AGREEMENT BETWEEN
THE DEPARTMENT OF WATER RESOURCES ,
AND
THE DEPARTMENT OF FISH AND GAME
TO OFFSET DIRECT FISH LOSSES IN RELATION TO
THE HARVEY O. BANKS DELTA PUMPING PLANT

THIS AGREEMENT is entered into by and between the Department of Water Resources, hereinafter referred to as "Water Resources", and the Department of Fish and Game, hereinafter referred to as "Fish and Game", to offset direct losses of striped bass, chinook salmon and steelhead caused by the diversion of water by the Harvey O. Banks Delta Pumping Plant (Pumping Plant).

RECITALS

Water Resources and Fish and Game recognize:

A.   Fish populations of the Sacramento-San Joaquin Delta (Delta), some of California's most valuable resources, are declining. Striped bass populations dependent upon the Delta have been declining since the 1960's. Today, California's native chinook salmon resource is extremely dependent upon the Sacramento River System.   Fall runs of chinook salmon stocks in the Feather and the American Rivers are in good condition due to habitat maintenance, hatchery production, and stocking procedures. Other fall runs of chinook salmon in the Sacramento System have been depleted to varying degrees. Winter and spring runs of chinook salmon are severely depleted. Salmon stocks in the San Joaquin System are depleted more than stocks in the Sacramento River System. Steelhead stocks in the Sacramento

1

System are depressed. Other species of fish which are dependent upon the Delta have been adversely affected, but none of them appear to be endangered as a species.

B. Fish populations in the Delta are greatly influenced by a number of complex interactions, no one of which has been identified as the principal environmental factor. Delta inflow, water exports, power plants, consumptive uses, upstream and local diversions, tidal action, levee failures, pollution, agricultural return flows and recreational and commercial activities are all recognized factors that to varying degrees affect the fish resources of the Delta.

C. Overall fishery resources dependent upon the Delta have been adversely affected by impacts of flow distributions in the Delta caused by the State Water Resources Development System (which includes what is commonly called the State Water Project) and other water resource development projects. The State Water Project must mitigate for its impacts on fishery resources. This agreement covers only some of the impacts of the State Water Project.

D. The purpose of this agreement is to offset direct losses of some species of fish caused by the State Water Project Pumping Plant diversions. Direct losses are defined as losses of fish which occur from the time fish are drawn into Clifton Court Forebay until the surviving fish are returned to the Delta. These losses occur in spite of fish screens located at the Pumping Plant because of such things as enhanced predator

2

efficiency in parts of the system, very poor screening efficiency for fish less than about one inch long, and mortality caused by handling fish in the salvage process. Direct losses of fish have reduced the abundance of affected species. Since these species are less abundant, the direct losses of these species in any given year are now likely less than they would be if water diversions in previous years had not occurred. An attempt to take this factor into account was made in defining responsibilities under this agreement. The parties do not intend to cover in this agreement losses which occurred prior to 1986.

     E. Other adverse fishery impacts related to State Water Project operations need to be addressed. The parties intend to begin discussions on developing ways to offset these impacts which are not covered in this agreement, including facilities needed to offset fishery impacts and provide more efficient conveyance of water. The parties intend to continue the process which led to this agreement. That process included an advisory committee of representatives from interest groups concerned with fish resources affected by the State Water Project including representatives of the State Water Project contractors. Additional measures for impacts not covered in this agreement will have to be included in proposals by Water Resources to expand its diversions beyond the limitations contained in this agreement and will be part of agreements between Fish and Game and Water Resources regarding such proposals. Until agreement is reached on such measures, the State Water Project will not

increase its diversions beyond those set forth in the U.S. Corps of Engineers Public Notice 5820A, amended, dated October 13, 1981 which limits exports to the amount of water that can be diverted by the existing pumps, except during winter months when additional amounts can be diverted during high San Joaquin River flow periods.

F. In principle, Fish and Game and Water Resources intend this agreement to offset direct losses of all fish caused by the diversions of water by the Pumping Plant starting in 1986. Presently however, information on impacts and measures to offset those impacts is sufficient only to deal with chinook salmon, steelhead and striped bass. Impacts on other species of fish will be addressed if impacts are identified and measures can be developed which would offset such impacts. Measures provided under this agreement may benefit other fish species.

G. It is the intention of Fish and Game and Water Resources to give priority to measures which are designed to protect or improve fish habitat and which would preserve the genetic diversity of fish stocks in preference to hatchery and stocking programs.

AGREEMENT

NOW THEREFORE, Water Resources and Fish and Game agree as follows:

I. Beginning in 1986, Water Resources will offset direct losses of striped bass, chinook salmon, and steelhead

4

caused by the diversion of water by the Pumping Plant in the following manner:

A.   Direct losses of striped bass, steelhead and chinook salmon caused by the Pumping Plant shall be determined annually each calendar year starting in 1986. The procedure used to calculate these losses is outlined in Appendix A.   This procedure shall be revised by mutual agreement as better information becomes available.

B.   The parties recognize the probability that direct losses of striped bass, steelhead and chinook salmon for any given year would be greater had there not been direct losses caused by the Pumping Plant in previous years. Calculation of such losses is not possible with existing knowledge. Therefore, Water Resources agrees to provide $15,000,000 to initiate a program which will increase the probability of quickly demonstrated results.   The monies in this fund are in addition to the compensation for annual losses described in Section I.A.   This payment is not intended to cover losses which occurred prior to 1986.

C.   Commencing in 1986, Fish and Game will, following approval from Water Resources, undertake measures to compensate for the fish losses identified in Sections I.A and to provide the program set forth in Section I.B. Measures shall be selected in accordance with Sections I.D, I.E and I.F.

5

D. The following guidelines will be used in determining which measures shall be implemented.

1. Selection of such measures shall be based upon the following:

a. the magnitude of potential benefits;

b. evidence of the probability of achieving the benefits;

c. the costs (capital, operation, maintenance and replacement costs) of the measure in relation to other measures and to the expected benefits;

d. the ability and the cost to evaluate the success of the measure; and

e. environmental considerations.

2. Although it is recognized that hatchery operation can be an integral feature of any restoration program, priority shall be given to habitat restoration and other nonhatchery measures which help to protect the genetic diversity of the stocks and to avoid over reliance upon hatcheries. Where hatcheries are chosen, wild brood stock will be used.

3. In selecting salmon measures, priority will be given to measures on the San Joaquin River system.

4. The sum provided in Section I.B. shall be expended over a period of not less than five nor more than ten years from the date of execution of this agreement.

5. It is expected that obligations set forth in Section I.A. shall be met as soon as is practicable after they are incurred. However, compensation for these obligations may be accumulated over a period of years or spent in advance on the expectation of losses. Compensation for those obligations may be accumulated over a period of no more than ten years. Expenditures made in advance shall not exceed the obligations expected for the next ten years.

6. The average amount paid for fish replaced pursuant to Section I.A. shall not exceed the cost of replacing fish with hatchery reared yearling fish. Currently replacement costs are estimated to be $1.65 per striped bass and $.55 per steelhead and per yearling salmon. These costs will be adjusted yearly based on evidence of changes in hatchery production costs. During the reviews provided for in Section VI, progress on replacing fish will be reviewed to determine whether this limitation on expenditures is unreasonably constraining the ability to meet the guidelines provided in Section I.D. of this agreement. If so, the limitation on expenditures will be renegotiated.

E. Among the measures to be considered first will be those of Appendix B. At least one measure will be started

in 1987. The consideration of the remaining measures in Appendix B will be completed by December 1988.

F. Fish and Game and Water Resources will jointly appoint and seek input from an advisory committee during the estimation of losses pursuant to I.A. and identification, selection and implementation of measures pursuant to I.C. and D. That committee will consist of interest groups concerned with fish resources affected by the State Water Project, including but not limited to representatives of commercial and sports fishing organizations and representatives of agencies which contract for water from the State Water Project. The process to be followed with regard to any given proposal for measures shall be:

1. The staffs of Fish and Game and Water Resources shall evaluate each proposed measure following the guidelines set forth in Section I.D..

2. The proposal will be submitted to the advisory committee.

3. The proposed measure may be modified based on input from the advisory committee.

4. Recommendations from the staffs and the advisory committee will be presented to the Directors of Fish and Game and Water Resources for a decision.

II. By December 1990, Fish and Game will evaluate the stocking of striped bass to determine the contribution of stocked fish to the fishery using various stocking strategies. Water

Resources will reimburse Fish and Game annually for 30 percent of the cost of the evaluation or $50,000, whichever is smaller, plus $5,000 per 100,000 fish marked of those stocked pursuant to this agreement. Both costs will start with fiscal year 1986-87 and will be adjusted annually based on annual percent increases in the average State employee compensation rates. Monies from the Striped Bass Stamp Fund may be used for this evaluation program, but other monies from the Fish and Game Preservation Fund will not be used.

III. Water Resources and Fish and Game may implement a mutually acceptable plan to reduce fish losses by predation in Clifton Court Forebay. Fish and Game will evaluate the effects of the plan and the losses computed under Section I.A. will be reduced to the extent that predation losses are reduced.

IV. When water is being diverted through the Pumping Plant, the John E. Skinner Delta Fish Facility (Skinner Facility) will be operated according to the following procedures:

A. Records satisfactory to Fish and Game will be maintained by Water Resources of the numbers, sizes, and kinds of fish salvaged, water export rates, and Skinner Facility operations.

B. Water Resources will notify Fish and Game well in advance of any scheduled outages and at the time of unscheduled outages, if such outages might affect the effectiveness of the screens at the Skinner Facility. Water Resources is in the process of installing an auxiliary power

9

source to prevent outages from occurring. If, however, the screens are inoperative, Water Resources will stop diversions through the Pumping Plant unless there is an emergency situation and water is not available from any other source for direct deliveries or unless Fish and Game has determined that the adverse impact on fish is not sufficient to justify cessation of pumping. In making its determination, Fish and Game will consider the kind and numbers of fish present and the State Water Project's need for water as determined by Water Resources.

C.   The Skinner Facility will be operated in conformance with mutually acceptable criteria to maximize protection of the Delta fishery.

V.   The parties agree that State Water Project Pumping Plant diversions cause direct losses of some species other than striped bass, steelhead and chinook salmon, e.g., American shad and sturgeon.

A.   At this time not enough information is available to determine either what the impact of such diversions is on such species or what measures are appropriate to offset such losses. Water Resources and Fish and Game are involved in a variety of studies to determine what the impacts are and what can be done to reduce or eliminate identified adverse impacts. Fish and Game will prepare a report on these subjects by March 1987.

B. Measures to offset losses for fish species not covered in this agreement shall be included when information is obtained to develop effective measures. Measures provided under this agreement will benefit some of these species.

VI. By December 31, 1989, and by December 31 of each year thereafter, Water Resources and Fish and Game shall, with input from the advisory committee set forth in Section I.F, review the success of this agreement in offsetting the direct effects of diversions by the Pumping Plant on fisheries dependent on the Delta. If the agreement is not successful in this regard, it shall be renegotiated to fulfill the State Water Project's responsibilities relating to the direct effects of diversions by the Pumping Plant. The parties will provide an annual report describing the results of the annual review.

VII. Upon execution of this agreement, the parties will begin discussions on developing ways to offset the adverse fishery impacts of the State Water Project which are not covered in this agreement, including facilities needed to offset fishery impacts and provide more efficient conveyance of water. Until agreement is reached between the parties on offsetting such impacts, Water Resources will not increase diversions beyond those set forth in the U.S. Corps of Engineer's Public Notice 5820A, amended, dated October 13, 1981 and Fish and Game shall not unreasonably withhold its approval of such agreement.

VIII. The parties will make every effort to involve the Federal Government in the development of programs which would offset similar impacts of the Federal Central Valley Project.

IX. This agreement is intended to offset direct losses of fish resources caused by State Water Project Pumping Plant diversions. Therefore, Water Resources and Fish and Game will not object to the participation of groups concerned with protecting such fish resources in legal proceedings to enforce this agreement.
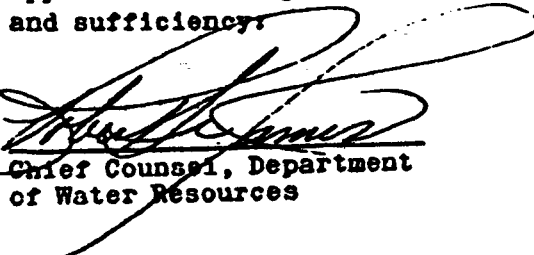
Dated: 12-30-86   Dated: December 30, 1986

_____   _____
David N. Kennedy, Director   Jack C. Parnell, Director
Department of Water Resources   Department of Fish and Game

Approved as to legal form
and sufficiency:

_____   I hereby certify that all conditions for exemption
Chief Counsel, Department   set forth in State Administrative Manual Section
of Water Resources   1209 have been complied with and this document
                                     is exempt from review by the Department of Finance.

                                     _____
                                     Signature

FORM	POLICY	BUDGET	

Department of General Services
APPROVED
NOV -4 1987

ORIGINAL SIGNED BY
ELIZABETH YOST

By   ELIZABETH YOST
            Chief Deputy Director

12

APPENDIX A

PART I   ESTIMATION OF THE FIVE YEAR AVERAGE OF YEARLING EQUIVALENT
          LOSS OF STRIPED BASS (LARGER THAN 20 MM), CHINOOK SALMON,
          AND STEELHEAD LOST DURING FISH SALVAGE OPERATIONS AT THE
          INTAKE TO THE CALIFORNIA AQUEDUCT

GENERAL APPROACH

The number of fish lost at the intake to the State Water Project (SWP)
export system is calculated from the estimated number of of fish
salvaged (collected) at the fish facility adjusted by factors
affecting their survival. The number of fish salvaged during the
first and second half of a month is estimated from a sampling program
at the facility. The sampling program is based on fish counts made at
fairly regular intervals during the day. Salvage is stratified by
size group.

Losses occur both before and after fish are collected in the holding
tanks where they are counted. Losses are estimated from the time fish
are entrained into the forebay until they are transported and released
back into the Delta. Fish entrained into the forebay are lost in two
ways before they are collected in the facility; (i) predation loss (P)
in the forebay, or (ii) loss through the fish screens. After fish
have been collected, some fish die as a result of the handling (H) and
trucking (T) required to return them to the Delta.   —

Losses of fish are standardized to yearling equivalents by estimating
the number which would have survived to that age.

Survival of striped bass to the yearling stage is a function of the
growth and mortality rates of the various length groups the fish must
live through to become yearlings. It is also a function of the time
of year during which a given size fish is collected.

Instantaneous growth rates (G) and mortality rates (Z) for each length
group were calculated from equations developed by Miller (ms):

$$G = 0.08395 - 0.01793 \times \ln(FL \text{ mm})$$
$$\ln(Z) = 1.3906 \times (-0.04236 \times FL \text{ mm})$$

These relationships may be modified as additional information on
mortality and growth become available. This data was used to
calculate the survival rate for each length group and the number of
days a fish spends in the group (Table 1). Yearling equivalent
survival factors for striped bass are then calculated as the product
of the individual survival rates for each length interval that a fish
must live through to become a yearling (Table 2). Yearling status for
the purposes of this model is defined as living to the first half of
March or reaching the 141-150 mm length interval.

TABLE 1. STRIPED BASS SURVIVAL RATES FOR VARIOUS LENGTH GROUPS AND
THE NUMBER OF DAYS SPENT IN EACH GROUP

Species	Length Interval (mm)	Survival [1] Rate	Number days in length Interval
STRIPED	21 - 25	0.4888	5.75
BASS	26 - 30	0.5592	5.77
	31 - 35	0.6239	5.79
	36 - 40	0.585	8.13
	41 - 50	0.5652	11.64
	51 - 60	0.6873	11.69
	61 - 70	0.7818	11.72
	71 - 80	0.8508	11.75
	81 - 90	0.899	11.78
	91 - 100	0.9328	11.80
	101 - 110	0.9554	11.82
	111 - 120	0.9705	11.84
	121 - 130	0.9806	11.86
	131 - 140	0.9872	11.87
	141 - 150	1.0000	

[1] Survival rates refer to survival from the mid-point of the length
interval to the midpoint of the subsequent interval.

2

TABLE 2. STRIPED BASS YEARLING EQUIVALENT SURVIVAL FACTORS STRATIFIED
BY SIZE GROUP AND TIME OF YEAR ENTRAINED INTO THE STATE
WATER PROJECT INTAKE.

LENGTH INTERVAL (MM)	JANUARY		FEBRUARY		MARCH	
=========	1-15	16-31	1-15	16-28	1-15	16-31
21 - 25	0.031272	0.045179	0.088036	0.223395	0.019418	0.019418
26 - 30	0.058479	0.077698	0.135872	0.297095	0.039728	0.039728
31 - 35	0.096598	0.123084	0.190831	0.363654	0.071047	0.071047
36 - 40	0.145765	0.175729	0.254003	0.438861	0.113870	0.113870
41 - 50	0.231795	0.268512	0.352154	0.524012	1	1
51 - 60	0.383142	0.422170	0.504440	0.654718	1	1
61 - 70	0.532948	0.568128	0.638544	0.757645	1	1
71 - 80	0.661838	0.690287	0.745285	0.833728	1	1
81 - 90	0.762945	0.784325	0.824770	0.887690	1	1
91 - 100	0.837487	0.852821	0.88141	0.924926	1	1
101 - 110	0.897619	0.900928	0.920622	0.950162	1	1
111 - 120	0.939518	0.939518	0.947259	0.967073	1	1
121 - 130	0.968045	0.968045	0.968045	0.978305	1	1
131 - 140	0.987221	0.987221	0.987221	0.987221	1	1
141 - 150	1	1	1	1	1	1

(MM)	APRIL		MAY		JUNE	
=========	1-15	16-30	1-15	16-31	1-15	16-30
21 - 25	0.019418	0.019418	0.019418	0.019418	0.019418	0.019418
26 - 30	0.039728	0.039728	0.039728	0.039728	0.039728	0.039728
31 - 35	0.071047	0.071047	0.071047	0.071047	0.071047	0.071047
36 - 40	0.113870	0.113870	0.113870	0.113870	0.113870	0.113870
41 - 50	0.194565	0.194565	0.194565	0.194565	0.194565	0.194565
51 - 60	1	1	0.344265	0.344265	0.344265	0.344265
61 - 70	1	1	1	1	0.500875	0.500875
71 - 80	1	1	1	1	0.640696	0.640696
81 - 90	1	1	1	1	1	1
91 - 100	1	1	1	1	1	1
101 - 110	1	1	1	1	1	1
111 - 120	1	1	1	1	1	1
121 - 130	1	1	1	1	1	1
131 - 140	1	1	1	1	1	1
141 - 150	1	1	1	1	1	1

3

Table 2 (continued)

LENGTH INTERVAL (MM)	JULY		AUGUST		SEPTEMBER	
	1-15	16-31	1-15	16-31	1-15	16-30
21 - 25	0.019418	0.019418	0.019418	0.019418	0.019418	0.019418
26 - 30	0.039728	0.039728	0.039728	0.039728	0.039728	0.039728
31 - 35	0.071047	0.071047	0.071047	0.071047	0.071047	0.071047
36 - 40	0.113870	0.113870	0.113870	0.113870	0.113870	0.113870
41 - 50	0.194565	0.194565	0.194565	0.194565	0.194565	0.194565
51 - 60	0.344265	0.344265	0.344265	0.344265	0.344265	0.344265
61 - 70	0.500875	0.500875	0.500875	0.500875	0.500875	0.500875
71 - 80	0.640696	0.640696	0.640696	0.640696	0.640696	0.640696
81 - 90	0.753069	0.753069	0.753069	0.753069	0.753069	0.753069
91 - 100	1	1	0.837306	0.837306	0.837306	0.837306
101 - 110	1	1	0.897619	0.897619	0.897619	0.897619
111 - 120	1	1	1	1	0.939518	0.939518
121 - 130	1	1	1	1	0.968045	0.968045
131 - 140	1	1	1	1	1	1
141 - 150	1	1	1	1	1	1

(MM)	OCTOBER		NOVEMBER		DECEMBER	
	1-15	16-31	1-15	16-30	1-15	16-31
21 - 25	0.019418	0.01957	0.020041	0.020879	0.022387	0.025152
26 - 30	0.039728	0.039791	0.040616	0.041955	0.044277	0.048864
31 - 35	0.071047	0.071047	0.071952	0.073943	0.077427	0.083608
36 - 40	0.113870	0.113870	0.114601	0.117080	0.121355	0.129507
41 - 50	0.194565	0.194565	0.194565	0.197378	0.203051	0.212927
51 - 60	0.344265	0.344265	0.344265	0.344689	0.351187	0.36234
61 - 70	0.500875	0.500875	0.500875	0.500875	0.503294	0.513754
71 - 80	0.640696	0.640696	0.640696	0.640696	0.640696	0.646081
81 - 90	0.753069	0.753069	0.753069	0.753069	0.753069	0.753069
91 - 100	0.837306	0.837306	0.837306	0.837306	0.837306	0.837306
101 - 110	0.897619	0.897619	0.897619	0.897619	0.897619	0.897619
111 - 120	0.939518	0.939518	0.939518	0.939518	0.939518	0.939518
121 - 130	0.968045	0.968045	0.968045	0.968045	0.968045	0.968045
131 - 140	0.987221	0.987221	0.987221	0.987221	0.987221	0.987221
141 - 150	1	1	1	1	1	1

Yearling equivalent survival factors for salmon and steelhead were developed by DFG from marking experiments involving young-of-the-year (YOY) and yearling Sacramento River chinook salmon released in the Delta (Hallock 1979). These studies found that YOY contributed to the ocean fisheries at a rate of 0.96% while yearlings contributed at a rate of 5.58%. Therefore, the ratio 0.96/5.58 was used as the yearling equivalent survival factor of YOY chinook salmon and also for steelhead. For the purposes of this model YOY are considered any salmonid from 1 - 100 mm.

Species	Length Interval (mm)	Survival Rate [1]
CHINOOK	1 - 100	0.1724
SALMON	$\geq$ 101	1.0000
STEELHEAD	1 - 100	0.1724
	$\geq$ 101	1.0000

ESTIMATION PROCESS

Loss estimates are generated for each time interval, species, and size group. These are summed over time to estimate bimonthly and annual losses. Each year's replacement obligation is the average of the annual loss estimates for the previous five years.

EFFICIENCY OF FISH SCREENS

Parameters used to calculate screening loss are influenced by the size of the fish and the velocity of water passing through the fish screens. Regression equations predicting screening efficiencies for different length intervals of fish, based on primary water velocity (fps), were developed from data collected during a field testing program at the fish facility in 1970 -71:

Striped Bass

Length Interval (mm)

A) 21 - 30		Eff(A) = 0.935 - (0.149 x Velocity)
B) 31 - 40		Eff(B) = 0.806 - (0.0431 x Velocity)
C) $\geq$ 41		Eff(C) = 0.945 - (0.0717 x Velocity)

Chinook Salmon and Steelhead

Length Interval (mm)

A) 1 - 100		Eff(A) = 0.630 + (0.0494 x Velocity)
B) $\geq$ 101		Eff(B) = 0.568 + (0.0579 x Velocity)

[1] These estimates will be revised based on an evaluation of experimental results prior to estimating the 1986 annual replacement obligation.

NUMBER OF FISH ENCOUNTERING FISH SCREENS

The number of fish encountering the screens after crossing the forebay is calculated by dividing the number of fish salvaged by the screening efficiency (Eff):

$$\text{\#Encountering Screens} = \text{\#Salvaged} / \text{Eff}$$

PREDATION LOSS IN CLIFTON COURT FOREBAY

The number of fish entrained into the forebay is calculated by dividing the number of fish encountering the screens by the proportion of fish which survive crossing the forebay (1-P):

$$\text{\#Entrained} = \text{\#Encountering Screens} / (1-P)$$

HANDLING AND TRUCKING LOSSES

The number of fish released alive is calculated by multiplying the number of fish salvaged by the survival rates for the handling (1-H) and trucking (1-T) operations:

$$\text{\#Alive} = \text{\#Salvaged} \times (1-H) \times (1-T)$$

SYSTEM LOSS

The number of fish lost due to SWP operations is calculated as the difference between the number of fish estimated to have been entrained into the forebay and the number of fish released alive back into the Delta:

$$\text{System Loss} = \text{\#Entrained} - \text{\#Alive}$$

TABLE 3. VALUES OF PARAMETERS USED IN COMPUTATIONS. [1]

	Striped Bass	Salmon	Steelhead
Predation (P)	0.10	0.75	0.75
Handling (H)	0.20	0.47	0.47
Trucking (T) [2]	0	0	0

[1] These estimates will be revised based on an evaluation of experimental results prior to estimating the 1986 annual replacement obligation.

[2] Handling and trucking loss rates in this table are combined and listed under handling. When more information is available H and T values will be separated.

YEARLING EQUIVALENT LOSS

The number of fish loss as a result of entrainment into the SWP intake
is calculated by multiplying the system loss by the appropriate
yearling equivalent survival factor:
Yearling Equivalent Loss = System loss x Survival Factor

Annual losses are averaged over the previous five years to compute the
annual replacement obligation. For Part I, sufficient information is
available to compute five year means starting in 1986.

PART II   ESTIMATION OF THE YEARLING EQUIVALENT LOSS OF STRIPED BASS
           (LESS THAN 21 MM) LOST ANNUALLY DURING FISH SALVAGE
           OPERATIONS AT THE INTAKE TO THE CALIFORNIA AQUEDUCT

GENERAL APPROACH

The densities of striped bass eggs and larvae in Old River in the
vicinity of the intake to Clifton Court Forebay will be monitored
during the striped bass spawning period. Thoses densities will be
used to estimate the number of eggs and larvae entrained into the
forebay, based on the assumption that water drawn into the forebay
contains the mean densities of eggs and larvae measured in Old River.

All eggs and larvae drawn into the forebay are assumed to be lost.
The number lost is converted to yearling equivalents based on
values used by Baracco (1983).

Length Group	Survival Rate to Yearlings
Eggs	0.000047
3-6 mm	0.000124
7-10 mm	0.000338
11-14 mm	0.002509
15-18 mm	0.006415
19-20 mm	0.020414

Since direct measurements of egg and larval losses started in 1985,
the 1986 replacement obligation will be the 1985 loss estimate. Each
subsequent year through 1990 the obligation will be the average of
prior annual losses. Commencing in 1991, a five year moving average
will be used.

APPENDIX B

Potential mitigation measures are:

   I.   Projects in the Sacramento-San Joaquin Delta

        A.   Striped bass grow out facilities for fish salvaged
             at the J.F. Skinner Delta Fish Protective Facility.

        B.   Screening of large Delta agricultural diversions.

        C.   Striped bass hatchery production augmentation.

        D.   Sherman Island joint use facility cost sharing for
             intake screening and operation in all years.

        E.   Construction of a permanent Old River Barrier to
             provide fishery benefits in the south Delta.

  II.   Projects on the San Joaquin River

        A.   Augmentation of San Joaquin River tributary flows by
             water purchases or exchanges, or by water
             development or conservation projects.

        B.   San Joaquin River chinook salmon hatchery.

 III.   Projects on the Sacramento River

        A.   Mill Creek fish passage problem correction.

        B.   Provide assistance to the development and
             implementation of measures to correct problems at
             the Glenn-Colusa fish screen.

        C.   Flow augmentations on rivers tributary to the
             Sacramento River.