaus River RM 50.9 & 50.4.** *Recommendations:* RM 50.9 and 50.4 both need an infusion of spawning sized gravel as soon as possible and then to be made part of a continuing periodic gravel supplementation program. (RM 47.4 was added later).

- **Tuolumne River – Riffles 3A & 3B (La Grange).** *Recommendations:* This site should be continued as a gravel injection site and linked to the upstream site (Riffle 1B), which the inspection team was not able to visit. Riffle 1B is part of an ongoing upstream gravel maintenance program that is funded by several sources including DFA. The middle riffle (3A) should be reconfigured as a rearing pool to match the geomorphic process which scoured the existing pool. Because there is easy access to the 3A site, this should be used as an injection point for the lower spawning riffle, which seems to be developing quite nicely.

- **Merced River Pond Isolation – Magneson Pond.** *Recommendations:* One suggestion might be to strengthen the berm to improve long term integrity. A more immediate need is the removal of old construction debris and irrigation pipe remaining at the site, and weeding of revegetated areas. Other than the vegetation cleanup, some of the secondary project benefits related to salmon spawning and rearing that formed naturally at the site could be enhanced. Spawning gravel could be added to the top end of the project to improve sediment transport and replenish spawning riffles.

- **Merced River Gravel Phase 1 – Hatchery Site (Riffle 2).** *Recommendations:* The current project gravel supplementation/maintenance program should be continued and copied at other mitigation sites.

- **Merced River Gravel Phase II - Braden Farms (Riffles #10 & 11).** *Recommendations:* DFA should rebuild the sites.

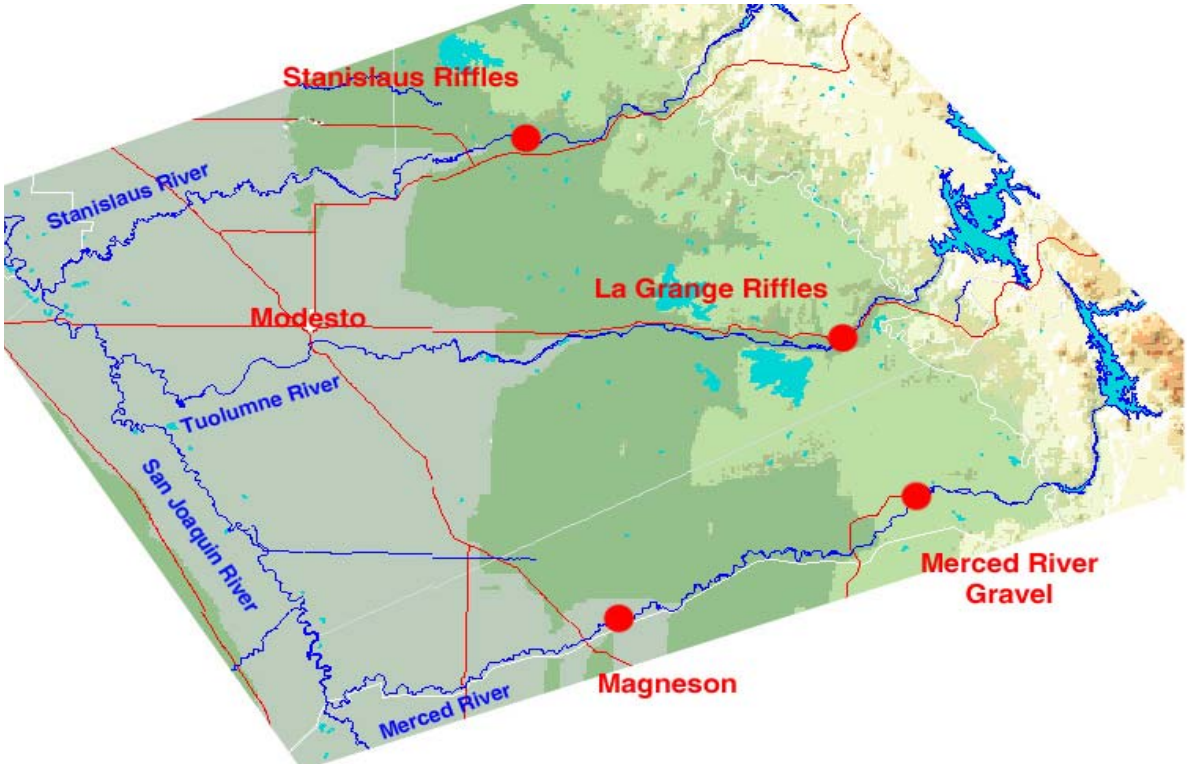


Figure 1 – Locations of DFA Projects Affected by this Proposal

4.2 Summary of Assessment and Proposed Actions

DWR engineers conducted physical surveys, collected monitoring data, and performed sediment transport calculations to identify locations, quantities, and qualities for each of the sites. This information was used to compare the current condition of the sites with the previous designs or as-builts. The assessments allowed engineers to determine if any changes to the original designs were needed, test 2004 recommendations, and come up with recommended designs for implementation.

A summary table of objectives for proposed actions is below, and a brief description of the assessment findings and proposed action for each site follows. More detail for each is presented in the engineering report (DWR, 2009).

Objective	Stanislaus RM 47.4	Stanislaus RM 50.4	Stanislaus RM 50.9	Tuolumne 3A	Tuolumne 3B	Merced Magneson	Merced Braden 2	Merced Braden 3	Merced Hatchery
1	✓	✓	✓	✓		✓	✓	✓	
2	✓	✓	✓			✓	✓	✓	
3	✓	✓	✓	✓		✓	✓	✓	
4				✓			✓	✓	
5							✓	✓	
6				✓				✓	
7	✓	✓	✓			✓	✓	✓	
8	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 1. Objectives of Proposed Actions

Below is a description for each objective:

1. Create suitable velocities, depths and substrate conditions,
2. Mobilize newly placed gravel at or near bankfull flow,
3. Create and enhance river diversity,
4. Create gravel storage for sediment transport during flow events exceeding bankfull,
5. Protect backwater area,
6. Create a riffle-pool complex,
7. Add spawning gravel to increase the quality and quantity of spawning habitat for fall-run Chinook salmon and Central Valley steelhead trout,
8. Monitor conditions at each site and recommend maintenance if needed

4.2.1 Lower Stanislaus Riffles

These sites originally included Riffles 50.4 and 50.9, but riffle 47.4 was later added by DFG. Each of these was originally constructed in 1994. DWR staff conducted topographic surveys, cross-section surveys, and gravel sampling in 2005 and used the data to assess current conditions and recommended actions for each site. Resulting recommendations are below.

4.2.1.1 Riffle 47.4

The proposed design will have similar design criteria as the original. However, in the proposed design, no new rock structures or drop structures will be installed. Approximately 1,500 tons of clean graded spawning gravel will be added at a gradual slope of 0.2% from the top edge of the existing rock structure to approximately 300 ft upstream. This will improve

salmon spawning habitat and allow gravel mobility at much more frequent flows. Specific recommended actions include:

- Add fresh spawning gravel to this site,
- Continue monitoring and maintenance for 10 years

These actions follow the primary 2004 recommendations listed in Section 2.1 for the Stanislaus riffles. Adding gravel to the riffle as recommended will restore the spawning habitat originally constructed in 1994 with gravel that is appropriately sized for both Chinook salmon and steelhead trout. This is needed because historically high flows in 1997 scoured much of the spawning gravel from the site. DFG has established access for this site with the adjacent landowners and we anticipate it will not be a problem for this project.

4.2.1.2 Riffle 50.4

Restoring the riffle site to a condition similar to the originally constructed characteristics will take approximately 1,050 tons of spawning gravel. The riffle is designed to slope downstream at 0.26%, and has a length of 239 feet. The confined nature of this part of the river concentrates bed shear in the channel, allowing larger gravels to move at moderate flows. This fact has led to winnowing of smaller gravels, leaving very large gravel and cobble in the riffle, so that the existing gravel is not only too large for salmonid spawning but is too large to move at flows less than about 4,200cfs. The new gravel is expected to begin to move at 1,100cfs, with significant surface transport at 3,000cfs. Specific recommended actions include:

- Add fresh spawning gravel to this site
- Continue monitoring and maintenance for 10 years

These actions follow the primary 2004 recommendations listed in Section 2.1 for the Stanislaus riffles. The proposed action will not only increase Chinook salmon and steelhead spawning habitat in the reach, but will replenish spawning gravel to an area that is currently gravel starved after scouring by historically high flows in 1997. Access for construction at this site is a significant advantage, with simple access through an adjacent park.

4.2.1.3 Riffle 50.9

From data collected during assessment of this riffle, restoring it to a condition similar to the original construction will require approximately 1,070 tons of spawning gravel. The completed riffle will have a 0.2% slope downstream and be 180 feet long. The greatest need identified at this site is to fill portions of the riffle that have scoured, although much of the riffle appears to currently be functioning well. Specific recommended actions include:

- Add fresh spawning gravel to this site
- Continue monitoring and maintenance for 10 years

These actions follow the primary 2004 recommendations listed in Section 2.1 for the Stanislaus riffles. As with the previous Stanislaus River riffles, this action will increase

salmon and steelhead spawning habitat by restoring the area with appropriately sized spawning gravel. As with Riffle 50.4, access is ideal here because of the adjacent park, which is a significant advantage for this project.

4.2.2 Tuolumne River La Grange Riffles

Each of these was originally constructed in 1994. DWR staff conducted topographic surveys, cross-section surveys, and gravel sampling in 2007 and used the data to assess current conditions and recommended actions for each site. Resulting recommendations are below.

4.2.2.1 Riffle 3A

This riffle was originally constructed as a spawning riffle, but in the high flows of 1997 and in subsequent high flows, gravel in the site was scoured and transported downstream resulting in a deep pool. As was observed in the 2004 report, it appears the gravel has been at least partially transported to Riffle 3B, maintaining that riffle in apparently satisfactory condition. The 2004 recommendations included reclassifying the 3A site as a rearing pool and using it as a gravel augmentation site to feed Riffle 3B.

DWR engineers designed a system of alternating bars for the site that will maintain depths and low velocities at lower flows, but provide a gravel source for transport downstream at high flows. The design avoids altering existing rearing habitat in the form of a backwater channel at the upstream end. Total gravel needed for the bars is approximately 14,450 tons. Specific recommended actions include:

- Add gravel in gravel bars for transport downstream at high flows
- Continue monitoring and maintenance for 10 years

Although this project will require larger quantities of gravel than the others in this proposal, it is important because the project will provide a significant amount of gravel to feed the riffle immediately downstream (Riffle 3B) in higher flows. This will help maintain Riffle 3B over the long term, and reduce the likelihood maintenance in 3B will be required in the future. Maintenance is less likely to be required at this site than at the other sites within the 10 year period because the estimated flow needed to begin transporting significant quantities of material corresponds to a about a 20 year event. Nearby access to a highway through public land is also an advantage for this project.

4.2.2.2 Riffle 3B

The 1997 flooding changed this riffle somewhat, as it did in Riffle 3A, but a riffle remains in this location. The alternate bar morphology that has developed is valuable from a habitat standpoint because it maintains depths in the channel at spawning flow and allows overbank flow at higher flows to reduce shear forces within the channel, maintaining gravel in the riffle. Based on gravel data collection at the site, however, the high flows of 1997 did remove a significant proportion of the smaller gravels, leaving larger gravel that is not mobile at lower flows. With a median surface grain size of 71 to 89mm (2.8 to 3.5 inches), salmonids should still be able to use the riffle to spawn, but it is unclear how successful spawning will be without periodic gravel movement due to bed transport. The current

estimated mobilizing flow in the riffle is 10,000 to 21,000cfs (20 to 40 years), with significant sediment transport requiring even higher flows. Augmenting the Riffle 3A site may help by providing gravel influx at this site at more frequent flows. Specific recommended actions include:

- Continue monitoring for 10 years
- Add gravel to Riffle 3A

Maintenance in the form of gravel augmentation to this site is not currently recommended, although may be deemed necessary based on further monitoring and evaluation over the next 10 years. Any maintenance would be part of a future proposal. Monitoring will be crucial to efforts to ensure this riffle maintains salmonid habitat value.

4.2.3 Merced River Magneson Site

There were several recommendations in the 2004 document for this site. DWR chose to assess the recommended gravel augmentation site and design an appropriate implementation for it. The existing scour pool appears to be a favorable place to augment with new spawning gravel. The gravel will add spawning habitat as well as provide fresh gravel for transport to riffles throughout the original project site. The augmentation site is more likely to mobilize gravel because it is in a narrow section of channel between a bluff and berm. Gravel mobility is expected to begin at bankfull flows, which occur on average about every 1.6 years. The proposed project will require about 1,150tons of gravel to create about 300ft of riffle. Specific recommended actions include:

- Add fresh spawning gravel to this site
- Continue monitoring and maintenance for 10 years

Adding gravel to the proposed site will add value by creating salmon and steelhead spawning habitat, as well as providing gravel for transport through lower riffles within Magneson Site at higher flows, maintaining those riffles as viable habitat. Access is an advantage to this project because DWR and DFG have had a long standing relationship with the landowners who have been sympathetic to restoration efforts.

4.2.4 Merced River Gravel Phase 1 – Hatchery

The 2004 recommendation that the current maintenance plan be continued will be addressed by continuing a plan similar to the other riffle sites. In addition, the December 2004 DWR report titled “Merced River Gravel Augmentation Project Monitoring Report” recommended a more complete monitoring plan to go with the existing augmentation program to improve efficiency of the program. The monitoring plan proposed here will fulfill that recommendation.

There is no immediate need to add gravel to the site under this proposal, but we anticipate future augmentations will be required within the 10 year project life based on results of past monitoring. Specific recommended actions include:

- Continue monitoring and maintenance for 10 years

This is a very valuable historic spawning site that is located at the Merced River migration terminus for anadromous salmon and steelhead. Monitoring and periodic maintenance will maintain this important spawning site for the project life.

4.2.5 Merced River Gravel Phase 2 – Braden Farms Sites

These sites consisted of individual riffles that were constructed in 1991. DWR staff conducted topographic surveys, cross-section surveys, and gravel sampling in 2007 and used the data to assess current conditions and recommended actions for each site. Resulting recommendations are below.

4.2.5.1 Riffle 10

The 2004 recommendations essentially were that this site should be rebuilt and/or improved. DWR performed physical evaluations of the terrain and gravel quality to determine how the riffle had changed over the years and how it would be expected to behave under various conditions. The results of the data collection and analysis are that although there is a significant amount of bedrock throughout the site, the overall volume of gravel has not changed much since original construction. In addition, gravel sizes appear to be slightly smaller than what was originally put in place. These results are explained by the fact that the channel is relatively wide and has a low slope in this reach, which tends to reduce gravel mobility. This was confirmed with sediment transport analysis, which showed the gravel is likely to begin moving at between 8,000 and 14,000cfs under current conditions.

In this case, rebuilding the riffle to the original 1991 specifications was not recommended because sediment transport conditions would continue to be inadequate. DWR proposes a modified design that would narrow the low flow channel by adding gravel bars, and would increase the slope of the riffle through the length of the reach. These measures will ensure adequate spawning depth and velocities over the riffle through the addition of about 2,500 tons of new gravel, as well as increase mobility of the gravel above bankfull flows. Specific recommended actions include:

- Add fresh spawning gravel to site, and add bars to improve gravel mobility and spawning habitat
- Continue monitoring and maintenance for 10 years

The proposed work to this riffle would add salmon and steelhead spawning habitat through the addition of appropriately sized gravel in a configuration that improves gravel mobility, spawning velocities, and depths. Access is conveniently near a public road, although a gravel ramp will be necessary to get equipment and materials to the channel bottom.

4.2.5.2 Riffle 11

As with Riffle 10, the 2004 recommendations essentially were that this site should be rebuilt and/or improved. DWR performed physical evaluations of the terrain and gravel quality to determine how the riffle had changed over the years and how it would be expected to behave under various conditions. The results of the data collection and analysis are that the site has

changed significantly since original construction, probably due to very high flows in 1997. The reach transformed from a riffle into a riffle/pool complex, and significant amounts of bank material were scoured and transported downstream in high-flows. In addition, remaining gravel appears to be significantly larger than what was originally put in place. These changes are probably due to the reach being on a bend in the river and having high banks that confine high flows to a narrow width. The sediment transport analysis showed the remaining surface gravel is unlikely to begin moving until flows exceed 12,000cfs (100yr).

In this case, rebuilding the riffle to the original 1991 specifications is not recommended by DWR because the river would likely revert to the riffle/pool complex during the next high flow. DWR proposes a modified design that would add gravel, narrowing the channel to increase gravel mobility at lower flows, but maintain a riffle/pool complex similar to what currently exists. These measures will increase potential spawning habitat area, bring spawning size gravels to the riffle, and ensure adequate spawning depth and velocities over the riffle through the addition of about 7,800 tons of new gravel. Specific recommended actions include:

- Add fresh spawning gravel to site in a riffle/pool configuration,
- Continue monitoring and maintenance for 10 years

Rebuilding this site would reestablish spawning habitat that has been severely degraded by high flows. Current gravel sizes on the surface have median sizes of 74 to 105mm (3.0 to 4.3in), which are too large for steelhead spawning, and the current width of the channel does not allow mobilization below about 12,000cfs. The site has favorable access through public land, which is an advantage for the site.

5 Project Cost Estimates and Timeline

5.1 Cost Estimation

Cost estimates consist of three main parts: construction, monitoring, and maintenance. For construction cost estimation, the "Labor Surcharge and Equipment Rental Rates, Effective August 1, 2008 through March 31, 2009" published by the California Department of Transportation were used to estimate the equipment costs, and general prevailing wages published by the California Department of Industrial Relations were used to estimate the labor costs.

The construction management portion of the construction estimate assumes DFG will conduct material purchasing duties and contract construction of the projects in-house through existing funding. If the DWR Division of Engineering is assigned the tasks of bid specification, advertising and awarding of contracts, and construction contract oversight, it will add approximately an additional 25 to 40% to the construction costs if each site were treated as its own project. By combining the sites into one larger project, the administrative costs per site may be less.

Monitoring cost estimation is based on three visits to each site within the 10 year project life. Each visit will include pebble counts and cross section surveys at monitoring sections, bulk samples of the channel gravel, and topography surveys of the riffles. These monitoring activities will allow

engineers to assess any changes occurring at the sites and inform managers to the timing and magnitude of future maintenance actions. Monitoring data will be reported in a memorandum each year monitoring work occurs, with a final report at the end of the 10 year project life.

Maintenance estimates have been based on sediment transport calculations for the project sites as designed. DWR made several assumptions in coming up with these estimates, including relative representation of monitoring sections to riffle gravel volumes, and assignment of critical dimensionless shear values in mobility calculations. Another important assumption made was that most of the maintenance costs would be equivalent to current construction cost estimates (with 2.68% inflation per year applied), but reduced by the relative volume of material being placed. More detail regarding these estimates can be found in the engineering report (DWR, 2009).

Total costs for each project are shown in Table 2.

	Construction (w/o DOE)	Monitoring (3 visits)	Maintenance (10 yrs)	Total
Stanislaus RM 47.4	$128,000	$74,600	$42,000	**$244,600**
Stanislaus RM 50.4	$103,000	$74,600	$91,000	**$268,600**
Stanislaus RM 50.9	$104,000	$74,600	$43,000	**$221,600**
Tuolumne Riffle 3A	$608,000	$81,000	$127,000	**$816,000**
Tuolumne Riffle 3B	$0	$76,600	$0	**$76,600**
Merced Magneson	$109,000	$176,000	$51,000	**$336,000**
Merced Hatchery	$0	$74,600	$353,000	**$427,600**
Merced Braden Site 2	$182,000	$78,700	$48,000	**$308,700**
Merced Braden Site 3	$428,000	$83,200	$95,000	**$606,200**
				$3,305,900

Table 2. Summary of Estimated Costs

5.2 Cost of the Project in Relation to Expected Benefits

The nine projects identified for reconstruction and ongoing maintenance, as well as one that is identified for monitoring only, are all previously constructed habitat enhancement actions that have been identified by restoration professionals as successful habitat actions that benefit the San Joaquin Chinook salmon populations (DFG, 2004). This group of professionals further recommended that the sites be continued into the future with modifications which would provide additional benefits for steelhead trout. Based on the past fifteen or more years of DFG redd count surveys, the nine project sites produce a total of approximately 168 redds annually. This redd production yields an average of 40,469 San Joaquin Chinook salmon smolt equivalent credits each year. Projecting the past annual credits for the identified projects to the estimated costs to modify and continue the project for another ten years yields the following cost/benefit calculation:

Reconstruct seven project sites = $1,662,000

Monitor & maintain nine project sites = $1,643,900

Estimated project credits over the next 10 yrs = 404,690 salmon smolt equivalents

$1,662,000 (construction) + $1,643,900 = $3,305,900/404,690 => $8.17/smolt

5.3 Schedule

We propose construction of the sites to begin in 2010 and be staged over 3 years. Monitoring and maintenance terms would begin with initial construction. A timeline and corresponding annual costs is presented in Table 3.

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Stanislaus RM 47.4	Contracting	$0	$0												
	Construction		$128												
	Monitoring					$23			$25			$27			
	Maintenance												$42		
Stanislaus RM 50.4	Contracting	$0	$0												
	Construction		$103												
	Monitoring					$23			$25			$27			
	Maintenance							$43					$49		
Stanislaus RM 50.9	Contracting	$0	$0												
	Construction		$104												
	Monitoring					$23			$25			$27			
	Maintenance												$43		
Tuolumne Riffle 3A	Contracting		$0	$0											
	Construction			$608											
	Monitoring						$25			$27			$29		
	Maintenance													$127	
Tuolumne Riffle 3B	Contracting														
	Construction														
	Monitoring						$24			$25			$28		
	Maintenance														
Merced Magneson	Contracting		$0	$0											
	Construction			$109											
	Monitoring						$54			$59			$63		
	Maintenance													$51	
Merced Hatchery	Contracting														
	Construction														
	Monitoring				$23			$25			$27				
	Maintenance					$108			$116			$129			
Merced Braden Site 2	Contracting			$0	$0										
	Construction				$182										
	Monitoring							$24			$26			$28	
	Maintenance														$48
Merced Braden Site 3	Contracting			$0	$0										
	Construction				$428										
	Monitoring							$26			$28			$30	
	Maintenance														$95
	Total	**$0**	**$335**	**$717**	**$633**	**$176**	**$103**	**$117**	**$191**	**$111**	**$81**	**$210**	**$254**	**$236**	**$143**

Table 3. Estimated Expenditures per Calendar Year (in 1,000s)

6 Conclusion and Summary

6.1 Goals

The goal of the proposed project is to perform design modification and maintenance activities for the nine projects identified in the 2004 DFG Report and recommended by DFG for modification and continued maintenance activities. In addition to professional suggestions, all the projects have all

been resurveyed and engineered by DWR to meet the suggested criteria. This adaptive management approach to redesign and maintenance will insure that these previously successful projects will continue providing fish benefits and mitigation credits for an additional ten years of monitored project life. Based on historic use of the sites, these projects are expected to produce approximately 404,690 San Joaquin Chinook salmon smolt equivalents (SSE) at a cost of $8.17/SSE.

6.2 Recomendation

It is the recommendation of the DFG and supported by the DFA staff that the projects identified within this proposal be constructed and maintained as redesigned using funds from the DFA Annual account for the ten year engineered life of the reengineered projects. Therefore, the DFA staff would ask the DFA Advisory Committee to approve and recommend the funding of these projects to the Directors of DFG and DWR.

The ongoing maintenance activities necessary to achieve the desired project goals will include various techniques to determine the developing geomorphic condition of the river course site. These techniques will enable biologists and engineers to monitor and record the condition of the sites as well as determine the location, quantity, and quality of materials to be used in ongoing maintenance activities.

MRSHEP PHASE IV: UPPER WESTERN STONE

A PROJECT PROPOSAL FOR THE 4-PUMPS ADVISORY COMMITTEE

By

California Department of Water Resources

South Central Region

May 13, 2010

1 Background

Phase IV (Upper Western Stone Reach) of the Merced River Salmon Habitat Enhancement Project (MRSHEP) is located on the Merced River from river mile 41.5 to 42, just downstream of the Highway 59 bridge (Figure 1). This reach is characterized by a deep, relatively narrow section of river, much of which is virtually devoid of a floodplain and riparian communities and is adjacent to a gravel mining operation. The total project area is 47.3 acres.

Figure 1. Site Location Map

As a result of various meetings, comments, concerns, and discussions between the MRSHEP Planning Team and landowners, designers produced preliminary project designs in 2006. However, some changes occurred in the reach due to high flows in recent years. The design concept has been revisited and adjusted after field visits to observe the changes and after discussions with Dan Larson (Larson, 2009), Plant Manager at the adjacent gravel operation Calaveras Materials, Incorporated (CMI).

This proposal refers to final designs. Further background of the process, including early conceptual designs and input by agencies, stakeholders and interested parties can be found in the attached engineering report (DWR, 2009), which also provides the assumptions, calculations, and estimates used to create the current designs. The purpose of this proposal is to provide a plan of action, as well as an estimate of cost and a timeline, for the construction of the MRSHEP Upper Western Stone project.

2 Need for Funding

This proposal addresses a significant portion of the final section of the Merced River Salmon Habitat Enhancement Project (MRSHEP). The MRSHEP planning activities begun in 1994, included two major large scale river restoration actions (Ratzlaff and Robinson Projects), and will help link the restoration of approximately 5 miles of the watershed which is important to the Merced River salmon population. The MRSHEP project is one of the largest river restoration actions ever attempted in California and has become a signature DFA project which is often been reviewed and copied by other restoration planning forums.

Because the economy and the availability of funding is always a major consideration when implementing a project, the individual design elements presented within this proposal identify the various construction elements needed to fix this portion of the river. Although all the identified elements are necessary, various stand-alone project element combinations have been presented. In this manner, the project can move forward in time as funding becomes available and the completed portions of the project can be used to leverage and cost-share available funds.

3 Project Elements

Goals

The goal of the proposed project is to implement the DWR recommended design that will improve the reach by creating and improving salmon and steelhead trout habitat, improving sediment transport, eliminating predator habitat, installing a fish screen, and establishing a gravel augmentation site.

The project consists of 7 key elements to improve the reach that would allow us to construct the project individually or in phases if necessary due to budget or other constraints. Figure 2 illustrates these elements and a brief description of each is shown below.

- **Upper End Floodplain and Channel (Elements C1 and C2).** *Issues/Concerns:* Element C1 is the portion of the project that passes under the bridge and downstream approximately 900 feet. The elevated haul road on the right (north) bank encroaches on the river floodway, leading to excess velocities and scour in the main channel. Element C2 is located to the north of Element C1. It consists of high terrace and a large pond that, along with the haul road encroachment, constricts the river's ability to migrate and acts to funnel floodwaters to a narrow portion of channel, causing high velocities.

- **Central Channel and Floodplain (Element C3).** *Issues/Concerns:* Originally, this element consisted of a small gravel pit pond located in the center of the channel. Over the years it has slowly filled with gravel transported downstream by the river, but remained a significant sediment sink and provided predator habitat. By 2007, enough gravel had deposited in the pond to reduce concerns that it would remain an impediment to sediment transport and provide predator habitat, so this element has been removed from recommended action.

- **Lower Channel, Pond (Element C4).** *Issues/Concerns:* This element consists of a gravel pit remnant that forms a pond spanning most of the downstream half of the project. The pond currently causes flow velocities to drop as water moves through it, eliminating bedload transport, and it appears to provide prime predator habitat.

- **Encroachment #3/Constriction (Element C5).** *Issues/Concerns:* The downstream end of the site is characterized by a former road crossing that constricts the channel. The remnant of the crossing on the south side is a steep bluff that was once the approach from that side, while the north side remnant is a long, flat approach that is reinforced by cobble. The remaining channel is relatively deep due to scouring during high flows. An encroachment is adjacent to the constriction, and consists of an abandoned haul road and berms separating the gravel operation storage piles from the river. The constriction causes high velocities at higher flows, scouring the channel of smaller gravel.

- **Screen CMI Pump (Element C6).** *Issues/Concerns:* A pump on the north side of the river toward the downstream end of the project area is used by CMI on occasion to provide water for various uses. CMI has expressed that they want to continue using the pump after the project is built. The overall design of the project is not likely to interfere with the pump's intake; however, there is concern about potential juvenile salmonid mortality because the diversion is unscreened.

- **Spawning Gravel Augmentation (Element C7).** *Issues/Concerns:* Just below the existing split flow immediately downstream of the bridge, an opportunity for gravel augmentation exists in the main channel. Currently, this section is relatively deep and slow-moving at low flows, probably due to scour at high flows caused by a narrow floodway (see Element C1). However, there is a steep drop at this location that would allow for adequate slope for a spawning riffle.

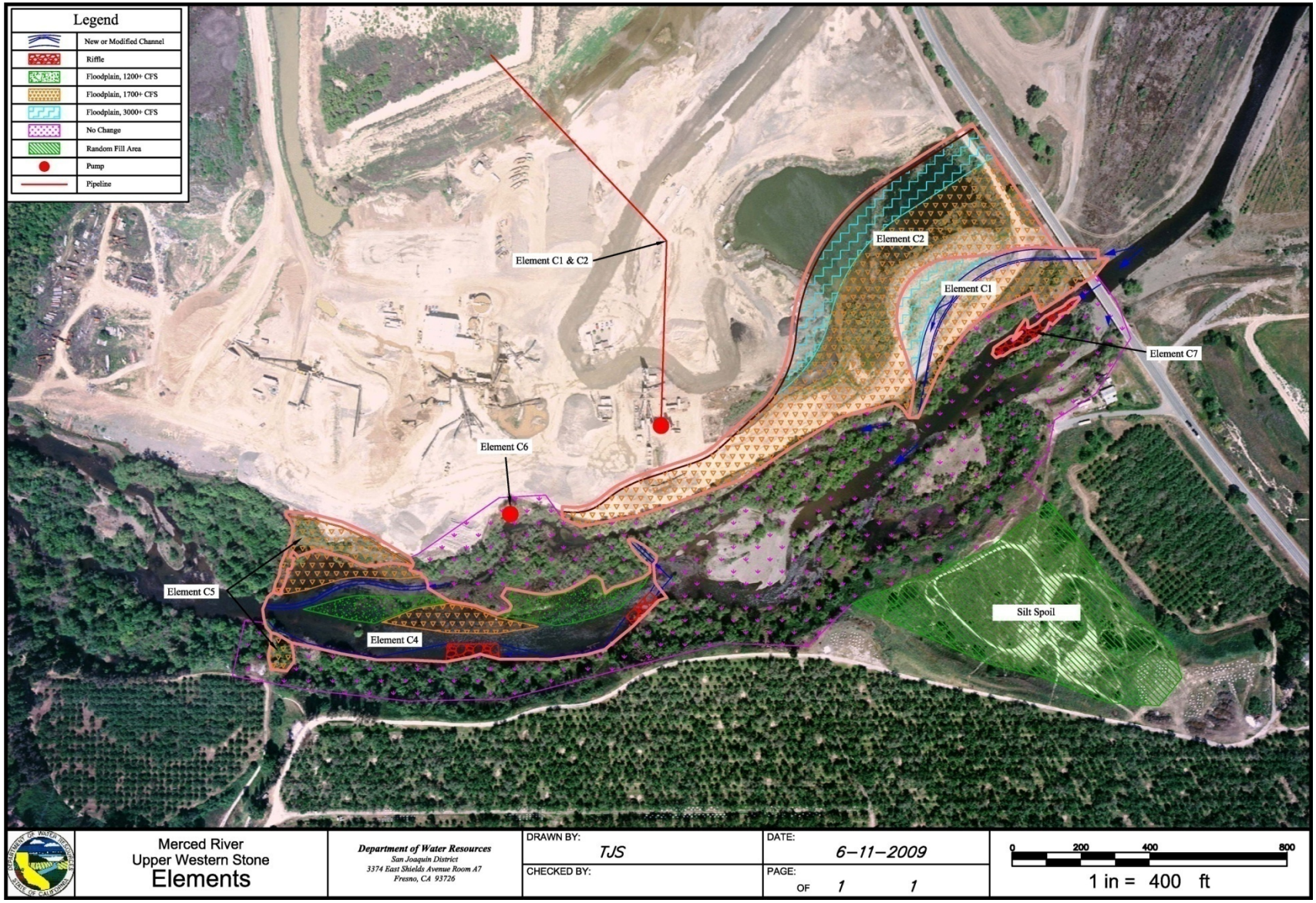


Figure 2. Project Elements on 2006 Aerial Photo

Summary of Assessment and Proposed Actions

After an extensive effort between the District, the Planning Group, and the landowners, DWR engineers have come up with a proposed design for the Upper Western Stone reach on the Merced River (Figure 3). In order to address the issues and concerns previously discussed, this section will briefly describe the assessment findings and proposed action for each element. A summary table of objectives for proposed actions is below, and a more detailed explanation for each is presented in the engineering report (DWR, 2009).

Objective	Element C1 and C2	Element C4	Element C5	Element C6	Element C7
1	✓	✓			
2		✓			✓
3	✓	✓	✓		
4		✓			
5				✓	
6					✓

Table 3-1 Objectives of Proposed Actions

Below is a description for each objective:

1. Create and ensure rearing habitat,
2. Create spawning habitat,
3. Improve sediment transport,
4. Eliminate predator habitat,
5. Reduce potential juvenile salmonid mortality,
6. Create gravel augmentation site.

Upper End Floodplain and Channel (Elements C1 and C2)

Our solution to the issue of high velocities and scour in the channel is to reduce floodplain elevations and fill portions of the existing pond to allow floodplain flow above 1,700cfs. By re-grading these areas, revegetating them as floodplain, and designating them as off-limits to future gravel plant activity, hydraulics, sediment transport, and riparian vegetation would be greatly improved through this portion of the river. We believe improved sediment transport characteristics would also lead to improved salmonid habitat in the reach by allowing smaller gravels to be deposited in the adjacent channel. The new floodplain will contain features such as varying inundation rates and a scour channel to encourage diverse floodplain habitat.

It is necessary to maintain a portion of the pond because according to Dan Larson of CMI, this pond supplies water for the plant and for water trucks (DWR, 2009). The pond is fed by return flow from the siltation basin. A sump will have to be built in order to collect the baghouse fines and mix the fines with water to create a slurry. A 5-hp slurry pump at the bottom of the sump and a 6-inch

diameter pipeline will be used to transport the slurry to a siltation basin north of the asphalt plant. The pipeline will be approximately 1,280 feet long. The current well and water pump at the hot mix plant is undersized, and will need to be replaced. Also, the irrigation well and pump at location #1 may have to be used to maintain the water surface level of the remainder of the eastside pond so that the pond can continue to be used to fill up water trucks.

Central Channel and Floodplain (Element C3)

We do not recommend action to change or improve this element, but instead prefer to allow the river to continue to develop naturally to create spawning and rearing habitat with the help of periodic gravel augmentation upstream (Element C7).

Lower Channel, Pond (Element C4)

In this element the shallow pond encompassing the downstream half of the project site will be partially filled in to create floodplains and also to create an appropriately sized channel that follows the current left bank. Another proposed change is to construct a new channel at the upstream end of the area to route water to the pump mentioned in Element C6. The purpose of creating a new pump channel inlet is to decrease the length of inlet channel and future maintenance needs. Fill would not be placed beyond the banks where vegetation is present. This work should eliminate significant amounts of predator habitat in the reach. In addition, some new spawning habitat would be created. Like Element C1/C2, the floodplain design contains regions of varying inundation rates to encourage habitat diversity.

Encroachment #3/Constriction (Element C5)

The proposed solution to scouring caused by the constriction is to reduce the high points to a proper floodplain elevation, which will help decrease velocities and improve local sediment transport.

Screen CMI Pump (Element C6)

A fish screen will be installed on the pump located on the north side of the river toward the downstream end of the project to reduce juvenile salmonid mortality due to the diversion. The screen would be beneficial regardless of whether or not any of the other elements are constructed.

Spawning Gravel Augmentation (Element C7)

New spawning gravel will be used to fill in the deep pool and will serve to provide a gravel source downstream by being transported at moderate flows. We propose that this element be a long-term augmentation site, with at least 3 gravel infusions within the next 10 to 15 years depending on flows.

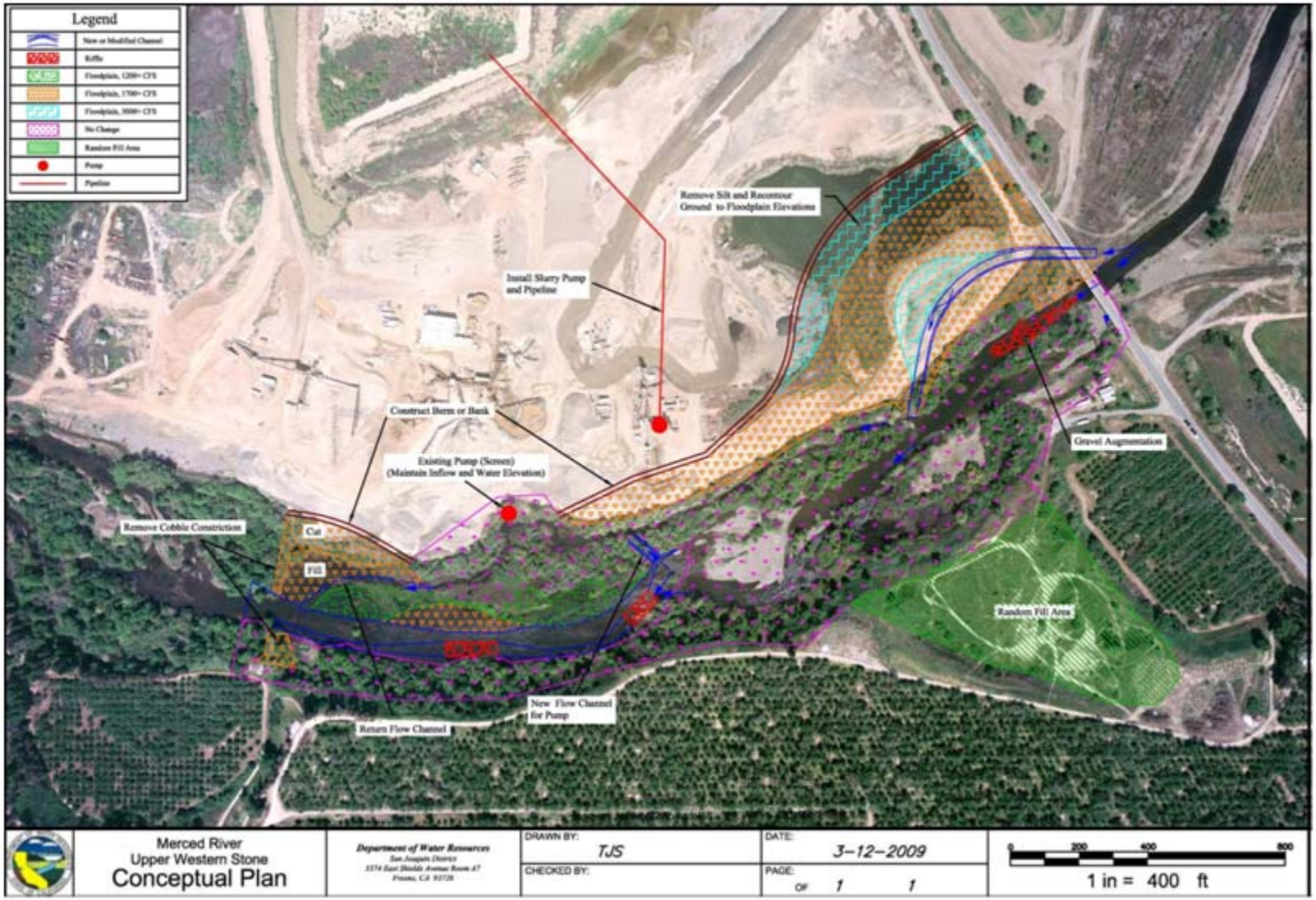


Figure 3. Proposed Conceptual Plan

Benefits

This project is expected to increase the San Joaquin River system's annual salmon smolt contribution to the Delta. Although the actual credits will be determined by what project elements are constructed, for purposes of establishing a habitat cost-benefit value for the proposed project, we will estimate the credit potential for the entire project. The credit estimate uses the Four Pumps San Joaquin Smolt Survival Model which has been used as the basic credit estimator for all past DFA projects. Using this information, DFG staff has calculated an estimate of improved salmon production which assumes an increased smolt survival from improved fish passage, increased spawning success due to improved spawning area, and better quality gravel.

The calculation estimates are itemized below. Assuming basic project maintenance and no significant storm event, our past experience has shown that such a project should remain productive for approximately 15 years. It has been determined that approximately 95,000 salmon smolt equivalents (SSE) would be produced to Mossdale during the 15 year life of the project. Considering the estimated project construction and maintenance cost of $5,960,000, this would yield a **$62.36/smolt SSE**.

3.1.1 50-Year Project Life Expectancy – Predator habitat removal benefit worksheet for a pool-type habitat. Merced River, RM 41.5 through RM 42, Upper Western Stone Reach

Number of Acres Removed	2.1

Bass Per Acre:	
Large Mouth	12.8
Small Mouth	1.7

Project Site Total Estimated Bass Population	
Large Mouth	26.9
Small Mouth	3.6
Total	30.5

Time Period	Predation Rate	Total Bass	Days of Feeding Activity	Estimated Salmon Predation
Jan-Mar	0.00	30.5	60	0.0
April	0.07	30.5	30	63.9
May-June	3.44	30.5	45	4713.7
Total Estimated Salmon Juveniles Consumed Annually				4777.6

Project Smolt Survival Benefit: Adding this predator removal benefit was justified for the Magneson Pond Isolation Project, located between Merced River Miles 29 and 30.	0.02
Smolt Tributary Survival (0.40+0.02):	0.42
Project/Tributary Smolt Survival:	2,007
Smolt Survival from Merced River to Mossdale	0.46
Annual Smolt Survival to Mossdale from all Predator Habitat	923
Total Smolt Survival over 15-year Project Life Expectancy	46,152

3.1.2 15-year Project Life Expectancy – Potential number of redds from spawning habitat restoration based on water year type. Merced River, RM 41.5 through RM 42.0, Phase IV, Upper Western Stone Reach.

Water Year Type	Frequency	Percent
Critical	8	13.1
Dry	12	19.7
Below Normal	10	16.4
Above Normal	8	13.1
Wet	23	37.7

Table 3-2 Water Year Frequency from 1930 to 1990

Equation 1: Estimated number of redds over the project life based on frequency of water year type

$$R_{\max} = \frac{SQ \times U}{R_a} = \frac{2113 \times 0.1}{7} = 30$$

Where:

- SQ = Area of spawning habitat in square yards (2,113 yds^2)
- R_a = Redd area in square yards (7 yds^2)
- U = Actual use factor, 0.1 for "non-stabilized" project
- R_{max} = Number of maximum potential redds (30 redds)

Maximum Redds Available annually from 15-year spawning habitat = 30

Equation 2: The estimated number of redds over the life of the project

$$PR = R_{\max} \times W_y \times F \times P$$

Where:

- W_y = Proportion of maximum potential redds based on water year type
- F = Water year frequency factor
- P = Project life in years
- PR = Number of redds over life of the project

Water Year	Wy	F	P	Rmax	PR
Critical	0.00	0.131	15	30	0.00
Dry	0.25	0.197	15	30	22.16
Below Normal	0.50	0.164	15	30	36.90
Above Normal	0.75	0.131	15	30	44.21
Wet	1.00	0.377	15	30	169.65
Total Redds over Life of Project (15-years)					272.93
Estimated Average Annual Number of Redds					5.46

Table 3-3: Number of Redds Over Life of Project

3.1.3 15-Year Project Life Expectancy – Merced River, Upper Western Stone Reach Chinook Salmon Spawning and Rearing Habitat Smolt Benefit Worksheet

1	Gravel area in square yards	2,113
2	Annual potential number of redds	18.2
3	Eggs per female (per redd)	5,000
4	Egg to smolt survival	

Developmental Stage	Survival Factor	Number Surviving
a. Annual egg production: redds x eggs per redd		91,000
b. Egg to fry in-river survival:	0.41	37,310
c. Fry to smolt survival:	0.48	17,909
d. Smolt tributary survival:	0.40	7,164
e. Smolt survival from Merced to Mossdale:	0.46	3,295

5	Estimated project life in years:	15	
6	Estimated salmon smolt equivalents (SSE) over the 15-year project life (3,295 smolt x 15 years)	49,428	
7	DFA Project Cost (Annual Mitigation Account)	$5,960,000	*

Total Estimated Project Credits for 15-Year Project Life Expectancy:	
Predator Habitat Removal	46,152
Spawning Habitat Improvement	49,428
Estimated Potential Smolt Credits	95,580
Total $/Credit:	$62.36

* - Project cost after Lump Sum expenditures for Option #6 below

4 Material Volume, Cost, and Timeline Estimates

Volume Estimation

Engineering modeling software was used to create current condition surfaces, over-excavation surfaces, and final design surfaces. Silt excavation, pit-run import, and gravel import quantities were calculated by comparing these surfaces and estimating additional changes to the topography since 2003 surveys. The tables below summarize the various quantities.

Element C1 & C2		
Total Silt Excavation	151,600	cu.yd.
Total Silt Fill	2,200	cu.yd.
Total Silt Export	149,500	cu.yd.
Usable Cut	17,800	cu.yd.
Fill Needed	45,700	cu.yd.
Total Fill Import	27,900	cu.yd.

Table 4-1 Quantities for Elements C1 & C2

Element C4		
Cut	1,300	cu.yd.
Fill	29,000	cu.yd.
Total Fill Import	27,800	cu.yd.
Spawning Gravel Import	6,200	cu.yd.

Table 4-2 Quantities for Element C4

Element C5		
Cut - North Side	3,800	cu.yd.
Cut - South Side	900	cu.yd.

Table 4-3 Quantities for Element C5

Element C7		
Spawning Gravel Import	300	cu.yd.

Table 4-4 Quantities for Element C7

Cost Estimation

Cost estimates consist of six primary parts: construction, DWR project management, permits and pre-construction surveys, easement purchase, monitoring, and maintenance.

Construction

For the construction cost estimate the equipment rental rates from CalTrans (CalTrans, 2009), and labor rates from DIR (DIR, 2009) were used for equipment and labor. Materials purchases are estimated based on pricing for those materials in today's market.

Construction management and permitting

We assumed DWR would oversee construction management for the project. Later on in this proposal, we will discuss the advantage of combining the elements in order to decrease the construction management costs. We also assumed DFG would oversee obtaining all necessary permits including the DFG 1600 agreement, the proper permissions from Central Valley Flood Protection Board, and a USACE Section 404 permit. DWR would oversee pre-construction surveys and monitoring.

Easements

We assumed land values to be $8,500 per acre. This is a reasonable estimate based on previous easement purchase costs in the area and considering land value increases in recent years. It would include all agency labor costs, real estate costs, and purchase of any in-situ material within the easement boundaries. During the easements purchase, any necessary water rights will be negotiated to allow us to provide irrigation water for the revegetation portion of the project.

Monitoring

Assuming a typical project life span for this project to be fifteen years, geomorphic monitoring visits would happen once every four to five years, for a maximum of four visits. For the gravel augmentation site, visits will happen once every other year on average. The site will also be visited after a significant event. Each visit will include pebble counts, bulk samples, and cross-section surveys. The monitoring will allow us to assess any changes occurring and inform managers to the timing and magnitude of future maintenance actions. Monitoring data will be reported in a memorandum for each visit. A final report will be written after the last visit.

Maintenance

The crest of the berm is three feet higher than the 8,000cfs water surface elevation. This is equivalent to about a 23,000cfs event. While the berm is very unlikely to be overtopped, it may need some maintenance repairs if there are sustained high flows. We assumed that over its 15 year life, 20% of the berm will have to be replaced.

Based on a sediment transport analysis of the riffle site and the hydrology of the reach, we estimated approximately 50% of the augmentation site will need to be replenished every 4 years on average. We anticipate that every four years, 130 cubic yards of spawning gravel would be required to replenish the augmentation site.

Over time the irrigation equipment will need maintenance, or in some cases, the drip line will need to be replaced. It is common for the equipment to become plugged with sediment, chewed on by rodents, damaged during high flows, or vandalized.

The fish screen will need to be cleaned, inspected and maintained once a year. Rubbish will clog the screen over time and will have to be brushed off. The screen, seals, and brushes will have to be inspected, and if necessary repaired or replaced.

Element Estimates

The following tables show the summary of cost estimates for each element and for the entire project if each element were constructed independently. Please note that Elements C1 and C2 are now combined. We decided to combine them because element C1 is no longer the main channel, but part of the 1,700cfs and 3,000cfs floodplains. Another assumption made in the first cost estimate is that a conservation easement for the entire project site would be purchased rather than just the portion that the two elements comprise.

Item	Amount
Construction	$2,343,000
DWR Project Management	$402,000
Permits & Pre-Construction Survey	$377,000
Easement Purchase	$454,000
Monitoring (4 Visits)	$168,000
Maintenance	$1,019,000
Total	$4,763,000

Table 4-5 Cost Estimate for Elements C1 & C2

Item	Amount
Construction	$888,000
DWR Project Management	$223,000
Permits & Pre-Construction Survey	$349,000
Easement Purchase	$92,000
Monitoring (Four Visits)	$179,000
Maintenance	$12,000
Total	$1,743,000

Table 4-6 Cost Estimate for Element C4

Item	Amount
Construction	$150,000
DWR Project Management	$152,000
Permits & Pre-Construction Survey	$341,000
Easement Purchase	$64,000
Monitoring (Total of four visits)	$81,000
Maintenance	$11,000
Total	$799,000

Table 4-7 Cost Estimate for Element C5

Item	Amount
Construction	$981,000
DWR Project Management	$246,000
Permits & Pre-Construction Survey	$356,000
Easement Purchase	$103,000
Monitoring (Total of four visits)	$189,000
Maintenance	$68,000
Total	$1,943,000

Table 4-8 Cost Estimate for Elements C4, C5, & C6

It appears that building C4, C5, and C6 at the same time (Table 4-8**Error! Reference source not found.**) costs nearly the same as building Element C4 by itself (Table 4-6). One of the advantages of building them together is that some of the expenses are absorbed under project management, such as costs for preparing plans and specs, bidding, and advertising. Another reason for lower cost would be that the cut from C5 can be used to build C4, so less pit-run material needs to be imported. This is assuming that pit-run material can be purchased from a nearby vendor. However, cost for delivery will change if the selected vendor is farther away from the project site. Therefore, the costs for producing the material and delivery can significantly increase the cost of the project.

Item	**Amount**
Construction	$66,000
DWR Project Management	$166,000
Permits & Pre-Construction Survey	$342,000
Maintenance (15yrs)	$52,000
Total	$626,000

Table 4-9 Cost Estimate for Element C6

Item	Amount
Construction	$15,000
DWR Project Management	$123,000
Permits & Pre-Construction Survey	$341,000
Monitoring (Total of eight visits)	$170,000
Maintenance	$631,000
Total	$1,280,000

Table 4-10 Cost Estimate for Element C7

Item	Cost
C1 & C2	$4,763,000
C4	$1,743,000
C5	$799,000
C6	$626,000
C7	$1,280,000
All Elements build individually	$9,211,000

Table 4-11 Summary of Cost Estimate for Each Element Done Independently

Item	Amount
Construction	$3,265,000
DWR Project Management	$461,000
Permits & Pre-Construction Survey	$391,000
Easement Purchase	$454,000
Monitoring (Total of eight visits)	$418,000
Maintenance	$1,551,000
Total	$6,540,000

Table 4-12 Cost Estimate for all Elements Combined Into One Project

By comparing Table 4-11 and Table 4-12, it can be seen that approximately $2,671,000 can be saved by combining all the elements together into one project. Most of the savings comes from four places: 1) using cut from one element as fill for another, 2) utilizing foreman and inspectors by having them oversee several elements simultaneously, 3) applying for one permit that applies to all elements, as opposed to one permit for each element, 4) developing one set of plans and

specifications that applies to all elements, as opposed to developing separate plans and specifications for each element.

The tables below show some options for implementing project elements if total funding is limited to $772,000 (limited solely to funding from Lump Sum acct). In some cases, easement purchases, monitoring, and maintenance were deferred in the options with the assumption those portions would be funded by other sources. We recommend Option #6 if only $772,000 is available.

Option #1	Cost
Permits and Preconstruction Surveys	$377,000
DWR Project Management	$216,000
Construction C1 Only	$484,000
Total	$1,077,000

Table 4-13 $772k Option #1, Construct Element C1 Only, Does Not Included Easement Purchase, Monitoring or Maintenance

Option #2	Cost
Permits & Pre-Construction Survey	$342,000
DWR Project Management	$205,000
Construction Only (C6)	$66,000
Construction (C7)	$15,000
Total	$628,000

Table 4-14 $772k Option #2, Construct Elements C6 & C7 Only, Does Not Include Easement Purchase, Monitoring, Or Maintenance

Option #3	Cost
Permits & Pre-Construction Survey	$342,000
DWR Project Management	$166,000
Construction Only (C6)	$66,000
Establish New Well for CMI	$23,000
Establish Sump, Pump, and Pipeline	$35,000
Total	$632,000

Table 4-15 $772k Option #3, Construct Element C6, Establish New Well for CMI, Construct Sump, Pump, and Pipeline, Does Not Include Maintenance

Option #4	Cost
Permits & Pre-Construction Survey	$342,000
DWR Project Management	$151,000
Construction (C5)	$150,000
Easement (C5)	$64,000
Monitoring (C5)	$81,000
Maintenance (C5)	$11,000
Total	$799,000

Table 4-16 $772k Option #4, Purchase Easement, Construct, Monitor, and Maintain Element C5

Option #5	Cost
Permits & Pre-Construction Survey	$342,000
DWR Project Management	$205,000
Construction (C5)	$150,000
Construction Only (C6)	$66,000
Total	$763,000

Table 4-17 $772k Option #5, Construct Elements C5 & C6 Only, Does Not Include Easement Purchase, Monitoring, or Maintenance

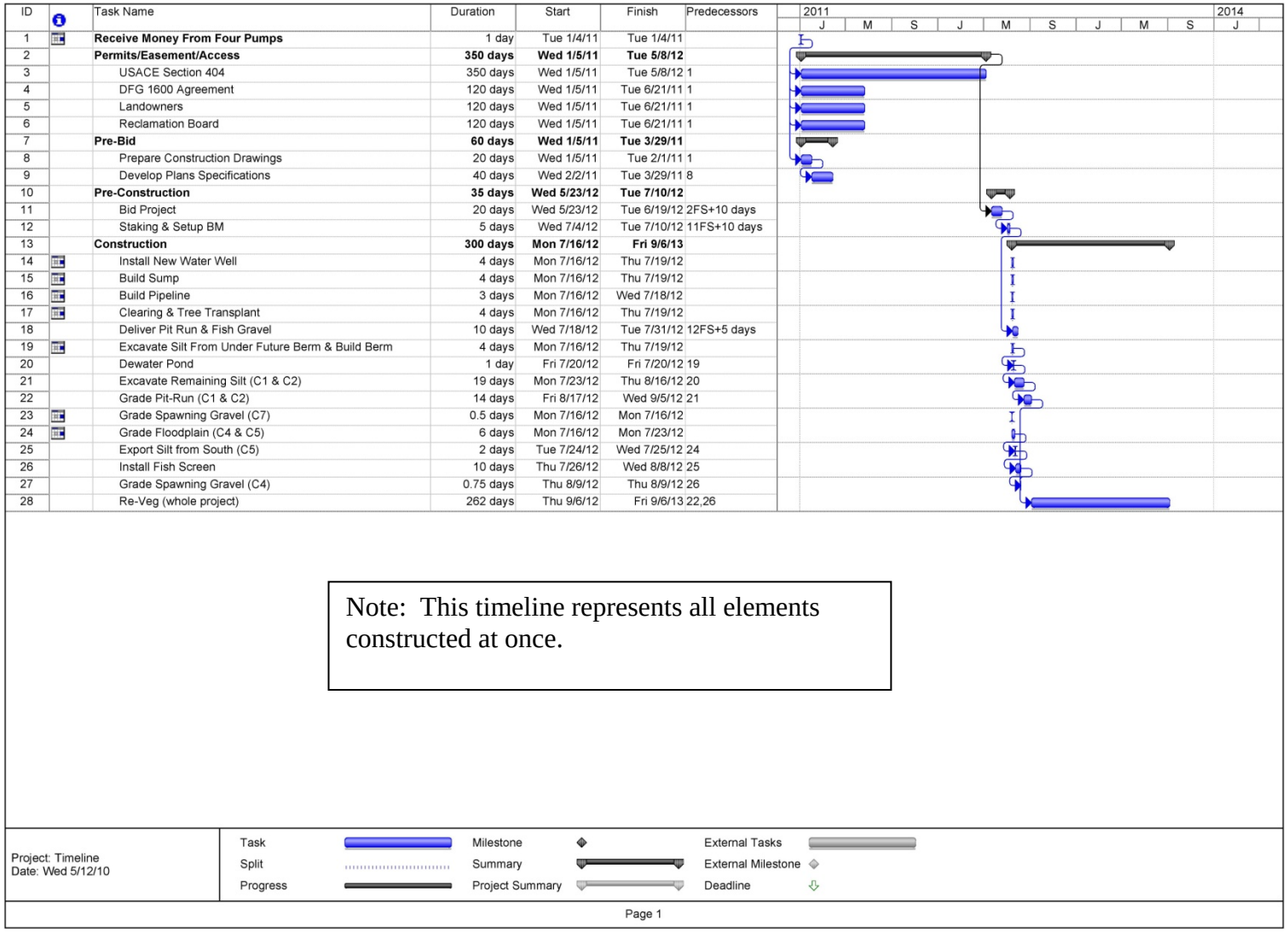
Option #6	Cost
Environmental Surveys & PEIS/PEIR	$129,000
Easement Purchase	$454,000
Total	$583,000

Table 4-18 $772k Option #6, Environmental Surveys, PEIS/PEIR, Purchase All Easements, Does Not Include Permitting, or Pre-construction Surveys

Schedule

We assumed that obtaining the proper permits would require at least one year based on our experience with current river projects. Once the permits are obtained and the contract has been awarded, construction could begin as early as July 15th of 2012. July 15th is considered the end of the flood season. All channel work needs to be done by September 30th. September 30th is the beginning of spawning season for fall run Chinook salmon. According to our schedule, which assumes all project elements would be constructed together, construction could be completed by

September 2012 with the exception of the revegetation which may take an additional year to complete. However, if each element was constructed individually, each could likely be done more quickly, but it would take multiple years to construct multiple elements separately.



ID	Task Name	Duration	Start	Finish	Predecessors
1	**Receive Money From Four Pumps**	1 day	Tue 1/4/11	Tue 1/4/11	
2	**Permits/Easement/Access**	**350 days**	**Wed 1/5/11**	**Tue 5/8/12**	
3	USACE Section 404	350 days	Wed 1/5/11	Tue 5/8/12	1
4	DFG 1600 Agreement	120 days	Wed 1/5/11	Tue 6/21/11	1
5	Landowners	120 days	Wed 1/5/11	Tue 6/21/11	1
6	Reclamation Board	120 days	Wed 1/5/11	Tue 6/21/11	1
7	**Pre-Bid**	**60 days**	**Wed 1/5/11**	**Tue 3/29/11**	
8	Prepare Construction Drawings	20 days	Wed 1/5/11	Tue 2/1/11	1
9	Develop Plans Specifications	40 days	Wed 2/2/11	Tue 3/29/11	8
10	**Pre-Construction**	**35 days**	**Wed 5/23/12**	**Tue 7/10/12**	
11	Bid Project	20 days	Wed 5/23/12	Tue 6/19/12	2FS+10 days
12	Staking & Setup BM	5 days	Wed 7/4/12	Tue 7/10/12	11FS+10 days
13	**Construction**	**300 days**	**Mon 7/16/12**	**Fri 9/6/13**	
14	Install New Water Well	4 days	Mon 7/16/12	Thu 7/19/12	
15	Build Sump	4 days	Mon 7/16/12	Thu 7/19/12	
16	Build Pipeline	3 days	Mon 7/16/12	Wed 7/18/12	
17	Clearing & Tree Transplant	4 days	Mon 7/16/12	Thu 7/19/12	
18	Deliver Pit Run & Fish Gravel	10 days	Wed 7/18/12	Tue 7/31/12	12FS+5 days
19	Excavate Silt From Under Future Berm & Build Berm	4 days	Mon 7/16/12	Thu 7/19/12	
20	Dewater Pond	1 day	Fri 7/20/12	Fri 7/20/12	19
21	Excavate Remaining Silt (C1 & C2)	19 days	Mon 7/23/12	Thu 8/16/12	20
22	Grade Pit-Run (C1 & C2)	14 days	Fri 8/17/12	Wed 9/5/12	21
23	Grade Spawning Gravel (C7)	0.5 days	Mon 7/16/12	Mon 7/16/12	
24	Grade Floodplain (C4 & C5)	6 days	Mon 7/16/12	Mon 7/23/12	
25	Export Silt from South (C5)	2 days	Tue 7/24/12	Wed 7/25/12	24
26	Install Fish Screen	10 days	Thu 7/26/12	Wed 8/8/12	25
27	Grade Spawning Gravel (C4)	0.75 days	Thu 8/9/12	Thu 8/9/12	26
28	Re-Veg (whole project)	262 days	Thu 9/6/12	Fri 9/6/13	22,26

Figure 4. Project Timeline After Committee Approval

Below is a table showing how much it will cost each calendar year to monitor and maintain the different elements. Each element assumes a yearly inflation rate of 4.06%. For the maintenance of element C7, we assumed that when we get environmental permits to construct the project, the permits will allow us to do gravel augmentation for ten years without having to renew the permits until 2022 (assuming a 2012 construction). So in year 2022 a $472,000 cost is associated with renewing all the environmental permits.

We estimated it would cost $536,000 in 2012 dollars to rebuild 20% of the berm. Since we do not know when or to what extent the berm will experience damage, it would be conservative for us to have the rebuild money, in 2027 dollars, available just after its original construction is complete. Assuming a 4.06% inflation rate, $536,000 in 2012 is equivalent to $975,000 in 2027. If the berm is rebuilt in 2022, approximately $472,000 can be saved from combining the environmental permitting costs from the gravel augmentation with rebuilding the berm. Fish screen maintenance is not shown on the table, but would add $2,500 to $4,500 per year over the 15 year period.

Task	Year							
	2012	2014	2016	2018	2020	2022	2024	2026
Monitor Elements C1, C2, C4, & C5	$63,000		$74,000		$87,000		$94,000	
Monitor Element C7	$18,000	$19,000	$21,000	$23,000	$25,000	$27,000	$29,000	$31,000
Maintain Element C7			$45,000		$53,000	$472,000	$62,000	
Rebuild Berm (C2)	$975,000							
Maintain Reveg	$30,000	$30,000						
Totals	$1,086,000	$49,000	$140,000	$23,000	$165,000	$499,000	$185,000	$31,000

4-19 Estimated Expenditures for Monitoring and Maintenance per Calendar Year

5 Conclusion and Summary

Goals

The goal of the proposed project is to address part of the final section of the Merced River Salmon Habitat Enhancement Project (MRSHEP). The MRSHEP contains three reaches, Robinson, Western Stone, and Ratzlaff, for approximately 5 miles of watershed, which is important to the Merced River salmon population. This project is expected to produce approximately 95,000 salmon smolt equivalents during its 15 year life with a cost of $62.36 per smolt.

Recommendation

Depending on funding available in the DFA Lump Sum Account, DFG and DFA staff has three levels of recommendations. The three levels are described below.

First, it is recommended that the entire project (Table 4-12) be funded. If funding is not available then;

Second, it is recommended that Elements C4, C5, and C6 (Table 4-8) be funded. If funding is not available then;

Third, it is recommended that Option #6 (Table 4-18) be funded.

The DFA staff would ask the DFA Advisory Committee to approve and recommend the funding of one of the recommendations above to the Directors of DFG and DWR.

6 References

CalTrans. (2009, April 1). *Equipment Rental Rates and Labor Surcharge.* Retrieved July 31, 2009, from CalTrans Division of Construction: http://www.dot.ca.gov/hq/construc/eqrr/Book_2010.pdf

DIR. (2009). *DLSR-Director General Prevailing Wage Determinations: 2009-1 Journeyman Determinations.* Retrieved July 31, 2009, from Department of Industrial Relations: http://www.dir.ca.gov/dlsr/PWD/index.htm

DWR. (2009, July 31). MRSHEP Phase IV: Upper Western Stone, Final Engineering Report. Fresno, California, USA: California Department of Water Resources.

DWR. (2006, October 5). MRSHEP Phase IV: Upper Western Stone, Preliminary Designs and Cost Estimates. Fresno: California Department of Water Resources.

Larson, D. (2009, February 26). Discuss Updated Conceptual Plan. (D. Encinas, Interviewer)

DELTA FISH AGREEMENT

PROJECT PROPOSAL

HILLS FERRY FISH BARRIER

Project Proposal

2010 - 2012

Prepared by:

Department of Fish and Game

January 2010

Introduction

Fall-run Chinook salmon populations in the San Joaquin River basin have declined to seriously low levels. Estimated San Joaquin basin spawning escapement in 2007, 2008 and 2009 each totaled less than 2,000 compared to historic levels of 70,000 fish in 1985, and 80,500 in 1953.

Historically significant numbers of San Joaquin River salmon have strayed during their upstream spawning migration. These fish do not enter their natal streams, but continue up the main stem San Joaquin River into west side sloughs and canals. These sloughs contain poor quality water and have no suitable salmon spawning habitat.

In 1988, the Department of Fish and Game (DFG) began an adult trapping and egg salvage effort in the west side sloughs and canals. This effort was continued through 1991. During that spawning season, trapped fish were spawned and the eggs transported to the Merced River Fish Facility for incubation and rearing (Table 1).

Table 1 - Estimated Fall-Run Chinook Salmon Escapement for San Joaquin River Drainage 1988-1993

YEAR	STANISLAUS RIVER	TUOLUMNE RIVER	MERCED RIVER	WESTSIDE CANALS		TOTAL SAN JOAQUIN DRAINAGE ESTIMATE
				TRAPPED	ESTIMATED 2 X TRAPPED	
1988	12,328	6,340	3,168	1,150	2,300	24,136
1989	1,543	1,274	211	166	332	3,360
1990	492	96	73	142	284	941
1991	321	77	119	88	176	693
1992	267	132	978	-0- ELECTRIC BARRIER		1,377
1993*	360	475	1,765	-0- PHYSICAL BARRIER		2,600

Although the Department had some success in salvaging eggs from fish straying into west side canals and sloughs, a more effective solution to the straying problem

was needed. The salvage operation was costly and did not allow the salmon strays the opportunity to spawn naturally. A preferable solution to the straying problem was to guide fish to natural spawning habitat. The Delta Fish Agreement (DFA), formerly Four-Pumps) has and continues to fund several habitat and hatchery improvement projects in the San Joaquin drainage. Guiding fish into the Merced River has been determined by DFG and their Federal counterparts to be an effective method to assist efforts to increase natural spawning and utilization of these mitigation projects.

Previously, in the fall of 1992, a temporary electrical fish barrier was installed and tested on the main stem San Joaquin River immediately upstream from the confluence with the Merced River. Funding for installation and operation of the electrical barrier was provided by the Department of Water Resources (DWR), pursuant to the DFA Program. A temporary fish trapping facility was installed immediately upstream of this barrier to monitor the effectiveness of the electrical barrier in blocking fish passage. Funding for the trap was provided by the Commercial Salmon Trollers Advisory Committee (Salmon Stamp). In association with the 1992 barriers, increased water releases were obtained from the Merced Irrigation District (MID). These attractant flows in the Merced and San Joaquin Rivers were secured by the sale of water from MID to the State Drought Water Bank. These measures (the barriers and attraction flows) were generally successful in guiding fish into the Merced River and preventing fish straying. Problems with electrode stability, fish passing the barrier, and public safety resulted in a DFG and DWR staff decision to terminate the continuation of the electrical barrier program.

In the fall of 1993, a pipe-rack fish barrier was installed and operated at the same location as the electrical fish barrier. The basic structure of the physical barrier followed the design of the weir installed upstream of the electrical barrier in 1992. Tripods spanned by pipe rails were placed across the river. This structure supported steel racks in the configuration of an "Alaska Weir," effectively blocking fish passage. Funding was provided to DFG through DWR, pursuant to the DFA Program.

The physical fish barrier proved to be more effective in guiding fish than the electrical barrier. It was safer, easier, and less expensive to operate. Salmon were reported upstream passed the barrier in 1993 and it was determined that the fish found upstream of the barrier had swam through a scour hole, which

developed in the silt and sand bottom at this site. The scour hole was located and sandbagged soon after fish were noticed upstream.

DFG and DWR evaluated the feasibility of installing a permanent base for this weir and the engineering confirmed that the silty bottom will make it difficult and expensive to construct a permanent support structure or permanent barrier at this site. Alternative sites on the San Joaquin River upstream of the Merced River confluence were also evaluated but found not as effective in guiding fish to natural spawning areas. Based on these observations and the available technology, a temporary seasonal barrier with real-time monitoring and maintenance was determined to be the best option to prevent fish from straying.

Since 1994, the Hills Ferry Barrier (HFB) has been installed annually by DFG with adaptive modifications to continually improve the performance.

Project Description

The DFG requests funding to install and operate a temporary physical barrier on the San Joaquin River at the Merced River confluence each fall from 2010 through 2012. The extension of the existing contract will allow continued operation and prevent fish losses in upstream canals and sloughs.

The basic structure of the temporary physical barrier is based on the original design of the weir installed in 1993. This design has been improved over the past 15 years, incorporating designs to improve functionality. The tripod stands are made from wood beams, rails are made of aluminum and racks are made using steel conduit pipes and designed to slide down as the river bottom moves or fish dig at the bottom. The barrier will be reassembled each year to form an "Alaskan Weir" across the San Joaquin River. One section of the racks will be removable to allow boat passage or a trailer will be used to transport boats around the barrier. A fish trap has been designed and installed to capture and hold salmon and steelhead until they can be sampled, tagged and released. The fish trap was constructed using aluminum frame and steel conduit supported on floating pontoons. Material cost was approximately $6,000 (aluminum and pontoons) and used approximately 240 seasonal aide hours to construct. Data from these trapped fish will give a more accurate estimate of fish saved from straying, location of spawning (hatchery or in-river) and survival of redirected fish. Minimal damage to some racks and tripods has occurred occasionally and will likely occur during the life of the project.

Maintenance, repair, and replacement of parts are expected to be nominal. New technologies and new designs will continue to be tested to insure we are using the best barrier design to protect fish. The barrier will be erected on-site each year by DFG personnel in early September and operate until mid December. Exact construction and removal dates will vary. The weir will be staffed on a 24-hour basis to assist with boat passage and clean debris from the racks. A trailer will be placed at the project site to house HFB staffing personnel.

Funding is requested for operation, supervision, construction, administrative overhead, and periodic repair of the barrier.

Magnitude and Potential Benefits

The physical barrier will prevent passage of salmon into the upper San Joaquin River, and west side sloughs and canals. The "Alaskan Weir" has proven effective at this and other sites. No formal monitoring studies are proposed for this project. Anecdotal evidence of fish passing the barrier is obtained through DFG personnel conducting interviews with upstream landowners, water users and DFG wildlife area personnel. Historical trapping efforts above the barrier have captured more than 1,000 fish. Recent anecdotal evidence indicates as little as 10 or less fish have been lost above the barrier. Fish trapping efforts will help to determine the success of redirecting fish and number of fish saved. The extended use of the "Alaskan Weir" will be continually reevaluated as new technology becomes available and future flow actions are implemented.

The San Joaquin River Restoration Program (SJRRP) includes actions that may influence conditions at the HFB site by increasing seasonal flow duration and timing within the main stem San Joaquin River. Evaluations will be conducted by the SJRRP to determine the effectiveness of the barrier in preventing upstream migration of salmon and steelhead.

Anticipated Benefits

The previous 15 years of HFB operation has produced more than 2.1 million smolt credits (Table 2). There was more than 26,000 female Chinook saved from straying into west side sloughs and canals (Table 2).

Annual cost compared to smolt credits earned averaged $1.24 per smolt over the

last 15 years of weir operation and ranges from $ 0.09 – 7.27 per smolt (Table 3). Recent salmon returns have drastically declined to near historic lows and costs have increased (or remained near the same) which increased the average cost per smolt credit.

Table 2 Smolt credits earned from Hills Ferry Barrier operation from 1992 – 2008.

Year	Total Estimate	In-River Estimate	Hatchery Count	Loss above HFB	Females Saved	Smolt Credits
1992	986	640	346	11	375	n/a
1993	1,782	1,373	409	12	677	32,954
1994	2,965	2,022	943	2	1,127	32,952
1995	2,541	1,939	602	8	966	34,859
1996	4,034	2,893	1,141	15	1,533	93,550
1997	4,079	3,133	946	16	1,550	101,311
1998	4,153	3,354	799	4	1,578	81,326
1999	4,644	3,007	1,637	7	1,765	85,761
2000	13,101	11,130	1,971	4	4,978	542,876
2001	10,837	9,174	1,663	42	4,118	406,576
2002	10,678	8,840	1,838	76	4,057	341,862
2003	3,079	2,530	549	34	1,170	106,945
2004	4,320	3,270	1,050	43	1,642	99,581
2005	2,530	2,109	421	9	801	53,876
2006	1,877	1,728	149	5	418	75,627
2007	571	495	76	2	109	19,555
2008	465	389	76	2	57	9,866
Total Smolt Credits						**2,119,477**

Table 3. Smolt credits and cost

Year	Cost	Escapement Estimate	Smolt Credits	Cost ($) Per smolt
1993	$37,000	1782	32,954	$1.12
1994	$40,000	2975	32,952	$1.21
1995	$61,650	2541	34,859	$1.77
1996	$42,581	2893	93,550	$0.46
1997	$43,500	3645	101,311	$0.43
1998	$45,136	3354	81,326	$0.56

1999	$46,201	3007	85,761	$0.54
2000	$47,293	11,130	542,876	$0.09
2001	$47,829	9174	406,576	$0.12
2002	$61,131	8840	341,862	$0.18
2003	$51,757	2530	106,945	$0.48
2004	$55,071	3270	99,581	$0.55
2005	$67,906	2109	53,876	$1.26
2006	$67,906	1728	75,627	$0.90
2007	$57,592	495	19,555	$2.95
2008	$71,759	389	9,866	$7.27
	$844,312		2,119,477	
			Average cost/ smolt	**$1.24**

Numbers of returning adults have increased in 2009 with preliminary estimates of 571 in-river adults. Projected returns should continue to increase and benefits of the barrier will increase over the next three years. Previous estimates developed in the HFB 30-year plan expected to produce 3.119 million smolt credits (1994-2023). At the half-way point of that estimate the HFB has already earned 2.119 million smolt credits.

COST OF THE PROJECT

The estimated cost of this three-year project is approximately $204,163. This estimate consists of the following elements:

a. Permanent staff time to design weir, supervise construction and operation (6 months Habitat Assistant) $ 30,913

b. Temporary help for fabrication, installation, and monitoring of the barrier (1 scientific aid, 700 hours, @ $11.58/hour) $ 10,967

c. Operating Expenses (travel, road improvements, utilities, rent, materials) $ 14,000

e. Administrative Cost (20.43 percent) $ 11,416

2010 YEARLY TOTAL	$ 69,296
2011 YEARLY TOTAL (+2.5 percent)	$ 68,048
2012 YEARLY TOTAL (+2.5 percent)	$ 68,818
THREE YEAR PROJECT TOTAL	**$204,163**

Environmental Considerations

No significant adverse impacts are anticipated because of this project. Installation of the temporary barrier may result in a temporary localized increase in water turbidity.

Permits from the State Lands Commission, Reclamation Board, U.S. Army Corps of Engineers, DFG, and the Regional Water Quality Control Board will be obtained for the life of the project as necessary.

Conclusion

This proposed project, costing an estimated $204,163, would meet the stated objectives of the Delta Fish Agreement and provide a significant number of Chinook smolt equivalents to Mossdale annually. DFG will propose refinements to the project operation as new technology becomes available. A more comprehensive approach to monitoring benefits of multiple DFA projects will be considered.

EXHIBIT B
CONTRACTOR'S BUDGET*

HILLS FERRY FISH BARRIER

	FY 10/11	FY 11/12	FY 12/13
PERSONNEL SERVICES	$ 41,880	$ 42,155	$ 42,436
OPERATING EXPENSES			
Per Diem (estimated @ 85 days)	$ 3,400	$ 3,485	$ 3,572
Utilities/ Rent	1,400	1,435	1,471
Construction Materials	4,700	4,817	4,938
Miscellaneous (fuel, road improvements, etc.)	4,500	4,613	4,728
TOTAL OPERATING COSTS	$ 14,000	$ 14,350	$ 14,709
TOTAL PERSONNEL & OPS.	**$ 55,880**	**$ 61,259**	**$ 57,145**
Overhead (20.43%)	$ 11,416	$ 11,544	$ 11,675
TOTAL COST	**$ 67,296**	**$ 68,048**	**$ 68,820**

TOTAL CONTRACT AMOUNT $ 204,164

Personnel Services include items such as salaries, wages, and overtime.

* FY 10/11 budget computed using best available cost estimates. FY 11/12 and 12/13 budgets compute using an inflation rate of 2.5% compounded annually.

SCOPE OF WORK

I. PURPOSE

1. In partial fulfillment of fish mitigation obligations pursuant to the "Agreement between the Department of Water Resources and the Department of Fish and Game to Offset Direct Losses in Relation to the Harvey O. Banks Delta Pumping Plant" (Four Pumps Agreement), DFG agrees to implement the Hills Ferry Fish Barrier Project on the San Joaquin River. The purpose of the barrier is to block fall-run Chinook salmon spawners from migrating further up the San Joaquin River and into the canal/drain system of western Merced County where there are no salmon spawning areas. The barrier will help guide the salmon into the Merced River where natural spawning habitat is available.

    a. DFG shall annually construct, install, and operate a temporary Alaska Fish Weir barrier across the San Joaquin River immediately upstream of its confluence with the Merced River in the fall of 2010, 2011and 2012. The weir is designed as a series of tripod stands placed across the river with aluminum channel secured to these stands that hold free-floating conduit. A live-trap will be installed on the upstream side of the weir.

    b. DFG may operate a live-trap and tagging operation as part of the barrier project if river flow and water temperatures are suitable. The trap will not be operated if water temperatures exceed 60 degrees Fahrenheit. Salmon entering the trap will be tagged and released to provide a better estimate of the number of fish turned back by the barrier.

    c. DFG shall monitor and assure safety of the weir and live-trap operation, assist with boat passage, and clean debris from the weir. DFG will provide for the installation, maintenance, storage, and operation of the existing project trailer, and construction and maintenance of security fencing and road improvements, as needed, to transport equipment to the project site.

    d. DFG shall obtain all necessary permits and access agreements prior to barrier installation.

    e. DFG shall remove the weir structure as soon as possible each year at the end of the barrier operating season.

    f. DWR shall not be responsible for any damages or harm resulting from DFG construction, operation, and removal of the weir and live-trap structure.

2. If high water flows, other natural physical conditions, or site access make construction of the barrier unfeasible, DFG may provide an appropriate trapping

alternative, upon approval by the Four Pumps Advisory Committee, DWR, and DFG, that will provide the greatest benefit for migrating Chinook salmon in the San Joaquin Basin within the annual budget of this agreement.

3. This program is being funded by DWR to help offset losses of fish at the State Water Project's Delta Pumping Plant.

4. DFG will annually provide DWR with fish mitigation credits to satisfy fish loss mitigation provisions of the Four Pumps Agreement in return for funding the Hills Ferry Fish Barrier Project. Smolt credits will be based on DFG's annual fall-run salmon escapement estimates, as described in the DFG proposal approved by the Four Pumps Advisory Committee and the Directors of DWR and DFG. Credits shall offset losses at the Harvey O. Banks Delta Pumping Plant pursuant to the Four Pumps Agreement.

II. DELIVERABLES

DFG shall provide an annual report to DWR by March 1 of 2011, 2012, and 2013 that includes the following:

- Effectiveness of the barrier, or alternate project, in preventing upstream passage of salmon during the prior fall spawning season,
- Results of the trapping and tagging program, if implemented, related to barrier effectiveness and potential straying, and
- The report shall also define the salmon mitigation credits associated with the annual project that DFG will credit to DWR to offset salmon losses pursuant to the Four Pumps Agreement.

III. PROJECT REPRESENTATIVES DURING THE TERM OF THE AGREEMENT

Department of Water Resources
Division of Environmental Services
Mitigation and Restoration Branch
Attn: Laura Flournoy
3500 Industrial Blvd.
Sacramento, CA 95691

Phone: (916) 376-9730

E-mail: lflourno@water.ca.gov

Department of Fish and Game
La Grange Habitat Shop
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La Grange, CA 95329

Phone: (209) 853-2533
Fax: (209) 853-9017
E-mail: theyne@dfg.ca.gov

Project representatives can be changed upon written notice to the other party.

TO: Delta Pumps Fish Protection Agreement Advisory Committee
FROM: Fred Jurick
DATE: May 17, 2010
SUBJECT: Salmon Project Update and Status Briefing

Following is an update of activities related to existing Chinook salmon projects which have been funded by the Delta Fish Agreement, formally called the Delta Pumps Fish Protection Agreement. Although I oversee the overall DFG coordination of the Agreement, Dennis Blakeman is the DFG Coordinator to oversee activities in San Joaquin area and keep existing activities moving forward and on schedule. If anyone has questions, feel free to contact me either by e-mail at fjurick@dfg.ca.gov or by telephone at 916/445-3967.

Sacramento River Watershed:

- *Deer Creek Water Exchange* – An experimental flow release was made from DCID in the spring of 2009. One concern was whether the lower irrigation company on Deer Creek, Standford Vina Ranch Irrigation Company, would bypass or take the additional flow. During this experimental release, bypassed flow remained in the creek to the confluence with the Sacramento River: From May 22nd thru May 25th, 2009 the Deer Creek Irrigation District (DCID) participated with DFG and DWR in releasing a pulse flow to facilitate the passage of spring-run Chinook in Deer Creek. During the pulse, DCID contributed an extra 16 cfs of flow into Deer Creek. At least one Chinook was observed moving past the DCID diversion with the pulse juvenile Chinook appeared to outmigrate with the pulse. A total of 213 adult spring-run Chinook were counted in Deer Creek in 2009. This low level is a reflection of low numbers of Chinook throughout the Central Valley in 2009, and not due to access conditions into individual watersheds. A pulse was not necessary for fall Chinook in 2009. The Initial Study and Proposed Mitigated Negative Declaration for the DCID Deer Creek Environmental Flow Enhancement Program is scheduled for completion in the summer of 2010. Once completed, the Deer Creek Fish Passage Assessment Plan will be implemented. It is premature to estimate supplemental flow needs for 2010, although late spring rains had provided optimal spring flow conditions on both Deer and Mill Creeks.

  A new groundwater extraction permit was approved by the Tehama County Board of Supervisors on August 18, 2009. They approved the permit for up to 550 acre feet per year for the next seven years. As a result of the pulse flow that was performed in May 2009, DCID earned an 80 acre foot credit for use for pumping groundwater. DCID turned on the pilot production well and ran it from August 19 to September 2, 2009. The well pumped between 1,125-1,200 gallons per minute and produced a total of 71 acre feet before being shut down. The total cost of pumping the well during 2009, including the monthly standby fees was $3,821.51 or $53.53 per acre foot.

  The EIS for drilling and installing the two new production wells is nearly finalized.

Following the public review period, a drilling contract will be put out to bid and the wells drilled possibly this fall.

- *Mill Creek Water Exchange* – Additional Chinook flows were not requested on Mill Creek in 2009. Although 2009 was a low water year, snow run-off and late rains provided sufficient flow and water temperatures to facilitate upstream passage of all life stages of Chinook. A total of 220 spring-run Chinook spawned in Mill Creek in 2009. As with Deer Creek, this low number is not due to access into the creek but reflective poor survival of Chinook throughout the Central Valley.

  Because DFG did not request Los Molinos Mutual Water Company (LMMWC) to bypass Mill Creek surface water diversions to enhance in-stream flow for fish transportation, LMMWC did not accumulate any additional pumping credits during 2009. However, LMMWC started 2009 with 786 acre-feet of pumping credits from bypassing water during previous years and did utilize some of these credits by operating well 26N/02W-22G001M (22G001M) from August 3, 2009 through October 12, 2009. Well 22G001M operated at an average rate of 3,500 gallons per minute, with a total extraction volume equal to 362 acre-feet. LMMWC has 424 acre feet of pumping credits remaining. The Mill Creek Water Exchange Agreement allows LMMWC to bank groundwater pumping credits for up to three years from the time surface water diversions are bypassed. Of the 424 acre-feet of remaining pumping credit, LMMWC is required to utilize 189 acre-feet by the fall of 2011 and 235 acre-feet by the fall of 2012.

  The total cost associated with running well 22G001M during 2009 including all the standby charges and flat monthly fees was $14,302 . This results in a cost of $39.49 per acre foot for 2009. Well 14R001M was turned on for a short period of time to exercise it and test the flow meter during 2009. The total cost including the standby charges and flat monthly fees for the year was $841.

  The Buck Jones and Woods water rights (the Buck Jones water right was formally leased by DFA for the Mill Creek Water Exchange Program) are currently held by The Nature Conservancy (TNC). The Buck Jones and Woods water rights are a maximum of 13.2 cfs and 4.7 cfs, respectively. The LMMWC is managing the water rights for spring- and fall-run Chinook salmon transportation flows and for agricultural irrigation under an agreement with TNC. When transportation flows are requested by DFG, these water rights are the first to get returned to the creek and the last to be re-diverted. The LMMWC is not given groundwater credit under the Delta Fish Agreement for the use of these water rights to provide Chinook salmon transportation flows. For example, if LMMWC is requested to provide 50 cfs of bypass flow, and the current Buck Jones and Woods water rights total 17 cfs, LMMWC would only be provided credit for 33 of the 50 cfs that is bypassed.

  The DFA water exchange activities have inspired other NGO's to get involve in the activity of keeping fish friendly water in the creeks. TNC purchased the Buck Jones and Woods water rights in the interest of securing this water to be managed for the

benefit of Mill Creek Chinook salmon, but they did not want to be the long term holder. Funding for the purchase of TNC's Mill Creek water rights could come from various sources including DFA or the Wildlife Conservation Board (WCB). The Mill Creek Management Committee proposed that LMMWC hold the water rights and that they be managed under an easement held by DFG. However, TNC cannot sell the water rights until they figure out how to avoid having this transaction result in a profit for private water users (private inurnment). TNC is working with their Sacramento and San Francisco offices to develop a mechanism to avoid private inurnment while achieving the goals described in the Long-Term Cooperative Management Plan for Mill Creek.

The Mill Creek Management Committee would like to see the sale of the water rights as soon as possible while WCB funds are still available. The Management Committee has met with TNC over the past year to try to help work through issues. Early this year the Mill Creek Watershed Conservancy used their legal services to draft an easement for the sale of the water rights to give TNC a starting point and help move the process forward.

In addition to the available TNC water rights, the Orange Cove water right is also available. Unfortunately there is no current effort to purchase this water right because the asking price for the water right has been too great. Although there have been past negotiations between the Mill Creek Conservancy and the Orange Cove Irrigation District, they have been successful.

- *Butte Creek Projects*:

  The Butte Creek spring-run salmon escapements have been down these last few years but not like the rest of the Central Valley tributaries. The Butte Creek contribution continues to account for a significant portion of the entire Central Valley spring-run Chinook population. DFA projects in the Butte Creek watershed which contribute to this success include:

  Parrot-Phelan Fish Ladder
  Durham Mutual Fish Ladder and Screen
  Warden Overtime to protect for Spring-Run Chinook salmon

- *Warden Overtime to Protect Spring-Run Chinook Salmon* – Because of the recent decline in river angling opportunities for salmon, more and more sport effort has shifted towards steelhead trout. With this shift of sport fishing effort comes an increase in illegal activities towards these already threatened fish stocks. Therefore, more and more enforcement effort is being expended to protect these fish populations. These activities were considered in the recent OCAP NMFS Biological Opinion.

  There are two areas of enforcement effort, the Northern Unit which covers the upper Sacramento River and it's tributaries like Mill and Deer Creek and the Southern Unit which covers the lower Sacramento Tributaries and the American River drainage. Southern Unit enforcement efforts for the fiscal year 2009-2010 were concentrated

throughout the American and Sacramento River systems. Although the salmon season was closed with a zero possession limit, numerous citations were issued for the unlawful take and possession of salmon. In addition, citations were issued for the use of illegal gear and attempt to take salmon.

The steelhead run was very active this past year resulting in a large number of fish entering the system. Citations were issued for the take of native steelhead, and the use of barbed hooks. Wardens worked very closely with a network of informants and concerned citizens who reported violations in progress. A number of cases were made as a result of the reported violations.

From June of 2009 to April of 2010 a total of 116 citations were issued for use of illegal gear on the American River. A total number of 53 citations were issued for the take and or possession of salmon and 8 citations were issued for the take of native steelhead. Most of these salmon cases resulted in adult fish in their prime being destroyed due to stress and removal from the river.

During the spring release of juvenile salmon several details were conducted. Wardens worked the release sites in efforts to detect the netting of juvenile salmon which are used for bait. The wardens also worked night patrols in an effort to apprehend violators utilizing salmon smolts as bait. Some enforcement efforts utilized the use of Fish & Game aircrafts as well as coordinated efforts with D-BEEP.

Delta:

- *Delta Bay Enhanced Enforcement Program (DBEEP)* – The program is funded through FY 2010-11 and has expanded their enforcement effort to include other threatened fish species, all of which are of concern and included in the OCAP Reasonable and Prudent Actions. In April 2009, DBEEP and the SOU team worked a case involving 6 suspects that were catching and selling sturgeon and sturgeon roe. The primary suspect was responsible for 24 sturgeon over a 4 month period. One of the sturgeon was a green sturgeon that was approximately 8 feet in length. All 6 suspects were arrested and the two primary suspects paid 20K in fines each in Colusa County. They were also using juvenile salmon as bait. DBEEP continues to issue dozens of citations for the illegal possession of juvenile salmon. Suspects have learned to only catch enough salmon to bait their hooks. There were two commercial striped bass cases made in San Joaquin County in the fall of 2009. Those cases are still pending. DBEEP officers arrested two men in March of 2010 for catching and selling sturgeon and sturgeon roe. They also were using salmon as bait. They were responsible for catching 18 sturgeon in 12 days. They retained 12 of the 18 and had approximately 40 pounds of roe in their possession when arrested. One of the suspects was involved in 2 prior arrests for the same violations. The case is still pending in Yolo County.

  DBEEP was the first unit in DFG to be issued TASER's and deployed them in Jan

2010. Although they have never been used to date, the TASER's have already proved to be very useful because simply displaying them has avoided several "use of force incidents" by officers through the act of simply removing them from the holster.

DBEEP has secured a warehouse with an evidence locker and freezer in the West Sacramento area. This has streamlined the evidence handling process and got us into compliance with new DFG policy regarding evidence. It has also been a place to have training and meetings. DBEEP continues to train on a monthly basis to stay sharp and proficient in all aspects on law enforcement work.

- *Suisun Marsh Fish Screen Operation and Maintenance Project* – This project supports the operation and maintenance of 14 delta fish screens. The Suisun Marsh Conservation District (SRCD) operates 13 screens within Suisun Marsh and DFG has one additional fish screen. This project is an excellent example of efficient screen maintenance being effectively implemented by the existing maintenance staff of the Solano Resource Conservation District (SRCD). Following is a report of their activities:
    - Provide technical assistance and labor to landowners for the operations and maintenance of the fish screens. SRCD Water Manager staff helped maintain water flow through the fish screens throughout the year by monitoring fish screen operation, operating the fish screens in the absence of the landowners, work with landowners to troubleshoot fish screen operation problems, and performing minor maintenance prior to the removal of the screens for annual maintenance.
    - Perform maintenance dredging at screen sites. Fish screen maintenance dredging will be performed in 2010. A dredging contract is currently being written and will go out to contractors for bid by 6/1/10.
    - Perform annual screen maintenance including cleaning, repairs, and other maintenance needed. Fourteen screens will be removed by SRCD staff for cleaning and will be replaced prior to Fall 2010 flooding. Intake Screens, Inc. and Electrical Equipment Co. completed the replacement of two fish screen gate actuators (425 and 506).
    - Obtain permits and environmental clearances needed to perform this work. A USACE Nationwide Permit 3 (for fish screen maintenance dredging) was applied for and authorized in March 2010. On April 23, 2010, a 401 certification was requested but there has been no response yet from the RWQCB.
    - Upgrade the monitoring and control systems to operate and monitor the fish screens. The original fish screen communication system is obsolete and new technology has become available to upgrade/make the systems functional again. A number of upgrade options were studied in FY 09/10 and three landowners (425, 506, and 525E) agreed to participate. This project was completed in May 2010.

San Joaquin Watershed:

- *DFG Staff Time* – The San Joaquin Project Manager has obtained all permits and agreements for gravel additions to be completed on the Tuolumne La Grange site and Merced River Hatchery sites. He is in the process of obtaining additional permits to cover future activities on Hill Ferry Barrier operations. He is engaged in all upcoming activities and overseeing their outcome.
- *San Joaquin Fish Screen Project* – Two screens have been installed on the Merced River near Snelling and are functioning (Cook and Dale Ditch, Ferrel Ditch). The final Fish Screen Report for this project has been completed and is available for distribution.
- *Four Pumps Projects Maintenance and Monitoring Program*. DWR San Joaquin Unit has developed a proposal with the help of DFG San Joaquin staff and it will be presented to the Committee at this meeting.

Stanislaus River:

- Existing Gravel projects – All project sites are still functioning and producing credits, though most are in need of minor to major maintenance. Natural gravel migration during elevated river flow conditions has depleted each site over time. Riffles are still producing credits, but all are in need of gravel infusions.

STANISLAUS (Riffle #)

  - *#29 Upper Horseshoe* – continues to produce some credits and upgrades are included in the *San Joaquin Projects Maintenance Proposal* currently being considered.
  - *#30 (J2/J3) Lower Horseshoe* – Most of the gravel has migrated out of this site which leads biologists to believe it is not very productive, though spawning activity still occurs. Upgrades are included in the *San Joaquin Projects Maintenance Proposal* currently being considered.
  - *#46 (M4) Worm Farm* – gravel has almost completely moved out of this site. Gravel addition to this area is recommended as previous gravel additions created good spawning habitat which salmon used. Upgrades are included in the *San Joaquin Projects Maintenance Proposal* currently being considered.
  - *#52 Lover's Leap* – The project has been completed. The Fish and Wildlife Service Anadromous Fish Restoration Program (AFRP) coordinated the restoration action using DFA Lump Sum funding. AFRP is currently considering some expansion to the previously completed project.

Tuolumne River:

- Existing Gravel projects - Still functioning and producing credits though some maintenance is needed at most sites. These sites are discussed in the San Joaquin Four Pumps Projects Evaluation and will be addressed in the *future San Joaquin Projects Maintenance Proposal* currently being considered.

TUOLUMNE (RIFFLE#)

- *I B* – continues to produce fish credits but the scope of the project has been modified and enlarged due to continuing gravel infusion activity. Riffle quality improves with each gravel addition as well as improving downstream riffle habitat as gravel from this site migrates downstream.
- *3A* – no longer produces credits because it has been significantly altered during the last few flood events. This riffle will not be restored and has been identified by USFWS as a resting pool for steelhead trout.
- *3B* – continues to produce fish credits and is included in the list of continuing Four Pumps San Joaquin restoration projects.
- *34/35 Ruddy* – no longer produces credits because the site was significantly altered during the 1997 flood event. Much of the gravel was moved downstream but still remains near the original addition site but is unavailable to spawning salmon. Some of this gravel may be available to be moved back into the river. Because TID had originally planned to include this site into a larger restoration project on the river, it was abandoned by the DFA program and not included in the proposed San Joaquin Projects Maintenance Proposal. It had produced decent credits when it was operating and could possibly be renovated rather cheaply to again produce DFA credits.
- *Bobcat Flat RM 43* – Funded out of Lump Sum Account. The project has been completed and is functioning well. The project sponsors are interested in doing some maintenance on the site and are looking for funding to accomplish the maintenance.
- *La Grange Gravel* – Gravel was purchased and delivered to storage area on DFG La Grange property. Gravel has not been placed due to State restrictions in renting construction equipment. Alternatives are being discussed and hopes are that the gravel will be placed this summer.

Merced River:

- Existing Gravel projects Still functioning and producing credits. These sites are discussed in the San Joaquin Four Pumps Projects Evaluation and will be addressed in the future *San Joaquin Projects Maintenance Proposal*.

MERCED (RIFFLE #)

- *#2 MRH Phase 1* – Continues to produce fish credits but the scope of the project has been modified and enlarged due to continuing gravel infusion activity. The site is included in the list of continuing Four Pumps San Joaquin restoration projects. Gravel supplementation for this site is planned for this summer gravel infusion activities.
- *#3 Expanded MRH* – See above. Site is part of the Phase 1 area expansion.
- *#10 Braden Phase 2* – No longer produces fish credits because the site was significantly damaged during high water events of the last decade. A plan to

rebuild the site is being included in the future San Joaquin Projects Maintenance Proposal.

- *#11 Braden Phase 2* – Same project as above. The site no longer produces fish credits.

MERCED RIVER SALMON ENHANCEMENT PROJECT

- *Upper Western Stones Reach* – DWR engineering staff have completed preliminary plan options based on the suggested results from the August 2005 agency site visit. Recommendations will be presented to the Committee at this meeting with the best funding options in the project proposal.
- *Robinson Reach Site* - Revegetation and weeding activities continue to move forward. Project riffles have lost some gravel to natural sediment migration. This reach would benefit from gravel introductions and or riffle reconstruction. Project Reporting: DFG has distributed a Fish Monitoring Report for the site. DWR has released an Interim Report of the salmon spawning study. A copy of this report can be obtained from DWR. Beaver predation on the developing riparian continues to be a problem which is being resolved by the landowner.
- *Ratzlaff Reach Site* – Activity at this sited has been completed. Department of Boating and Waterways has removed hyacinth from the pond and plans to re-visit yearly for follow up treatment if needed.

Other Merced River Restoration Projects

- *Magneson* – A matured restoration project which at the very least is a good example of habitat restoration. The site seems to have evolved into "good habitat", both hydrological and riparian, and continues to function appropriately. The landowner remains cooperative and is pleased with the project outcome. Suggestions to continue this project will be included in the future San Joaquin Projects Maintenance Proposal.
- *Hills Ferry Barrier* - New funding has been requested to operate the HFB through 2012. Permits are being obtained and renewed for future operations. Barrier operations were successful in 2009. Everything operated normally in 2009 with very few fish observed. A new fish trap design has been constructed and tested. The trap will be installed during construction to evaluate the effectiveness of the barrier and success of spawning by salmon which are re-directed into the Merced River. Peak salmon activity usually occurs Nov, 5 to Nov.20. The trap will also increase knowledge of salmonid migration timing in the San Joaquin basin.
- *Merced River Hatchery Production* – Functioning as expected. A new funding contract is close to being completed and discussions with MID to fund portions of the hatchery costs continue.
- *Wing Dam Gravel Supplementation* -- The past use of spawning gravel has proved extremely beneficial to salmon spawning in the immediate area. A few years ago, during a USFWS float trip of that reach of the river, agency biologists made a point to comment how nice the river habitat was in that reach of the river and attributed the benefits to the annual infusion of wing dam gravel. Two diverters were supplied and used spawning gravel in 2009. One additional diverter wanted gravel but permit issues prevented him from using the gravel. Diverters have expressed their willingness to continue the use of spawning

gravel in future wing dam construction. The latest wing dam gravel purchase was made using a portion of the remaining DFA Lump Sum funding obligation towards San Joaquin Gravel Infusion activities. These DFA funds are no longer available and any future funding for the wing dam project will have to come from other sources or be discontinued. Diverters and operators have been agreeable to receive and use spawning gravel to rebuild their wing dams and USFWS, NMFS, and DFG biologists believe this is a very worthwhile project to continue if funding can be identified.

Attachment 1 – *Suisun Marsh Fish Screen Operation and Maintenance Project Annual Report (Calendar year ending 12/31/07).*

This annual report is for Contract Number 4600004537, a contract between the Department of Water Resources and the Suisun Resource Conservation District (SRCD).
The contract obligates the SRCD to provide assistance to landowners for the operation and maintenance of 14 conical fish screens within the Suisun Marsh on Montezuma Slough.

During the 2007 work season, Tasks 1 – 7 in the Scope of Work were addressed:

1. Provide technical assistance and labor to landowners for the operation and maintenance of the fish screens. SRCD staff helped maintain water flow through the fish screens by performing minor maintenance prior to the removal of the screens for annual maintenance and completion of the screen motor retrofit.
2. Retrofit 13 of the fish screens with hydraulic cleaning brush motors. Intake Screens, Inc. completed the retrofit of 9 of the 13 fish screens with hydraulic cleaning brush motors, hydraulic pump and hoses, modified brush arms, and a brush cleaning cycle timer. The remaining four screens will be retrofitted during the 2008 work season. The owners of two of these three screens (625 and RD2112) declined to participate, one screen (424) is on an island without equipment on hand to remove the screen for retrofit, and the fourth (501) was still functioning and therefore not considered a priority.
3. Perform maintenance dredging at screen sites. CA Department of Fish and Game personnel performed maintenance dredging at the single remaining site in February 2007.
4. Perform annual screen maintenance including cleaning, repairs, and other maintenance needed. Twelve screens were removed (concurrent with the retrofit) by SRCD staff for cleaning and were replaced prior to Fall flooding. Additionally, each screen was undercoated with anti-fouling paint to discourage barnacle growth, which impedes water flow through the screens. SRCD provided in-kind match of 614.5 staff hours ($17,269.37) toward this grant.
5. Install batteries, zincs, and screen cleaning brushes as necessary. Batteries were installed at two solar sites and the zincs were replaced on each screen.
6. Perform boom truck and vehicle maintenance as needed to implement the program. See attached FY0708 worksheet.
7. Obtain permits and environmental clearances needed to perform this work. A US Army Corps of Engineers Nationwide Permit #3 was issued on 8/10/06 for the fish screen dredging mentioned in #3 above.
8. Upgrade computer and software needed to centrally operate and monitor the fish screens. New technology has made the original fish screen communication system obsolete and new technology may be available to upgrade/make the system functional again. Additional funding and more study will be needed before deciding on a course of action.