SAN JOAQUIN RIVER GROUP AUTHORITY
RECOMMENDATIONS ON THE RIVER FLOWS:
SAN JOAQUIN RIVER AT AIRPORT WAY BRIDGE, VERNALIS:
FEBRUARY—APRIL 14 AND MAY 16—JUNE

These recommendations are in response to the September 17, 2004 Revised Notice of Public Workshop in which the State Water Resources Control Board ("SWRCB") indicated that it would receive information and conduct discussions regarding "specific plan amendments or revisions" to the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary adopted on May 22, 1995 ("1995 WQCP") (p. 1). These recommendations respond to Topic 8, the San Joaquin River flow objectives as measures at Airport Way Bridge Vernalis, for the period February to April 14 and May 16 to June. Under this topic, the key issues the SWRCB wanted discussed were:

> Should the SWRCB amend the flow objectives for the San Joaquin River at Airport Way Bridge, Vernalis, for February through April 14 and May 16 through June in the Water Quality Objectives for Fish and Wildlife Beneficial uses (Table 3 of the 1995 Plan)? How should the objectives be modified and what are the scientific and legal arguments in support of and against modification?
>
> Should the SWRCB change the methodology of r determining the applicable San Joaquin River flow objectives that currently are determined by reference to the required Delta Outflow objective? How should the methodology for determining required flows be modified and what are the scientific and legal arguments in support of and against modification?

## **February to April 14 and May 16 to June Flows**

The San Joaquin River Group Authority ("SJRGA") recommends that the SWRCB abolish the flow objective for the San Joaquin River at Vernalis from February to April 14 and May 16 to June because the objective is not based on sound science, it is based on erroneous assumptions, and it is not necessary for the protection of salmon or for endangered species. The SJRGA also recommends that the flow objectives not be increased because to do so would trigger the termination of the San Joaquin River Agreement ("SJRA") and the Vernalis Adaptive Management Plan ("VAMP").

### **Lack of Sound Science**

The flow objective, rather than being based on science, was instead based upon on a the US Fish and Wildlife Service's San Joaquin River flow recommendations to protect Delta smelt from the operations of the Central Valley Project ("CVP") and the State Water Project ("SWP").

Initially, the focus was on the flows needed to protect San Joaquin River salmon smolts. In fact, there was no evidence submitted on San Joaquin River flows needed to protect any other species. The Environmental Report (Environmental Report for the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (May 1995)) ("ER") prepared for the 1995 WQCP identifies four alternatives for San Joaquin River flows to protect salmon. These are: a San Joaquin River Salmon Index proposed by the U.S. Environmental Protection Agency ("USEPA"), a SWRCB staff proposal based on various recommendations proposed by workshop participants, a recommendation by the California Department of Fish and Game ("DFG"), and the flows agreed to in the 1994 Bay-Delta Principles for Agreement.

The USEPA had previously adopted salmon smolt survival criteria to protect salmon smolts and other migratory species in the Delta. The USEPA derived target values from the modeled values associated with protective measures recommended by USFWS, revised to provide additional protection in drier years. The USEPA postulated that its criteria would improve wet year survival by a factor of 1.8 and dry year survival by a factor of 4. Minimum flow requirements were to be maintained as specified in Table 1.

Table 1
USEPA Salmon Smolt Survival Criteria

| Parameter | San Joaquin Water Year Index | Criterion (cfs) | Minimum Flow |
|---|---|---|---|
| Vernalis Flow (cfs) Apr 15-May 15 | ≤ 2.5 | 832.52 + 1749.08*SJWYI | 5,205 |
| | > 2.5 and < 4.2 | -1972.43 + 2864.82*SJWYI | 5,205 – 10,060 |
| | ≥ 4.2 | 10,000 | 10,000 |

The SWRCB staff proposal was based on a combination of recommendations from various workshop participants including the USFWS. For the protection of Chinook salmon during the peak of smolt outmigration, the staff recommended that flows on the San Joaquin River at Vernalis for four weeks from April 17 through May 14 had to be at least 8,000 cfs in wet years, 7,000 cfs in above normal years, 6,000 cfs in below normal years, 5,000 cfs in dry years, and 4,000 cfs in critical years.

DFG's recommendation was similar the SWRCB staff recommendation in that it required a four week smolt outmigration flow. The DFG's recommendations were higher in wet years and lower in dry years than the SWRCB staff proposal. DFG recommended that for the protection of fall run chinook salmon, average San Joaquin River flows at Vernalis from April 15 to May 15 should be greater than 10,000 cfs in wet years, 8,000 cfs in above normal years, 6,000 cfs in below normal years, 4,000 cfs in dry years, and 2,000 cfs in critical years.

Except for the proposed flows in the Principles for Agreement, none of the alternatives evaluated in the ER included flows on the San Joaquin River outside of the mid-April to mid-May pulse flow period. Furthermore, no party had even argued for minimum flows on the San Joaquin River beyond the one-month pulse flow period. It was not until after the Principles were agreed to and presented publicly for the first time that the concept of maintaining a minimum base flow from February through June on the San Joaquin River was discussed as an alternative to improve conditions for salmon smolts in the San Joaquin River. Even the flows themselves had been discussed publicly prior to the Principles for Agreement.

The alternatives in the ER were based at least based on some science (albeit not good science) and from studies conducted on the San Joaquin River and its tributaries over many years. The base flows in the Principles for Agreement were, on the other hand, agreed to by a handful of individuals representing export interests and the state and federal government. No one representing the San Joaquin River was present during the discussions, nor were any individuals knowledgeable in fishery science included in the negotiations.

Clearly, the purpose of the recommended flows in the Principles for Agreement was for the protection of *Chinook salmon*. The flow recommendations in the Principles for Agreement can be found in Attachment B to the Agreement, which is entitled "Narrative Criteria for Chinook Salmon in the Sacramento and San Joaquin Rivers." The proposal described in Attachment B requires that (1) water quality conditions be maintained, together with other measures in the watershed, sufficient to achieve a doubling of production of chinook salmon, consistent with the mandates of State and Federal law; (2) that the SWRCB assign responsibility for the San Joaquin River flows, together with other measures in the watershed sufficient to meet the narrative criteria, among the water right holders in the watershed; and (3) that the following flows be maintained:

| Year Type | Feb-June Flows (cfs)* | April-May Pulse Flows (cfs)* |
|---|---|---|
| C | 710-1,140 | 3,110-3,540 |
| D | 1,420-2,280 | 4,020-4,880 |
| BN | 1,420-2,280 | 4,620-5,480 |
| AN | 2,130-3,420 | 5,730-7,020 |
| W | 2,130-3,420 | 7,330-8,620 |

*higher flows provided when the 2 ppt isohaline (x2) is west of Chipps Island

The agreement also calls for a barrier to be installed at the head of Old River during the April-May pulse flow. The Bureau of Reclamation is responsible for providing the flows during an interim 3-year period in accordance with the biological opinion for Delta smelt.

Lacking any scientific basis whatsoever[1], the Principles for Agreement recommended San Joaquin River base flows that were essentially pulled from a hat and merely a fixed percentage of the amount of Delta outflow required to meet the minimum Delta outflow

[1] Ten years after agreement was reached on the Principles for Agreement, the biological intent of this objective was identified as the flows necessary to maintain a fractional component of the X2 Chipps Island objective from the San Joaquin Basin and South Delta channels (USBR, Long Term Central Valley Project Operations Criteria and Plan CVP-OCAP (June 30, 2004), p. 2-15) ("OCAP").

(lower objectives) or to maintain X2 at Chipps Island (higher objectives)[2] as shown in Table 2. These flows first appeared and are identical to the San Joaquin River protection measures identified in the 1995 Delta smelt biological opinion. (USFWS, Formal Consultation and Conference on Effects of Long-term Operation of the Central Valley Project and the State Water Project on Threatened Delta Smelt, Delta Smelt Critical Habitat, and Proposed Threatened Sacramento Splittail, March 6, 1995, p. 17) ("Biological Opinion").

Table 2
San Joaquin River Flow as a Percentage of Delta Outflow

| Water Year Type | % of Delta outflow | Min. Delta outflow (7,100 cfs) | X2 at Chipps Island (11,400 cfs) |
|---|---|---|---|
| C | 10% | 710 | 1,140 |
| D | 20% | 1,420 | 2,280 |
| BN | 20% | 1,420 | 2,280 |
| AN | 30% | 2,130 | 3,420 |
| W | 30% | 2,130 | 3,420 |

Another reason why the flow objective should be abolished is that the method for determining the flow objective for a particular year is based on conditions in the Sacramento River watershed. Because the San Joaquin River base flow objectives are simply a percentage of Delta Outflow, and Delta Outflow is driven primarily by runoff on the Sacramento River, the Sacramento River flow heavily impacts the San Joaquin River flow objective. Flows on the Sacramento River are many times more than the San Joaquin River and often hydrologic conditions in the Sacramento Basin can be entirely different than in the San Joaquin Basin.

Table 3 compares water year types on the Sacramento River and the San Joaquin River for the period 1994-2004. Two points are evident from this chart. One is the differences in the magnitude of flows on the Sacramento River as compared to the San Joaquin River even in the same water year types. Second, it is important to note the number of years where drier conditions prevailed on the San Joaquin River. During the 21 years, there were 6 years in which the index on the San Joaquin River was lower than on the Sacramento River. There was only one year, 1993, in which conditions in the San Joaquin River Basin were wetter than in the Sacramento Valley.

Table 3
Sacramento-San Joaquin Water Year Type Comparison

| | **Sacramento Valley** | | | **San Joaquin Valley** | | |
|---|---|---|---|---|---|---|
| **WY** | **WYsum** | **Index** | **Yr-type** | **WYsum** | **Index** | **Yr-type** |
| 1984 | 22.35 | 10.00 | W | 7.13 | 3.69 | AN |
| 1985 | 11.04 | 6.47 | D | 3.60 | 2.40 | D |

[2] Interestingly, there is no corresponding San Joaquin River flow objective when X2 is at Port Chicago further evidencing the lack of any scientific basis for the flow objective.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1986 | 25.83 | 9.96 | W | 9.50 | 4.31 | W |
| 1987 | 9.27 | 5.86 | D | 2.08 | 1.86 | C |
| 1988 | 9.23 | 4.65 | C | 2.48 | 1.48 | C |
| 1989 | 14.82 | 6.13 | D | 3.56 | 1.96 | C |
| 1990 | 9.26 | 4.81 | C | 2.46 | 1.51 | C |
| 1991 | 8.44 | 4.21 | C | 3.20 | 1.96 | C |
| 1992 | 8.87 | 4.06 | C | 2.58 | 1.56 | C |
| 1993 | 22.21 | 8.54 | AN | 8.38 | 4.20 | W |
| 1994 | 7.81 | 5.02 | C | 2.54 | 2.05 | C |
| 1995 | 34.55 | 12.89 | W | 12.32 | 5.95 | W |
| 1996 | 22.29 | 10.26 | W | 7.22 | 4.12 | W |
| 1997 | 25.42 | 10.82 | W | 9.51 | 4.13 | W |
| 1998 | 31.40 | 13.31 | W | 10.43 | 5.65 | W |
| 1999 | 21.19 | 9.80 | W | 5.91 | 3.59 | AN |
| 2000 | 18.90 | 8.94 | AN | 5.90 | 3.38 | AN |
| 2001 | 9.81 | 5.76 | D | 3.18 | 2.20 | D |
| 2002 | 14.60 | 6.35 | D | 4.06 | 2.34 | D |
| 2003 | 19.18 | 8.18 | AN | 4.88 | 2.82 | BN |
| 2004 | 16.05 | 7.50 | BN | 3.80 | 2.21 | D |

source: http://cdec.water.ca.gov/cgi-progs/iodir/WSIHIST

The SWRCB needs to recognize that the San Joaquin River Basin is significantly different from the Sacramento River Basin. As a result of these differences, it makes no sense to link the San Joaquin River flow objectives with Sacramento River hydrological conditions. Among the difference are:

- The Sacramento River Basin is primarily a *rain-fed system*, whereas the San Joaquin River Basin is a *snow-fed system*. This results in a significantly different runoff pattern which was recognized in the development and adoption of a separate index, the 60-20-20 index, for the San Joaquin system.

- The unimpaired and impaired flows for the Sacramento River Basin are *substantially greater* than for the San Joaquin River Basin. For example, for years 1921 to 1993 the average unimpaired San Joaquin River flow was approximately 16% of the total Delta inflow. San Joaquin River average measured flow was approximately 12% of total Delta inflow (1956-1993).

- A substantial portion of the Sacramento River flows to the Delta for *export*, whereas most of the San Joaquin River *is used within the basin or is exported out of the basin.*

- Water is *imported* into the Sacramento River Basin from the Trinity River, whereas approximately 1,500,000 acre-feet of water is *exported* out of the San Joaquin Basin on an annual basis.

- Only three of the four rivers used to calculate the San Joaquin River Index actually flow to the Delta on a regular basis.

**Based on Erroneous Assumptions**

Even had there been a sound scientific basis for the Vernalis flow objective, the objective should be abolished because it was based on erroneous assumptions. The objective was an illusory objective, as the SWRCB was fully aware when the objective was adopted and using the tools available at the time, that the objective could not be met by New Melones alone.

When the SWRCB modeled the impacts of the 1995 WQCP for the ER using the model known as DWRSIM, New Melones was used to provide the water to meet the flow requirements in the proposed alternative. In years when there was insufficient water to meet the flow objectives from New Melones, the SWRCB merely assumed that there would be "additional water from unspecified sources." (ER, p. VII-3) The amounts of "phantom" water range from 111 TAF in Critical years to 458 TAF in Above Normal years. (*Id.*, Fig. VII-10)

In responses to comments, the SWRCB explained how the analysis met the 1995 WQCP flows without identifying where the additional water needed would come from:

> "For modeling purposes, the SWRCB staff requested the DWR to assume that San Joaquin River flow requirements would be met by releases from New Melones Reservoir. If there was insufficient water to meet the requirements from New Melones, the DWR was requested to identify the additional water required. This request was made in order to identify the total amount of water needed to meet the objectives. Once the objectives are adopted, the SWRCB intends to use its regulatory authorities to ensure that the objectives are met." (*Id.*, Appendix II, p. 46)

> "Any flow requirements in excess of New Melones capacity are assumed to be provided by unspecified sources. No inference should be made from these assumptions regarding distribution of water supply impacts to specific water right holders. The SWRCB has not determined who will share in that responsibility, or how the impacts will be allocated….To clarify this point, statements in Chapter VII and Chapter XI have been amended to state that additional water will come from unspecified sources." (*Id.*, p. 73)

A recent update of the CALSIM II model indicates that New Melones does meet the Vernalis flow objective at all times. (See SJRG-EXH-07) Table 5 from SJRG-EXH-07 shows the simulated Vernalis non-pulse flow objective for the February through June period. Noncompliance with the standard occurred in 30 years out of 73 years and in 71 months out of 365 months. However, in 64 of those months in which a violation occurred, the assumed operation of New Melones under the New Melones Interim Plan of Operations ("IPO") did not allow flow releases for the Vernalis flow objectives, regardless of whether water was available in New Melones or not. Five of the months had violations when Goodwin was already releasing its maximum1,500 cfs (except for flood control purposes).

**No Impacts to Salmon or Endangered Species**

There is little correlation between flow at Vernalis and either the travel time through the Delta or the number of marked salmon smolts that are recaptured. Several workshop participants have suggested that flows through the Delta have a major effect on the survival of emigrating smolts, and there are several conceptual reasons why this may be true: increased flows might speed passage through the Delta and thus decrease exposure to predators and to poor water quality; increased flows might reduce temperatures that otherwise might be high enough to decrease survival; increased flows might dilute pollutants; and increased flows at Vernalis necessarily result from increased flows on the tributaries, which may have the same benefits as hypothesized for them in the Delta.

However, there are two good reasons why flows at Vernalis, and hence through the Delta, might not have much effect on smolt travel time and survival. First the flow effects of tidal action within the Delta are very pronounced. As the smolts move into the Delta, the effects of San Joaquin inflow diminish and the tidal effects become dominant. In the San Joaquin River near Columbia Cut and the mouth of Middle River, typical summer flows swing from roughly 50,000 cfs westward to 50,000 cfs eastward, and back again, each day.[3] At the confluence of the Sacramento and San Joaquin rivers, the typical daily excursion in each direction exceeds 300,000 cfs.

Second, as discussed below flow from the San Joaquin River is a relatively minor component of the total Delta freshwater inflow. Inputs from the Sacramento River and other rivers have a much greater effect on within-Delta flow dynamics.

Initially, it seems intuitive that increasing Delta inflows from the San Joaquin River would decrease travels times for salmon smolts moving through the Delta, and thereby improve salmon smolt survival. The data show otherwise. As pointed out in Baker and Morhardt[4], Delta inflow has little if any effects on smolt travel time. This is probably because of the tidal influences in that portion of the Delta. However, salmon smolt size seems to be a better indicator of travel time—the larger smolts are able to swim faster and move out of the Delta faster than their smaller siblings.

Recent analyses by Stillwater Sciences[5] confirm that this relationship is still

[3] Department of Water Resources. Sacramento-San Joaquin Delta Atlas (1993).

[4] Baker, Peter F. and J. Emil Morhardt. Survival of Chinook Salmon Smolts in the Sacramento-San Joaquin Delta and Pacific Ocean. In Contributions to the Biology of Central Valley Salmonids. Fish Bulletin 179, Vol. 2 (2001).

[5] Baker, Peter. Statistical methods for estimating time travel and survival applied to groups of Chinook salmon released near the head of Old River and Jersey Point and recovered in Chipps Island trawls (February 2005).

true—there is no meaningful relationship between travel time and flow for the tagged groups (see Figure 1). However, there are very clear relationships between travel time and smolt size (Figure 2). The relationships with smolt size and travel time suggest that smolts rely more on active swimming than on passive transport mechanisms.

The USBR recently completed Endangered Species Act consultation with NOAA Fisheries and the Fish and Wildlife Service relating to its Long Term Central Valley Project Operations Criteria and Plan (OCAP).

The Biologic Opinion was based on the results of modeling studies prepared by USBR using the CALSIM II study "OCAP_2001D10A_TodayEWA_012104". That study used the existing IPO—in other words, it allocated water for meeting Bay-Delta purposes only when New Melones storage plus forecasted March-September inflow exceeded 2.5 million acre-feet. All other operations on the San Joaquin River remained the same as they are. Accordingly,

> "The IPO only supports meeting the D-1641 Vernalis Base flow standards from Stanislaus River water resources when the water supply conditions are determined to be in the "High" or "Medium-High" IPO designation, and then are limited to 75,000 acre-feet of reservoir release." (OCAP, p. 3-41)

The result of this study was that New Melones was unable to meet the Bay-Delta flow objectives in all years. Out of 73 years of simulation, the flow objective was not met in 16 months: February (4), March (4), and June (8). The flow objectives for the first half of April and last half of May in many years may also have gone unmet, but do not show up because of the monthly time step used in the model. There were a total of 13 years out of 73 in which the flow objective was not met in at least one month. There were only 2 months in which the flow objective was met as a result of New Melones releases. Despite the inability to meet the flow objective, the biological opinions found "no jeopardy" to endangered salmon, steelhead, Delta smelt—all species that presumably require the February through June flow. In other words, the no jeopardy opinion was based on flows *already present in the system* and without any additional or supplemental releases (except for the 2 months).

Even though the model indicates that the San Joaquin River was not always meeting its "share" of Delta outflow, the Delta outflow objective was met at all times. This was confirmed by a representative of the U.S. Fish and Wildlife Service at the January 12, 2005, workshop to review the 1995 WQCP. In that workshop, the representative stated that the biological opinions prepared by Fish and Wildlife Service and NOAA Fisheries assumed that X2 was being met at all times and that X2 was considered as a baseline in the biological opinions.

**Termination of the San Joaquin River Agreement**

The 1994 Principles for Agreement required that for the three year period that the Principles for Agreement would be in effect, the Bureau of Reclamation would meet the Vernalis flows. The Bureau of Reclamation agreed to meet these flows, and the agreement was signed by the Secretary of the Interior.

The Bureau of Reclamation also agreed to continue meeting the base flows for the 10-year duration of the SJRA. The Bureau of Reclamation signed the SJRA on April 12, 1999, and agreed to meet the "San Joaquin River Portion of the 1995 WQCP objectives." (SJRA, paragraph 2.1.1, 10.1.1.) The "San Joaquin River Portion" includes both the San Joaquin River flows at Vernalis and the San Joaquin River Basin share of the Delta Outflow. (SJRA, paragraph 3.4.) Furthermore, the SJRA provides that, in the event the agreement is terminated, the Bureau of Reclamation will continue to meet the San Joaquin River flow objectives for a two year period or until the SWRCB can issue a new order implementing the flow objectives and assigning responsibilities as specified in the order. (SJRA, paragraph 10.1.1.)

The parties to the SJRA then presented the agreement to the SWRCB, which was accepted by the SWRCB in Decision 1641. As previously agreed, responsibility for the implementation of the San Joaquin River base flow objectives was assigned by the SWRCB in D-1641 to the Bureau of Reclamation. (D-1641, p. 161.)

D-1641 requires that while the SJRA is in effect, the Bureau of Reclamation is to ensure that the water quality objectives for fish and wildlife beneficial uses set forth in the Table of the 1995 WQCP are met with the exception of the April-May VAMP pulse flow. (Id.) D-1641 does not specify how USBR is to comply with this order. If the SJRA is dissolved before it expires, the Bureau of Reclamation is responsible for meeting the San Joaquin River flow objectives until the SWRCB can assign responsibility for those flows. (Id., p. 162.)

Some participants have argued that the upstream tributaries should be required to meet the base flows specified in the 1995 WQCP. Such a requirement would terminate the San Joaquin River Agreement. Section 13.1 of the agreement provides that "Any action which materially impairs, reduces or otherwise adversely affects the water supply used or relied upon by (a) any member of the SJRGA; (b) any of the agencies comprising a member of the SJRGA; or (c) the CCSF will be grounds for that Party's withdrawal from this Agreement, provided the remaining Parties can still satisfy this Agreement's requirements for water." Termination of the SJRA then requires that the SWRCB convene a hearing to allocate responsibility for meeting the San Joaquin River flow objectives and that the USBR continue to meet the objectives for a period of two years or until the SWRCB has conducted its hearing. (SJRA, 10.1.1)

**San Joaquin River's Contribution to Delta Outflow**

Studies performed by Flow Science, Inc. for the SJRGA confirm that in reality very little of the San Joaquin River actually contributes to delta outflow (see SJRG-EXH-04). In fact, without the head of Old River Barrier in place, most of the San Joaquin River ends up at the CVP and SWP export pumps where it is used to maintain exports as opposed to contributing to the 1995 WQCP fish and wildlife objectives.

Flow Science monitored major export locations to determine where San Joaquin River water leaves the Delta. Results are shown in Figures 12 and 13 from SJRG-EXH-04. For water year 1964, approximately 78% of the water that flowed down the San Joaquin River past Vernalis exited the Delta through the CVP and SWP export pumps. Approximately 1 percent of San Joaquin River left the Delta through Rock Slough Pumping Plant #1. The remaining SJR water, approximately 21%, represents in-Delta consumptive use, evaporation, net Delta outflow, and water which remained in the Delta beyond the study period. In water year 1988, San Joaquin River water fate was as follows (percentages are approximate): 62% exports, 1% Rock Slough Pumping Plant #1, and 37% remainder.

## May 16 to June Flows

In the event the SWRCB determines to retain the Vernalis flow objective, it should abolish that portion of the flow objective from May 16 through the end of June. The flows during that time of the year are not needed to protect outmigrating salmon smolts, nor are they necessary to protect other aquatic species in the Delta.

### Temperature

There have been suggestions that more flow is needed in late May and June to maintain optimum temperatures in the San Joaquin River for outmigrating smolts. Ambient air temperatures during this time are relatively high which results in temperatures in the lower San Joaquin River exceeding optimal temperatures for salmon smolt survival.

San Joaquin River water temperatures cannot be lowered with reservoir releases except at a tremendous cost in water supplies. The issue of maintaining temperatures in the lower San Joaquin River for the benefit of salmon has been reviewed on previous occasions by the SWRCB. Testimony before the SWRCB in 1990 showed why this was not feasible:

> "The most important consideration is that there appears to be no way that you can implement the objective.
>
> "The U. S. Bureau of Reclamation has done some modeling of temperature and in those modeling tests, there's indication that the quantities of cold water that would have to be released from storage to really get a change in temperature in the Delta would be huge and probably impossible to make. And the reason is that, first of all, it's unlikely that there's enough cold water in storage; and secondly, it's very likely that the released water would be warmed to essentially ambient air temperature by the time it reaches Sacramento or Freeport, or whatever other Delta station you are talking about.
>
> "There are other alternatives that have been talked about from time to time, like planting all the trees back along the river to create shade and keep the temperature down in the river or controlling some of the warm

agricultural return. There isn't very good evidence that either one of these would be any more effective or practical than the releases of water from storage."

(Testimony of E. Huntley, DWR, before the SWRCB, February 20, 1990)

The SWRCB recognized this fact when it set a narrative temperature objective for salmon in the 1991 WQCP for the Bay-Delta. The standard requires that "the daily average water temperature shall not be elevated by controllable factors above 68 deg. F." (1991 WQCP, Table III-3) The SWRCB concluded:

> Based on the record in these proceedings, controlling temperature in the Delta utilizing reservoir releases does not appear to be reasonable, due to the distance of the Delta downstream of reservoirs and uncontrollable factors such as ambient air temperature, water temperatures in the reservoir releases, etc. For these reasons, the State Board considers reservoir releases to control water temperatures in the Delta a waste of water therefore, the State Board will require a test of reasonableness before consideration of reservoir releases for such a purpose. (*Id.*, fn. 4)

Various studies have identified water temperatures of 68°F or more as stressful to Chinook salmon smolts (see SJRGA, 2004 Annual Technical Report (January 2005), p. 46) One study has concluded that optimal smolt survival occurs at <54°F. Smolt hormone levels are impaired at >54°F. Smolts reared in temperatures >64°F are not optimally prepared for seawater survival. Therefore, the optimal cut-off point should be <54°F, with sub-lethal >54<64°F, and lethal >64°F (Marston, Dean. Stanislaus River Water Temperature Criteria Development and Application for Chinook Salmon and Steelhead, 2003).

The infeasibility of controlling water temperatures from May 16 through the end of June in the San Joaquin River can be demonstrated using the Stanislaus River temperature model. Even though the Stanislaus River is the closest to Vernalis, incremental releases of 2,500 cfs are needed to lower the San Joaquin River water temperature to 66° F, still above the lethal temperature limit of 64° F. Incremental flows of 1,500 to 1,750 cfs are needed to bring the temperature down to the stressful level of 68° F. Figure 3 shows incremental releases of up to 2,500 cfs and the subsequent affect on Vernalis water temperature. The various lines assume October 1 starting storage at New Melones ranging from 620,000 to 1,500,000 acre-feet. The impact to New Melones storage can be seen in Figures 4 to 6. The impact of making such releases also has significant effects during other times of the year. For example, water released in May and June to control San Joaquin River water temperatures has a significant effect on September water temperature in the Stanislaus River below Goodwin Dam (Figure 7).

The inability of the Stanislaus River to effectively lower San Joaquin River temperatures was also recently analyzed by S. P. Cramer and Associates (Fuller, Andrea, S. P. Cramer and Associates, Memo to Stanislaus River Fish Group re Supplemental Flow Proposed for Late May, May 4, 2004). Their analysis of post-VAMP supplemental

Stanislaus River flows showed that the additional flows had little impact on Vernalis water temperatures. Overall average temperatures from 2001 through 2003 at Vernalis between May 15 and May 31 ranged from 67.8 °F to 71.2 °F, whereas temperatures at Knights Ferry ranged from 53.6 °F to 54.8 °F (Figure 8). Despite Stanislaus River supplemental flow releases from May 28 through June 30, 2003, average daily temperatures at Vernalis remained above 67.5 °F (Figure 9).

Of course, releases could also be made on the Tuolumne and Merced rivers. However, due to the distances involved and the ambient air temperatures during that time of the year such releases are not likely to have any significant effect on Vernalis water temperatures.

Once salmon smolts have left the tributaries, they face increasing temperatures lower down in the system especially in the Delta. This is particularly true for those smolts passing through the Delta in late May and June. It makes no sense and is unreasonable use of water to require high releases of water from May 16 to June 30 when temperatures downstream have already reached critical levels.

As part of the VAMP program, water temperatures have been monitored during the VAMP study using individual computerized temperature recorders (e.g., Onset Stowaway Temperature Monitoring/Data Loggers). Water temperature measurements are taken at locations along the longitudinal gradient of the San Joaquin River and interior Delta channels between Durham Ferry and Chipps Island—locations along the migratory pathway for the juvenile Chinook salmon released as part of these tests (SJRGA, Appendix C-1).

During the 2004 VAMP, temperatures in the tributaries were generally favorable for smolts, but temperatures in the lower San Joaquin River often exceeded 68°F. Even at Jersey Point, temperatures exceeded 68°F throughout May (SJRGA, Figures 5-1 to 5-5). While average temperatures in 2004 were generally higher than previous VAMP years (except for 2001), a review of temperature monitoring shows that temperatures in excess of 68°F were consistently exceeded in the lower San Joaquin River and Delta (SJRGA, Appendix D-8, D-8a). It is highly doubtful that optimal temperatures in the San Joaquin River below Vernalis could be achieved with reservoir releases.

A peer review panel reviewing water temperature objectives for the lower Stanislaus River concluded that there is limited information with regard to anadromous fish behavior and conditions in the lower San Joaquin River. The panel was of the opinion that Stanislaus River temperatures are more conducive to anadromous fish than the San Joaquin River. (Peer Review of Water Temperature Objectives Used as Evaluation Criteria for the Stanislaus—Lower San Joaquin River Water Temperature Modeling and Analysis, Task 9, CBDA Project No.: ERP-02-P28, July 29, 2004)

**Most Salmon Smolts Have Left the System**

The 1995 WQCP requires that the base flow continue from the end of the VAMP (usually around May 15) to June 30. (1995 WQCP, Table 3) This flow objective is not necessary because most of the salmon smolts have left the tributaries by late May.

Rotary screw trap data on the tributaries confirm that very few smolts are emigrating at that time. Most have already left the watershed. For example, S. P. Cramer and Associates analyzed data from studies performed on the Stanislaus River in response to a proposed supplemental flow release on the Stanislaus River from May 14 to May 24, 2004. The data suggest that during the previous 7 years of rotary screw trap sampling, S. P. Cramer and Associates found that 75% of the salmon juveniles migrate out of the river by May 7. (Fuller, at p. 2) They also found that late May pulse flows provided no apparent migration stimulus to young salmon. (*Id.*) Further evidence of the timing of outmigrating salmon smolts in the Stanislaus River can be seen in Figure 10 shows the results of rotary screw trapping at Caswell on the Stanislaus River from 1995 to 2004. As seen in these graphs, the timing of salmon smolt outmigration appears to respond to changes in flow.

Similarly, Figures 11 shows the results of rotary screw trapping at two locations on the Merced River from 1999 to 2004. By late May and June, most of the smolts have left the Merced River. Results of rotary screw trapping of wild salmon on the Tuolumne River from 1995 to 2004 can be seen in Figure 12.

Further evidence that most of the smolts have left the tributaries by late May can be seen in the observed salmon salvage at the CVP and SWP Delta fish facilities. Figures 13 to 16 are a series of scatter diagrams that show salmon salvage data for years 2001-2004. Comparatively few salmon are salvaged after May 31. Of particular note is the appearance of salmon smolts from the Merced River Fish Facility coinciding with releases under the VAMP program. Figures 17 through 19 are taken from the 2002, 2003, and 2004 SJRGA Annual Technical Report for the VAMP and show the combined salmon loss and salvage at the CVP and SWP Delta fish facilities for the years 2002 to 2004. When viewed on a monthly basis, most of the salvage and loss occurs during the February to May time period (Figure 20).

The annual Mossdale trawl conducted by DFG also provides some indication of Chinook salmon outmigration from the San Joaquin River tributaries. Although the trawl is not operated throughout the entire outmigration period or on weekends, one can clearly see that the majority of the catch occurs in April and May. Some of the catch is the result of the release of hatchery-reared fish into the Merced and Tuolumne rivers. Figure 21 shows the Mossdale trawl results from 2000 through 2004.

**<u>Flows Do Not Protect Delta Smelt</u>**

While most salmon smolts have already left the system, Delta smelt are present in the Delta. The May 16 through June flow requirement was originally a requirement in the Delta smelt biological opinion. The purpose of this flow, according to USFWS, is to assist in transporting Delta smelt larvae to suitable habitat in Suisun Bay. (Biological Opinion, p. 33) This opinion was not issued in response to any upstream San Joaquin River operation, but to respond to a request for formal consultation on the long-term operation of the SWP and CVP. The San Joaquin river transport requirement was viewed as a method for providing sufficient transport flow for Delta smelt while allowing for continued export from the SWP and CVP. The opinion does not address the lack of San Joaquin River flows *by themselves* as a reason for the needed transport flows.

A review of the 20mm townet survey performed by DFG shows that by late May and June the Delta smelt have moved to the Sacramento River, western Delta and Suisun Bay. Figure 22 shows the location of smelt sampled in the early June 20 mm townet survey for the years 1996 through 2004. Few if any are found in the San Joaquin River, especially in the south Delta where the May 16-June San Joaquin River flow objective would have an affect.

Once the head of Old River barrier is removed following the VAMP, San Joaquin River flows are once again permitted to freely flow down Old River in the direction f the SWP and CVP export pumps. Even if only 50% of the flow is diverted into Old River in a wet year when the flow objective is at 3,420 cfs, there remains just 1,710 cfs in the San Joaquin River. By the time this flow reaches the central Delta, the effect of tidal action and export operations has eliminated any noticeable downstream flow. The added flows on the San Joaquin River do nothing to transport Delta smelt—instead they merely allow the SWP and CVP exports to continue pursuant to guidelines issued in the USFWS biological opinion.

The effect of the barriers can be clearly seen in Figures 14 and 15 from Flow Science (SJRG-EXH-04). These two figures show the percentage of San Joaquin River water that flows down Old River and the percentage of San Joaquin River water that remains in the channel and flows towards the ship channel. With all of the barriers in place, nearly all of the San Joaquin River flows north. When the barriers are removed, approximately 50% of the San Joaquin River flows down Old River into the southwest Delta region. Figure 14 of SJRG-EXH-04 shows that when the HORB is open and the agricultural barriers remain in place and are configured as simulated here, very little water flows down Old River.

## Proposed Vernalis Flow Objective

The revised CALSIM II model was used to develop a Vernalis flow objective that more closely tracks hydrologic conditions within the San Joaquin River basin rather than being dependent upon Sacramento River hydrological conditions. In the event that the SWRCB chooses to retain the Vernalis flow objective, the SJRGA recommends that it adopt the flow objective as presented herein.

The SJRGA recommended alternative Vernalis flow objective consists of two-component determination based on the state of the New Melones Index and the state of the SJRBI. The SJRGA recommends using New Melones storage because New Melones is closest to Vernalis and is used to meet the San Joaquin River salinity and flow objectives. Table 4 illustrates the parameters of the determination. The flow objective applicable to each month during February through June is established by first determining which column of flow objectives applies for the month, either the high flow column when the New Melones

Index is greater than 2,500 TAF, or the low flow column when the New Melones Index is 2,500 TAF or less. The flow objective is established by the SJRBI.

Table 4
Alternative Vernalis Flow Objective Determination

| | **Vernalis Flow Objective (cfs)** | |
|---|---|---|
| **SJRBI** | **NM Index < 2,500 TAF** | **NM Index > 2,500 TAF** |
| 1 — W | 2000 | 2500 |
| 2 — AN | 2000 | 2500 |
| 3 — BN | 1250 | 1750 |
| 4 — D | 1250 | 1750 |
| 5 — C | 700 | 1000 |

Table 14 from SJRG-EXH-07 shows the results for the determination of the alternative Vernalis flow objective post-processing the results of the alternative Vernalis water quality objective scenario. The table illustrates the shortages in compliance with the alternative objective. These shortages (less than 33 TAF in a month) could be remedied by supplemental releases from New Melones Reservoir.