San Joaquin River Group Authority
Observations and Comments on Salmon Narrative Objective

Introduction

In the 1995 Water Quality Control Plan for the Bay-Delta Estuary, the Salmon Narrative Objective provides,

> "Water quality conditions shall be maintained, together with measures in the watershed, sufficient to achieve a doubling of natural production of Chinook salmon from the average production of 1967-1991, consistent with the provisions of State and federal law."

Salmon production is the sum of the recreational and commercial catch plus escapement. Cal. Fish and Game Code §6911. Recreational and commercial catch occurs primarily in the ocean or in rivers upstream of the Delta. Escapement is the number of adult spawners returning to rivers upstream of the Delta. By focusing on the doubling of natural production, the Salmon Narrative Objection improperly focuses salmon protection away from salmon survival through the Bay-Delta Estuary and instead focuses attention primarily on the number of returning adult spawners and secondarily on the number of adults in the ocean catch – areas outside the Bay-Delta Estuary.

By focusing on salmon production, evaluations of the Salmon Narrative Objective involve comparisons of San Joaquin versus Sacramento salmon production and comparison of the 1967-1991 escapements with later escapements within each basin. Many of those comparisons appear to be based upon the following unstated assumptions or premises:

1. The San Joaquin River Basin is just a smaller Sacramento River Basin and is subject to the same Delta mortality factors.

2. San Joaquin Basin reservoirs can store and then regulate and release flows in Wet and Above Normal water years so that steady high volumes of water over several months can be released for salmon smolt outmigration.

3. The smolt life stage is the primary contributing life stage to San Joaquin salmon production in all water year types; the fry life stage is not important.

As will be shown in this paper, the first two premises are false and the third premise is unproven especially in Wet and Above Normal water years. A Delta-focused Salmon Narrative Objective would relegate production-based comparisons to a secondary role and focus attention on Delta mortality factors that disproportionately impact San Joaquin Basin salmon.

1. Unequal River Basins and Unequal Delta Mortality Impacts

The San Joaquin River Basin is substantially different from the Sacramento River Basin. The mortality factors in the Delta are substantially different and produce substantially greater impacts on migrating San Joaquin fall-run Chinook salmon than on migrating Sacramento salmon. For the Salmon Narrative Objective, comparisons are made between average annual salmon production in the Sacramento Basin versus the San Joaquin Basin without recognizing those substantial differences. The premise for salmon purposes is that the San Joaquin River Basin is just a smaller Sacramento River Basin, i.e., the two basins are compared on an equal basis without consideration of the substantial differences between the two basins and the substantial disproportionate impact that Delta mortality factors have on San Joaquin salmon. The Salmon Narrative Objective encourages these types of myopic comparisons by improperly focusing away from salmon survival through the Delta.

Since 1987, the Delta Tributary Agencies Committee and now the SJRGA have pointed out the following major differences between the San Joaquin River Basin and the Sacramento River Basin:

(1) 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 Basin.

(2) Only three of the four rivers used to calculate the San Joaquin Basin 60-20-20 Index actually contribute flow to the Delta on a regular basis. Historic San Joaquin Basin unimpaired flow percentages: Stanislaus River, 20%; Tuolumne River, 32%; Merced River, 17%; and Upper San Joaquin River, 31%.

(3) 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 and around or away from the Delta.

(4) The unimpaired and impaired flows for the Sacramento River Basin are substantially greater than for the San Joaquin River Basin. San Joaquin Basin River actual inflow to the Delta is significantly less than the San Joaquin River Basin's unimpaired flow. Because of (2), (3), and (4) above, for years 1921 to 1993 the average unimpaired San Joaquin River flow was approximately 16% of the total Delta inflow. The San Joaquin River average measured impaired flow was approximately 12% of total Delta inflow (1956-1993).

(5) While the Sacramento Valley and the San Joaquin Valley are roughly the same size geographically, the San Joaquin River Basin only encompasses the approximate Northern one-third of the San Joaquin Valley. The much larger

Sacramento system has more widespread and diverse salmon spawning and rearing habitats in the Sacramento, Feather, Yuba, Bear, and American Rivers, and Butte, Battle, Chico, Deer, and Mill Creeks, whereas the San Joaquin River Basin is limited to the Stanislaus, Tuolumne, and Merced Rivers. Three major salmon hatcheries (Coleman, Feather River, and Nimbus) support the Sacramento fall-run compared with the single, small Merced River Fish Facility in the San Joaquin Basin.

(6) Because of the location of the Federal and State export pumps in the Southwestern Delta, Delta export operations substantially impact San Joaquin Basin salmon outmigration in all but wet water years. In other words, the fish are either entrained or victims of predation in/or at the pumping facilities.

The most recent example of an analysis that failed to consider the significant differences is The Bay Institute's opening comments dated March 21, 2005, on Vernalis Flow Objective, February-April 14 and May 16-June 30 (BAY-EXH-08).

While the first five differences are very important in understanding the differences between the two basins, the last creates an almost insurmountable handicap for improving San Joaquin Basin salmon production.

2. Delta Pumping Off-sets San Joaquin Basin Flow; Role of San Joaquin Basin Flood Management Flows; Potential Contribution of Fry

The Federal Central Valley Project Tracy Pumping Station (completed in 1951) and the California State Water Project Harvey O. Banks Pumping Plant (completed in 1968) withdraw large volumes of water from the Old River channel of the San Joaquin River in the south Delta. The CVP pumping plant at Tracy has a maximum capacity of 4,600 cfs, although the Delta-Mendota Canal leading from the pumps is often limited to 4,200 cfs. The SWP pumping plant has a capacity of 10,300 cfs, but under present operational constraints is generally limited to 6,680 cfs.

Delta water export greatly increased after the SWP was completed (Fig. 1). Combined export rates are now usually over 6,000 cfs almost year-round and often exceed 10,000 cfs (Fig. 2). Since 2000, export reductions below 4,000 cfs have been limited to the spring VAMP and post-VAMP period in April-May. The export rates routinely far exceed the flow of the San Joaquin River at Vernalis except during the limited APR-MAY period and in very wet seasons, such as in 1998 (Figure 3).

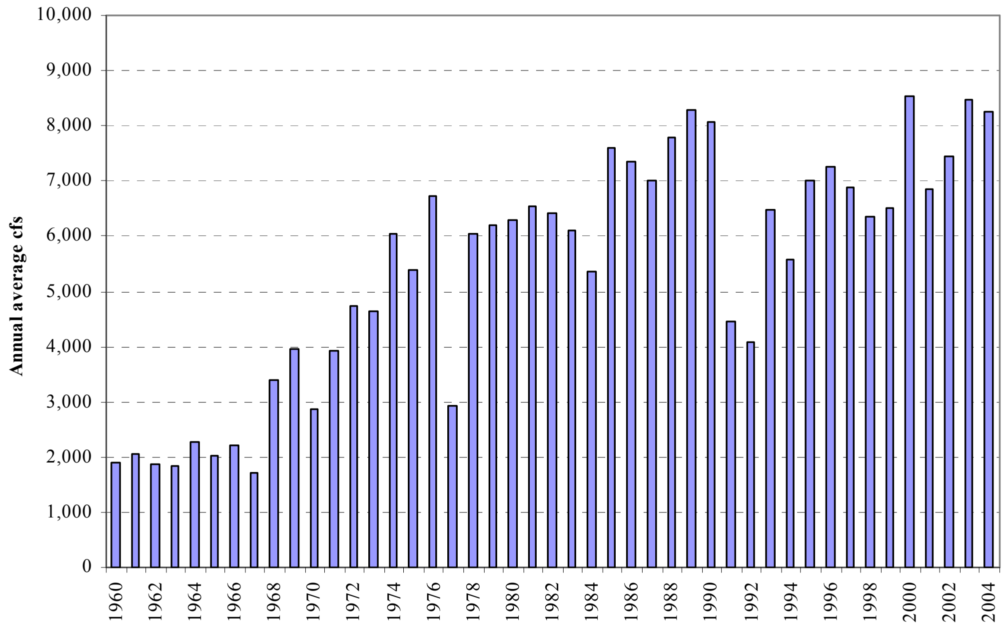

Figure 1. Average annual SWP and CVP export rate for water years 1960-2004.

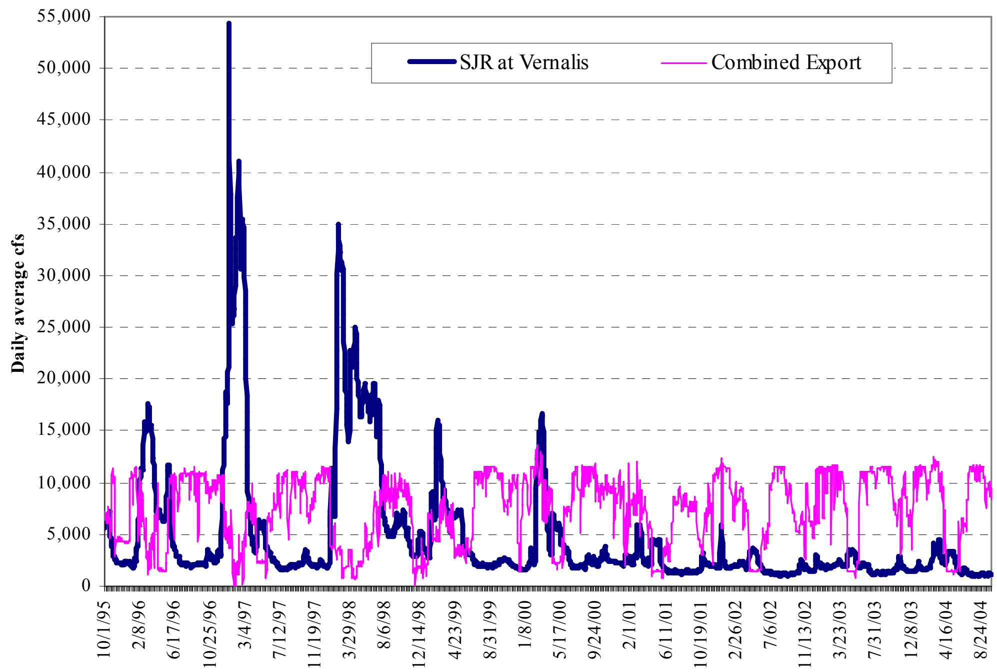

Figure 2. Daily average flow in the San Joaquin River at Vernalis and combined CVP and SWP export for WY 1996-2004. [WY 1996 (Wet); 1997 (Wet); 1998 (Wet); 1999 (AN); 2000 (AN); 2001 (AN); 2002 (Dry); 2003 (BN); 2004 (Dry)]

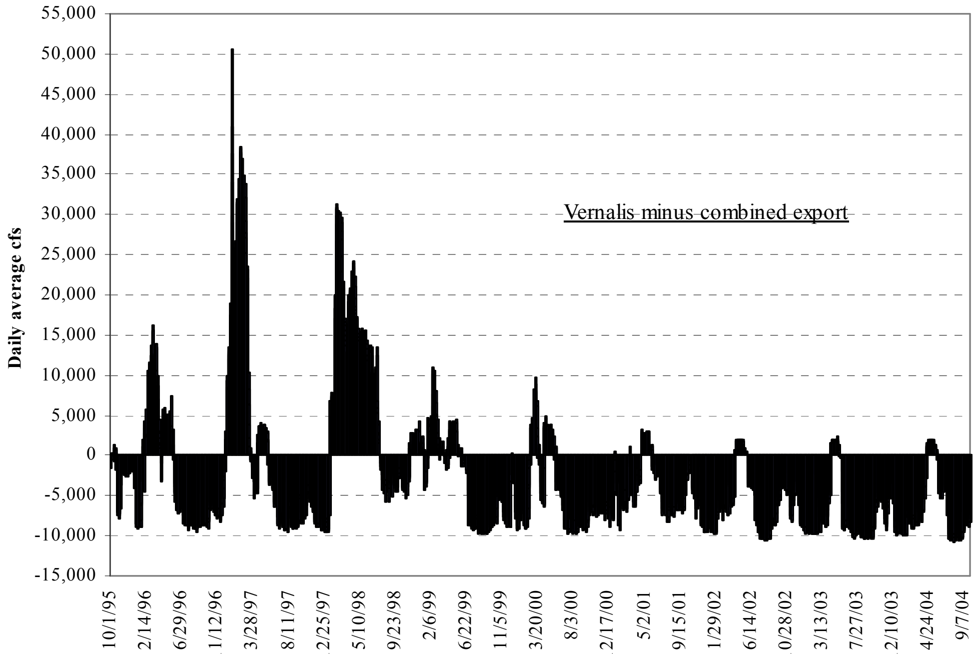

Figure 3. Daily average flow in the San Joaquin River at Vernalis minus combined CVP and SWP export for WY 1996-2004. [WY 1996 (Wet); 1997 (Wet); 1998 (Wet); 1999 (AN); 2000 (AN); 2001 (AN); 2002 (Dry); 2003 (BN); 2004 (Dry)]

Delta morality factors on San Joaquin salmon have been discussed in detail in this and prior Bay-Delta proceedings and will not be repeated here.

Delta export pumping has only minimal impact on Sacramento juvenile salmon, especially when the Delta Cross Channel (DCC) gates are closed. When outmigrating Sacramento juvenile salmon reach the Town of Locke, the major issue between Locke and the Golden Gate is whether the DCC gates are open or closed. If the DCC gates are closed and there are no substantial reverse flows downstream, then Sacramento juveniles experience no significant Delta mortality factors after passing the DCC gates and Georgianna Slough. In contrast, when outmigrating San Joaquin juvenile salmon reach the Head of Old River (HOR), there is no operable HOR Barrier and the temporary barrier is only in place for 30 days. From the HOR, San Joaquin juveniles have a straight course to the Federal export pumps and Clifton Court Forebay (CCF). The distance from the HOR to CCF is less than half the distance from the DCC to CCF. San Joaquin juveniles that successfully bypass the HOR tend to move into Turner Cut and Columbia Cut before the survivors can meet up with any DCC-diverted Sacramento juveniles downstream of Prisoners Point.

In addition to the Federal and State export pumps, San Joaquin salmon fry and smolts are also subject to some 4,000 cfs pumping capacity of Delta agricultural diversions. In 1990, over 1,600 diversion locations had been identified within the Delta [SWRCB Revised Draft WQCP for Salinity (June 1990) at p. 3-25.] serving some 538,000 acres of agricultural land within the Legal Delta [1991 Delta Atlas]. The impact of unscreened Delta agricultural diversions, especially in Critical and Dry water years, on San Joaquin salmon fry and smolts has not been assessed.

The State Board's own Environmental Report for the 1995 WCQP cited the substantially disproportionate impact of Delta export pumping on San Joaquin salmon outmigrants [Environmental Report (May 1995), p. V-83]:

> Chinook salmon fry and smolt losses occur at the CVP and SWP export pumps year-round, but peak levels generally occur in later winter and spring, when the most abundant salmon race, the fall-run, passes through the Delta (DWR 1992a). The proportion of [Chinook salmon] outmigrants from the San Joaquin River system that show up at the CVP and SWP intakes is greater (20-70 percent) than the proportion of Sacramento River system outmigrants that show up at the intakes (2 percent) (BDOC 1993). Peak Chinook salmon losses due to SWP pumping from 1980 to 1987 occurred in April-June. The majority of SWP salmon losses have been attributed to predation by striped bass at Clifton Court Forebay. Other factors associated with the water projects, such as screen efficiencies and salvage operations, also influence salmon survival (DWR 1992a).

Thus proportionately, Delta export pumping has a 10:1 to up to 35:1 greater influence on San Joaquin salmon outmigrants than Sacramento outmigrants. As Figure 3 above shows, higher San Joaquin Basin flows outside of the 31-day VAMP period in years without flood management releases have been offset by increasing rate of Delta export pumping. Delta pumping creates such severe habitat conditions in the Delta for San Joaquin juvenile salmon that it is unreasonable to apply a production doubling goal to the San Joaquin Basin.

<u>Flood Management Flows</u>.

DWR's "Chronological Reconstructed Sacramento and San Joaquin Valley Water Year Hydrologic Classification Indices" shows that the San Joaquin system has highly variable and highly cyclical periods of wet and dry water years. The six-year California Drought of 1987-1992 was followed by a six-year wet period from 1995 to 2000 of four Wet and two Above Normal water years, and then by a four-year dry period from 2001 to 2004 of three Dry and one Below Normal water years.

San Joaquin fall-run salmon escapement numbers have long been analyzed using the simplistic relationship of spring flows to escapement two years later. See Figures 13, 15, and 16 of DFG Exhibit #15 (July 1987) for the State Board's Bay-Delta Hearing Process Phase I. More recently, see Figure 2 of DFG-EXH-08 (March 21, 2005) and Figure 5 of The Bay Institute's opening comments dated March 21, 2005. While there are a number of problems and deficiencies with these simplistic analyses, a key flaw is the unstated premise that the San

Joaquin Basin reservoirs can store and then regulate and release flows in Wet and Above Normal water years so that steady high volumes of water over several months can be released for salmon smolt outmigration.

Each of the four San Joaquin Basin reservoirs have flood management requirements dictated by the U.S. Army Corps of Engineers (ACOE). For example, for the Don Pedro Project on the Tuolumne River, the operating flood control criteria are specified in the 1972 ACOE Flood Control Manual for the Don Pedro Project. In general terms, the flow at La Grange Dam (below Don Pedro Dam) must be managed to maintain seasonal flood storage space in Don Pedro Reservoir, yet not exceed 9,000 cfs as measured at the USGS gage at Ninth Street in Modesto, located just below the confluence of Dry Creek. A rain flood storage reservation of 340,000 acre-feet, corresponding to a reservoir elevation of 801.9 feet (28.1 feet below the maximum reservoir elevation of 830 feet) is specified by the ACOE for the period of October 7 to April 27. In years with above average snowpack, there are additional ACOE snowmelt parameters that may apply to the reservoir storage criteria. By agreement with the City and County of San Francisco, the Don Pedro Project has assumed the ACOE flood control requirements for the Tuolumne River system; i.e., CCSF reservoirs on the upper Tuolumne River have no flood control obligations.

Tuolumne River flood management flows are generally released (1) when the flood reservation elevation is approached and runoff projections indicate that the flood reservation space could be encroached and (2) when the flood reservation space is encroached and the ACOE determines an acceptable reservoir release schedule to reduce storage. Figure 6 shows the Don Pedro reservoir storage relative to the ACOE flood reservation space over the 1996-2004 water years. Figure 7 shows the flow at La Grange over the same time period - flood management flows were released in water years 1996-2001 and in 2004.

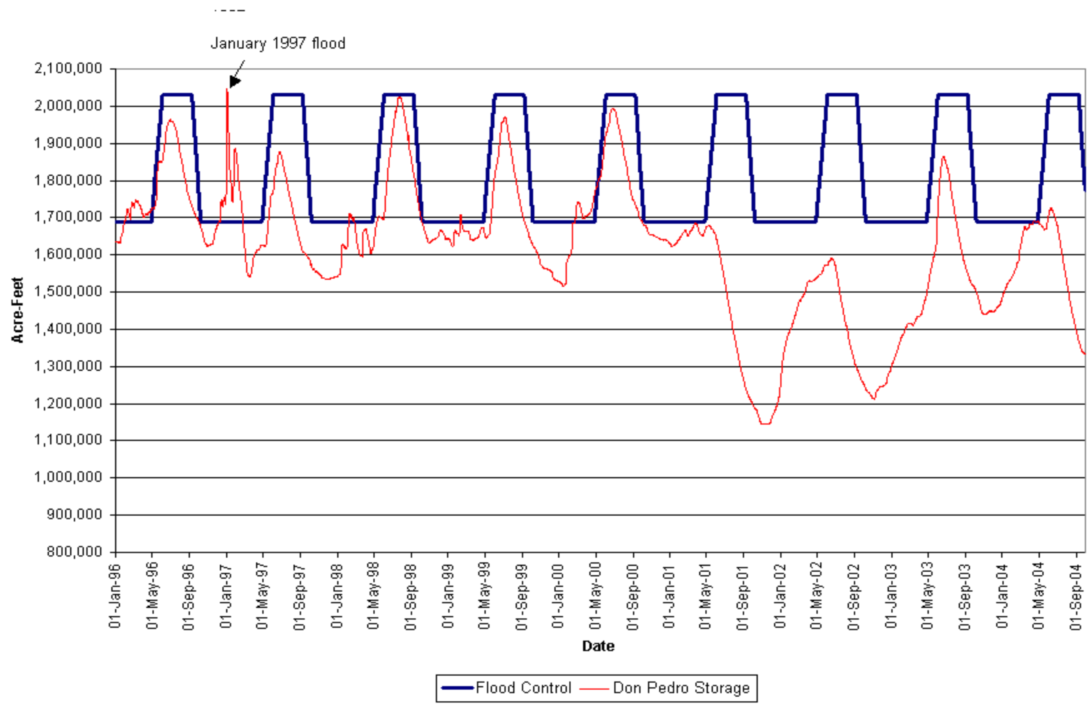

Figure 6. Don Pedro storage and USACE flood reservation space for WY 1996–2004. [WY 1996 (Wet); 1997 (Wet); 1998 (Wet); 1999 (AN); 2000 (AN); 2001 (AN); 2002 (Dry); 2003 (BN); 2004 (Dry)]

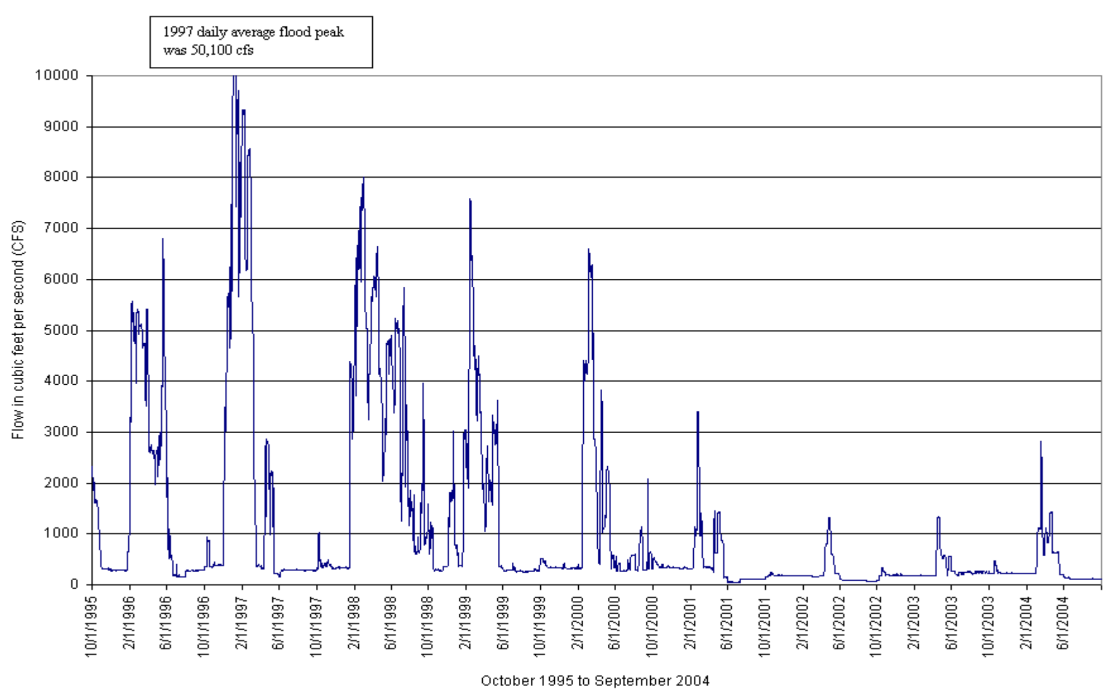

Figure 7. Daily average flow at La Grange for WY 1996–2004. [WY 1996 (Wet); 1997 (Wet); 1998 (Wet); 1999 (AN); 2000 (AN); 2001 (AN); 2002 (Dry); 2003 (BN); 2004 (Dry)]

In typical Wet and Above Normal water years, mandated flood management releases can begin as early as December and can continue until at least April 27 when the rain flood storage reservation requirement begins to be reduced. In certain Wet water years, flood control releases may be required to continue through June as is anticipated during the current water year. The reservoir operators are regulating releases in accordance with the ACOE requirements and in response to real-time rain flood events and snowmelt runoff within the watershed.[1]

How the role of flood management flows are ignored in simplistic analyses of the relationship between spring flows and later escapements may be seen by examining Figure 5 of The Bay Institute's March 21, 2005 opening comments (BAY-EXH-08), which is a graph showing "Escapement of San Joaquin Basin fall-run Chinook salmon (Stanislaus, Tuolumne and Merced Rivers only) plotted against average San Joaquin River flow (Vernalis) during the March-June period 2.5 years earlier when these fish migrated downstream as juveniles."[2] The graph includes seven open circles that are for years since the implementation of the May 1995 WQCP. Presumably the seven years are for March-June flows from 1996 to 2002 and fall escapements from 1998 through 2004. Water years 1996, 1997, and 1998 were Wet, 1999 and 2000 were Above Normal, and 2001 and 2002 were Dry.

As shown in Figures 2 and 7 above, flood management releases were made during the five water years 1996 through 2000. Based upon The Bay Institute's premise that high spring flows result in higher escapements 2.5 years later, it is assumed that the five open circles where March-June flows average 7,500 cfs[3] or greater represent escapements 2.5 years after the five Wet and Above Normal water years (1996-2002) during which flood management releases were made. Thus the 18 open and closed circles in The Bay Institute's Figure 5 where Vernalis flows are 7,500 cfs or greater during March-June represent water years when flood management releases were made in compliance with ACOE flood control requirements. As observed by Baker and Morhardt in "Survival of Chinook Salmon Smolts in the Sacramento-San Joaquin Delta and Pacific Ocean," in commenting on a graph similar to TBI's Figure 5, "As with the smolt data, there is a clear relationship when high flows are included in the analysis, but at flows below 10,000 cfs there is very little correlation between flows at

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[1] Major flood events, such as the January 1997 flood, do not guarantee a full reservoir. For example, following the January 1997 flood, Don Pedro reservoir did not fill because after the flood, the ACOE continued to require high flood management releases but normal precipitation dried up during the months following after the flood event.

[2] SJRGA is filing a separate specific response to The Bay Institute's March 21, 2005 opening comments.

[3] An average flow of 7,500 cfs for the period March through June (122 days) equals 1,814,445 acre-feet, or approximately the entire average unimpaired flow of the Upper San Joaquin River at Friant.

Vernalis and escapement, and there is a very large amount of scatter in the data." Fish Bulletin 179(2) (2001): 163-182, at p.180.

High spring releases in the San Joaquin Basin are the direct result of mandated flood management releases – water that the reservoir operators are prohibited from storing by the ACOE. To assume that similar type releases can be provided on a regular basis and over several months is unrealistic and unreasonable. The Bay-Delta WQCP must focus on those flows that can be realistically managed.

Potential Fry Contribution to San Joaquin Salmon Production.

Flood management releases would appear to make a significant contribution to the survival of salmon outmigrants through the Delta – mostly probably because those releases overcome adverse impacts from Delta pumping. But what salmon life stage is most benefited by flood management releases?

Fry emerge in the San Joaquin tributaries in January and February. In typical Wet and Above Normal water years, flood management release can begin as early as December. Flood management releases flush many fry out of the tributaries and into the Delta. Federal and State fish agencies have assumed the fry life stage makes no contribution to San Joaquin Basin salmon production and, consequently, they have concentrated entirely on the smolt life stage.[4] The Bay Institute's BAY-EXH-08 does not account for the movement of fry during the winter months and fry contribution to total salmon production in the San Joaquin Basin. While the two basins are unequal and the Delta mortality impacts on San Joaquin salmon are unequal, fall-run Chinook salmon in both basins are the same fish. Yet the fish agencies and the Bay Institute appear to ignore Sacramento Basin studies, which show that most fall-run juvenile chinook salmon leave the Sacramento system as fry, with the majority gone by the end of March. Feather River salmon emigration surveys conducted by DWR during 1996-1998 found that "most of the emigrating salmon were pre-smolt, and greater than 76% of all emigrants were smaller than 50 mm, demonstrating that most Feather River salmon emigrate well before smoltification." These results were found to be similar to historical Feather River emigration survey data from 1955 and 1967 through 1975 and lower American River surveys from 1994 through 1996. McEwan, Debbie, "Feather River Study: Highlights of the Salmon Emigration Surveys, 1996-1998, IEP Newsletter, Vol. 12, No. 4 (Fall 1999), at page 27.

The Bay Institute by concentrating on the March through June period further assumed that only the smolt life stage contributes to escapement. As suggested above, during years when flood management releases are made in the San Joaquin system, the fry that are being flushed out of the system may be a key factor contributing to higher San Joaquin Basin escapements. If there is a significant contribution of fry to escapement in Wet and Above Normal water

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[4] DFG is now willing to consider protection of San Joaquin salmon fry but not at the expense of smolt protection. See DFG-EXH-08 (3/21/05) at p. 27.

years, that unquantified contribution could artificially inflate any perceived smolt survival based upon a regression of spring flow and escapement 2.5 years later. No fry studies have been conducted in the San Joaquin Basin.

3. The 1995 Water Quality Control Plan's Salmon Narrative Objective Improperly Focuses Salmon Protection Away from the Bay-Delta Estuary.

The purpose of the 1995 Water Quality Control Plan is "to establish water quality measures which contribute to the protection of beneficial uses within the Bay-Delta Estuary," not for the protection of upstream areas and the ocean, which are outside of the Bay-Delta Estuary. [WQCP, p. 3] However, the salmon narrative objective does just that by providing,

> "Water quality conditions shall be maintained, together with measures in the watershed, sufficient to achieve a doubling of natural production of Chinook salmon from the average production of 1967-1991, consistent with the provisions of State and federal law."

California Fish and Game Code Section 6911 defines production as the sum of the recreational and commercial catch plus escapement. Escapement from the harvest is measured in the upstream streams upstream of the Bay-Delta Estuary and recreational and commercial catch takes place primarily in the ocean. As been presented many times to the State Board, salmon production is dependent upon many factors, including, but not limited to, survival of adults and juveniles through the Delta, spawning and rearing habitat conditions in upstream areas, ocean conditions, and harvest. Total salmon production does not directly measure the success of adult salmon upmigration and juvenile salmon outmigration through the Delta, but instead is based upon the physical count of adult salmon caught in the ocean and found spawning in the upstream areas.

As Judge Candee stated in his Statement of Decision: "the Board was obligated to commence a water rights proceeding to implement river flow and operational requirements that will help protect salmon migration through the Bay-Delta region." Statement of Decision (May 5, 2003) at page 82, *State Water Resources Control Cases*, Case No. JC 4118.

Direct measurement of the success of adult and juvenile salmon movement through the Bay-Delta is possible and feasible. The monitoring of the survival of both Sacramento and San Joaquin salmon smolts through the Delta has occurred for many years. See, for example, SJRGA's "2004 Annual Technical Report on Implementation and Monitoring of the San Joaquin River Agreement and the Vernalis Adaptive Management Plan."

The Doubling Goals thereby misdirects and misplaces the purpose and focus of a Bay-Delta water quality control plan to areas outside of the Bay-Delta Estuary. The existing Salmon Narrative Objective is not appropriate for a Bay-Delta

WQCP and should be replaced with a Delta-focused objective employing measurable factors within the Delta.

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