Appendix A4. Possible Effects of Daily Delta Conditions on Delta Wetlands Project Operations and Impact Assessments

Appendix A4. Possible Effects of Daily Delta Conditions on Delta Wetlands Project Operations and Impact Assessments

SUMMARY

This appendix evaluates how the averaging period used to simulate Delta conditions may influence estimates of the effects of Delta flows and Delta objectives on operations of the Delta Wetlands (DW) project. Results of daily simulations of Delta conditions, Central Valley Project (CVP) and State Water Project (SWP) operations, compliance with Delta objectives, and DW project operations are presented and comparison is made between these daily values and results of monthly simulations used in the DW project impact assessments.

The Delta Standards and Operations Simulation (DeltaSOS) monthly operations model was modified to simulate Delta conditions with a daily time step based on the historical hydrologic record. Results of the daily model, DailySOS, show the effects of variations in daily hydrologic conditions in the Delta. The differences between the ranges of these daily values and monthly mean values are shown, and examples of averaging-period effects on simulated CVP and SWP operations and on DW project operations are presented. The discussion concludes that impact assessments of the DW project based on monthly models of Delta conditions and CVP and SWP operations provide the basis for a reliable evaluation of major potential impacts of the project on water supply, hydrodynamics, water quality, and fishery resources. It further concludes that DW project operations should be regulated using information on actual daily Delta flow and salinity conditions, DW project operating capacities, CVP and SWP operations, and Delta objectives compliance and available water quality and fishery monitoring information.

INTRODUCTION

The principal impact assessments of the DW project presented in the environmental impact report/environmental impact statement (EIR/EIS) are based on monthly models of hydrologic, water quality, and fishery conditions in the Delta (i.e., models that use monthly average flows with a 1-month time step for simulations). The DW project would be operated, however, in response to short-term changes in hydrologic, water quality, or fishery conditions. DW project operations will be coordinated with daily operations of the CVP and SWP and will comply with all existing and future Delta water quality and fish protection requirements.

Purpose of This Appendix

The purpose of this appendix is to compare likely daily Delta conditions, daily CVP and SWP operations, daily compliance with Delta objectives, and daily DW project operations with monthly simulations of these Delta conditions, compliance with objectives, and operations used in the impact assessments of this EIR/EIS.

The results of the comparison of daily and monthly simulations of Delta conditions and DW operations will allow comparison between potential impacts of likely daily operation and monthly simulation of the DW project, facilitating evaluation of possible bias and uncertainty in the impact assessments. The description of daily Delta conditions, daily CVP and SWP operations, daily compliance with Delta objectives, and daily DW operations can be used to guide the formulation of:

- water right permit terms and conditions,

- mitigation measures that may be necessary for potentially significant water quality or fishery impacts, and

- monitoring programs that may be required for compliance or mitigation.

Daily Simulation Method

To assess the potential effects of short-term changes in Delta conditions on operations of the DW project, the monthly model DeltaSOS was modified to simulate Delta conditions with a daily time step. A description of the daily model (DailySOS) and a comparison between DeltaSOS and DailySOS model results are presented in this appendix. Potential bias (consistently higher or lower simulation results) and uncertainty in the monthly water supply, hydrodynamic, water quality, and fishery impact assessments can be approximated from the differences between the daily and monthly Delta model results.

Organization of This Appendix

This appendix includes sections on the following:

- daily DW project operations,
- daily variations in Delta conditions,
- daily CVP and SWP operations,
- daily compliance with water quality objectives and fishery protection requirements,
- possible daily monitoring and mitigation measures,
- comparison of simulated daily and monthly Delta conditions and DW operations, and
- conclusions.

DAILY DW PROJECT OPERATIONS

DW Diversion Facilities

The DW project and proposed operations are fully described in Appendix 2, "Supplemental Description of the Delta Wetlands Project Alternatives", and are summarized in Chapter 2, "Delta Wetlands Project Alternatives". Under the DW project, two new siphon stations, with 16 siphons each, would be installed on each reservoir island. Each siphon would have a diameter of 36 inches and a maximum flow capacity of about 140 cubic feet per second (cfs). Each siphon station would have a combined capacity of about 2,250 cfs. The diversion rate of DW siphons would not be constant but would be related to the amount of water already stored on the DW reservoir islands. The maximum diversion rate would be achieved when filling of a reservoir island began because the maximum head differential would exist between the channel water elevation and the reservoir water level. As the reservoir islands filled and the hydraulic head difference decreased, the siphon capacity would decline. Booster pumps would be installed in about half the siphons to maintain a diversion capacity of about 1,250 cfs for each siphon station. The booster pumps will allow the islands to be filled to approximately 6 feet above mean sea level.

Fish screens would be installed around the intake end of each existing and new siphon pipe. The screens will be designed and operated to prevent entrainment and impingement of most adult and juvenile fish that are present in the Delta. The proposed design would consist of a barrel-type screen with a maximum approach velocity of less than 0.33 feet per second (fps). The anticipated hydraulic operation of the siphon stations to fill the reservoir islands is further described in Chapter 3B, "Hydrodynamics".

The combined siphon capacity on two reservoir islands (four siphon stations) would be approximately 9,000 cfs, and the average daily maximum diversion rate will be limited to 9,000 cfs. The diversion rate would reach this maximum during the first week of filling and would decline to less than 5,000 cfs as the reservoir islands were filled. The actual daily diversion rate will depend on the reservoir storage and the number of booster pumps that are used at each siphon station, as well as the availability of water for DW diversion.

Conditions Required for DW Diversions

The DW project would divert water to storage under appropriative water rights. The project permits, if granted by the California State Water Resources Control Board (SWRCB), would contain terms and conditions to protect prior riparian and appropriative water right holders and the public trust. All existing and any future Delta water quality objectives would apply to the project. The project permits may require that project operations, including those of the existing SWP and CVP Delta facilities, fully comply with any applicable conditions in biological opinions or allowable "take limits" for threatened or endangered species.

It is expected that the DW project diversions to storage would not be permitted to interfere with the diversion and use of water by other users holding riparian or prior appropriative rights. Although most riparian and senior appropriative water right holders are located upstream of the Delta in the Sacramento River or San Joaquin River basins, a large number of riparian and appropriative water right holders divert water from Delta locations. The CVP and SWP, as well as Contra Costa Water District (CCWD) and several smaller diverters, also hold senior appropriative water rights. The DW project would not interfere with diversions by these prior water right holders.

Actual operation of the DW project would necessarily be conducted on a daily basis. The California Department of Water Resources (DWR) Division of Operations and Maintenance and the U.S. Bureau of Reclamation (Reclamation) Central Valley Operations Coordinating Office (CVOCO) maintain daily water budget estimates for the Delta and designate whether Delta conditions each day are either "in balance" or "in excess" relative to all SWRCB objectives and water right terms and conditions. When the Delta is designated by DWR and CVOCO (with possible review by the CALFED Operations Group) to be "in balance", all Delta inflow is determined to be required to meet Delta objectives and satisfy diversions by CCWD, CVP, SWP, other senior water right holders, and Delta riparian users. No additional water would be available for diversion by the DW project when the Delta is "in balance".

When the DWR Division of Operations and Maintenance and CVOCO determine that the Delta is "in excess", some water could be available to be diverted for storage on the DW project reservoir islands. DWR and CVOCO would estimate the daily quantity of available excess water according to their normal accounting procedures. However, these procedures must be approved by SWRCB, which has the final water allocation authority. Additional rules to govern allowable DW diversions would be provided by SWRCB in terms and conditions in water right permits.

Delta conditions are currently governed by the SWRCB 1995 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (1995 WQCP). One of the 1995 WQCP objectives limits maximum allowable SWP and CVP export diversions to a specified percentage of the total Delta inflows. This specified percentage of total inflow may control the allowable exports and may determine when the Delta is designated by DWR and CVOCO to be "in balance" or "in excess". The Delta inflows would be "in excess" only if the allowable exports, as a specified percentage of Delta inflows, exceeded the SWP and CVP permitted pumping capacity. For example, with a permitted CVP and SWP combined rate of 11,280 cfs and a 35%-of-inflow export limit, Delta inflows would be "in excess" only if they were greater than 32,228 cfs (11,280/0.35).

Diversions under all the DW project alternatives are assumed in the impact analyses to be governed by the 1995 WQCP "percentage of total inflow" (percent inflow) objective for export diversions (see Chapter 3A, "Water Supply and Water Project Operations", and Appendix A3, "DeltaSOS Simulations of the Delta Wetlands Project Alternatives", for additional discussion of this assumption). Therefore, DW diversions would only occur when the amount of allowable diversions (as a percentage of total inflow) was greater than the permitted maximum CVP and SWP pumping capacity.

SWRCB may establish DW requirements for various "buffers" to further protect Delta standards and existing water right holders. A buffer would be a volume of Delta water exceeding the "in excess" threshold but which would not be available for diversion to the DW reservoirs. During major runoff events, considerable "excess" Delta inflow could be available above the specified "buffer" amounts for diversion by the proposed DW project.

DW Discharge Facilities

One discharge pump station would be located on each reservoir island. The pump stations would consist of 32 new pumps (on Webb Tract) or 40 new pumps (on Bacon Island) with 36-inch-diameter pipes discharging to adjacent Delta channels. An assortment of axial-flow and mixed-flow pumps would be used to accommodate the variety of head conditions during drawdown of the reservoir storage islands. Actual rate of discharge by each pump would vary according to each pool's remaining elevation. The maximum daily average discharge rate would be about 4,000 cfs for Bacon Island and 3,000 cfs for Webb Tract, and the maximum combined daily average discharge rate would be 7,000 cfs. The pump stations are more fully described in Appendix 2 and are summarized in Chapter 2.

Conditions Required for DW Discharges

The DW project could discharge water to Delta channels at any time when DW storage water was available for beneficial uses. Potential beneficial uses for DW storage water include Delta flows to maintain salinity control or estuarine habitat, Delta flows to provide fish transport management, and Delta diversions for water supply needs (1995 WQCP objectives).

Water supply diversions of discharged DW storage water could occur at any existing Delta diversion location, but discharged DW water is most likely to be exported at either the CVP Tracy Pumping Plant or the SWP Banks Pumping Plant. (Use of these facilities to pump and convey water for another party is often called "wheeling".)

Pumping, conveyance, and storage of water in CVP or SWP facilities allows water transfers and exchanges of various kinds. The SWP and CVP routinely wheel water for each other to improve the efficiency of their operations. DW storage water that is exported from the Delta will require pumping and conveyance in CVP or SWP facilities to the designated purchaser of DW storage water (if it is not purchased directly by the CVP or SWP). There may be some opportunity to temporarily bank water or store water transfers from another water district or agency on the DW islands until unused pumping capacity becomes available. Diversions and discharges for this potential transfer "parking" arrangement are not considered here. Delivery of purchased DW water or of water temporarily stored on the DW islands may be subject to further environmental review.

Discharges of DW storage water for export can only be accomplished if there is available pumping capacity at the CVP Tracy or SWP Banks Pumping Plant; available conveyance in the Delta-Mendota Canal (DMC) or the California Aqueduct; and if needed, available pumping capacity at Edmonston pumping plant (to the southern California SWP) or storage in San Luis Reservoir or other storage facilities. Available pumping capacity may be limited by physical capacity or operating restrictions. The two most important existing restrictions are the U.S. Army Corps of Engineers (Corps) permit for operating the SWP Banks Pumping Plant and the SWRCB pumping restrictions for the CVP and SWP specified in the 1995 WQCP. The 1995 WQCP designates the "operations group" to be responsible for recommending changes in daily export pumping rates to provide additional fishery protection. DW operations will likely also be subject to "operation group" recommendations and may be utilized to provide adaptive management of Delta fisheries and water supply. These restrictions are described in Chapter 3A, "Water Supply and Water Project Operations". SWRCB retains final authority for water allocation rules.

The daily unused pumping capacity will fluctuate as Delta conditions change and CVP and SWP operations change correspondingly. The daily rates of DW discharge for export will therefore fluctuate considerably more than the monthly average rates of DW discharge for export. The daily rate of DW discharge for export would be limited by the maximum daily average DW discharge capacity of about 6,000 cfs.

Possible DW Discharges under 1995 WQCP Export Limits

The 1995 WQCP does not specifically describe operating conditions for DW project discharges for export at the SWP or CVP pumping plants. DW discharge operations might be controlled in various ways to be compatible with the1995 WQCP objectives and to protect senior water right holders and the public trust. This EIR/EIS evaluates two alternatives for controlling DW project discharges, as described in Chapter 3A and Appendix A3.

Under Alternative 1, it is assumed that DW discharges are considered to be additional Delta inflow but that SWP and CVP export pumping of any DW discharge water must remain within the specified percentage of total inflow. Opportunities for DW discharges and exports would exist whenever the SWP and CVP pumping is limited by Delta outflow requirements. In this case there may be unused pumping capacity within the specified percent inflow limits.

Under Alternative 2, it is assumed that DW diversions are controlled by the specified percent inflow limits, but that DW discharges for export are not controlled by the percent inflow limits. DW discharges for export pumping would be allowed whenever there was unused permitted capacity at the CVP or SWP pumping plants. Opportunities for DW discharges and exports would exist whenever the SWP and CVP pumping was limited by Delta outflow requirements or whenever the SWP and CVP pumping was limited by the specified percent inflow limits. In this case there may be considerably more days with unused pumping capacity that could be used for exports of DW discharges.

Because Delta inflows may fluctuate considerably within a month, the allowable export pumping as a specified percentage of inflow or as controlled by outflow requirements may change significantly from day to day within a month. The possible effects of these daily variations in Delta inflows on CVP and SWP pumping and on allowable DW project diversions and discharges are described and evaluated in the following sections of this appendix.

DAILY VARIATIONS IN DELTA CONDITIONS

There are three major categories of changes in Delta conditions:

- hydrologic changes associated with inflows, rainfall, and tidal effects;
- water quality changes resulting from inflows, salinity intrusion, temperature variations, and phytoplankton growth; and
- fishery changes resulting from migration, spawning, transport, growth, mortality, and entrainment processes.

Hydrologic changes directly affect the operations of the SWP and CVP Delta facilities (gates and pumps). Water quality changes may influence CVP and SWP operations necessary for compliance with applicable water quality objectives. Fishery variations have generally not influenced CVP or SWP operations, except recently when operations have reponded to endangered species incidental take limits for winter-run chinook salmon and delta smelt.

Because available data describe the patterns of hydrologic variables more accurately than they describe patterns of water quality or fishery conditions, the effects of daily hydrologic variations on CVP and SWP operations will be used to generally evaluate likely effects of daily variations in water quality and fishery conditions.

Daily Hydrologic Variations

The relative magnitudes of short-term fluctuations in flow were evaluated through comparison of daily and monthly average Delta flows. Daily inflow measurements and outflow estimates for water years 1967-1991 were obtained from DWR's DAYFLOW database, which is described in DWR (1986).

Monthly Maximum and Minimum Flows

Figure A4-1 shows the monthly range between minimum and maximum daily values for Sacramento River inflow for each month of water years 1967-1991. Figure A4-2 shows the range between minimum and maximum daily values for San Joaquin River inflow for each month of water years 1967-1991. Figure A4-3 shows the same information for Yolo Bypass inflow to the Delta for 1967-1991. The monthly ranges of QWEST flows calculated from DAYFLOW and monthly ranges for Delta outflow from DAYFLOW are shown in Figures A4-4 and A4-5, respectively, for 1967-1991. A wide shaded line indicates substantial variation within a month, while a thin line indicates small variation within a month.

As shown in Figures A4-1 to A4-5, the daily flows differed substantially during some months but were similar during other months. In months when the maximum and minimum daily values are similar, the monthly mean adequately represents flow conditions for simulation of potential project impacts. In months when the daily maximum and minimum are very different, however, the monthly mean may poorly characterize flow conditions for determining potential project operations and impacts. The maximums and minimums for Delta inflows, QWEST flows, and Delta outflows were generally similar to mean flows during the low-flow period at the end of each water year. During high-flow months, however, the means were often quite different from the maximums and minimums.

Figure A4-6 shows that daily minimum and maximum values of Delta exports are often quite different from the monthly mean. The daily variations in exports may be caused by hydrologic variations, necessary compliance with objectives, changes in demands, or other operational considerations (e.g., maintenance and electric power rates). Historical Delta exports have increased substantially during the 1967-1991 period, and exports vary substantially by month because of seasonal agricultural demands, export pumping limits, amount of water available for diversions, and available seasonal storage capacity (i.e., San Luis Reservoir).

Relation of Mean Flow and Daily Flow Variability

Figure A4-7 shows the daily Sacramento River inflows for 1967-1991 (25 years) as a function of the mean monthly flow plotted for each month to identify possible seasonal effects in this relationship. Figure A4-8 shows this relationship for San Joaquin River flow at Vernalis. Figure A4-9 shows this relationship for Delta outflow. Daily variation in inflows and outflows was substantial in many months and was generally greater when mean monthly flow was higher.

Although absolute variation in flows increased with mean flow, variation expressed as a percentage of the mean increased only slightly with mean flow. The lines in Figures A4-7 to A4-9 show the mean flows and values 25% above and 25% below the mean. Points between the upper and lower lines indicate days with flows within 25% of the monthly mean flow, and points outside the lines indicate days with flows greater than 25% above or 25% below the monthly mean.

During high-flow months, San Joaquin River inflows (Figure A4-8) were within 25% of the monthly mean flow much more often than Sacramento River inflows (Figure A4-7), presumably because San Joaquin River flows are more completely regulated than Sacramento River flows. San Joaquin River runoff characteristics may also differ from Sacramento River runoff (i.e., snowmelt controlled, less rainfall). Delta outflows (Figure A4-9) were within 25% of the monthly mean much less often than Sacramento or San Joaquin River inflows. All three flows were more often within 25% of the monthly mean during the driest months (July-October) than during the wettest months (December-March).

The hydrologic variations during months with substantial rainfall runoff are therefore expected to cause the largest effects on daily CVP and SWP Delta operations and on allowable daily DW project operations and potential DW project impacts. Summer periods during regulated reservoir releases without rainfall runoff will be more uniform and more easily represented in monthly operations models.

Daily Variations in Water Quality

Temporal variations in salinity were not analyzed, although salinity is largely determined by outflows and tides, with some influence from San Joaquin River inflow and agricultural drainage in the south Delta. Changes in daily average salinity lag slightly behind changes in daily average flow in the Delta, so short-term fluctuations in salinity should be similar to, but less pronounced than, short-term fluctuations in flow. Because salinity intrusion increases with lower Delta outflows, effects of flow fluctuations on salinity will be most important during periods of low Delta outflow. Tidal fluctuations in salinity are not considered in this appendix. The daily variations in measured electrical conductivity (EC) values at several Delta locations are shown as monthly minimum, mean, and maximum values for water years 1968-1991 in Appendix B2, "Salt Transport Modeling Methods and Results for the Delta Wetlands Project" (Figures B2-7 through B2-17).

Daily Variations in Fisheries

Daily records of fish abundance in the Delta are available from the CVP and SWP salvage records and other sampling programs. Unfortunately, the salvage records contain no information about fish eggs and larvae because the eggs and larvae are too small to be screened and counted. The egg and larval surveys conducted by California Department of Fish and Game (DFG) and DWR provide a great deal of information about the temporal and spatial distribution of fish larvae in the Delta, and although sampling is not conducted daily, it is conducted frequently (as often as every other day) during the spawning periods of some species. Short-term variations in fish abundance as indicated by salvage records and egg and larval survey data are described below.

Fish Salvage Records

The salvage records (number of fish each day) of the SWP and CVP Delta pumping facilities provide a measure of the daily variation of fish abundance in the south Delta. However, the variation in salvage records is generally influenced by a number of factors in addition to variation in abundance; influences include the spatial distribution of the fish, the level of prescreening losses (i.e., predation), and export rate. An estimate of fish density is obtained by dividing the number of fish salvaged by the volume of water exported each day. If fish density is constant, the salvage rate will be proportional to the export rate. This may not be strictly true because the export rate also affects efficiency of the fish screens and possible predation losses.

Estimates of SWP and CVP daily salvage "density" of several species (estimated by dividing the number of fish salvaged by the daily SWP or CVP exported volume) for February-September 1993 are shown in Figure A4-10.

Figure A4-10 shows that each fish species is found in the salvage records at a different time during spring and summer. The salvage records from SWP Banks and CVP Tracy Pumping Plants provide "replicate" daily samples of south Delta fish density. Because the source of water entering these two pumping plants is sometimes different (CVP may sometimes pump predominantly San Joaquin River water), the fish density estimates may also be different. There are also effects from spawning of local populations of fish or from predators in the intake channels or Clifton Court Forebay that may cause differences in the salvage records. However, for many species the period of greatest salvage "density" occurs during several weeks and is similar at the SWP and CVP pumping plants.

Only juvenile and adult fish are salvaged at the SWP Banks and CVP Tracy Pumping Plants. The interpretation of the daily salvage records will be different for each species. Some fish are migrating through the Delta from upstream rearing habitat to estuary or ocean habitats. Some are resident fish that spawn and rear in Delta channels. For some species, periods of migrating juvenile fish can be identified directly from the salvage records. For other species, the daily salvage records may be indicative of the spawning patterns that would have occurred sometime previously in the Delta or upstream in tributary rivers. For species that have eggs or larval life stages in the Delta, the approximate time of spawning can be estimated from the salvage records using length and growth-rate information.

The daily salvage records provide a measure of the daily variation of fish abundance in the south Delta. As fish sampling and monitoring methods improve, it should be possible to obtain accurate recent information about spawning, migration, and juvenile density patterns for several important fish species in the Delta. These monitoring records could be used in adaptive management of Delta facilities, including DW project siphons and discharge pumps, to provide increased fishery protection of target species. Adaptive management may increase fishery protection by limiting diversions or by increasing fish transport flows to reduce the vulnerability of the early life stages to entrainment and allow most of the population to reach suitable estuarine habitat for rearing.

Larval Fish Samples

Larval fish samples are collected every 2-4 days during February-June at a number of sites in the Delta for the egg and larval survey (DFG 1992). Four stations (Stations 930 to 933) sampled in 1992 that are fairly close to Bacon Island and Webb Tract, the two reservoir islands of the DW project, were selected to evaluate short-term variations in larval fish abundance. The stations were sampled about once every four days during February 12-April 4 and every other day during April 4-July 7.

The number of delta smelt larvae collected at these stations was analyzed. Larval smelt data from the four stations were pooled because on most days no delta smelt larvae were collected from individual stations. Delta smelt were collected from at least one of the four stations on only 13 of the 68 days during which the stations were sampled, and no smelt were collected after May. The mean number rather than total number collected was used to estimate abundance because not all four stations were sampled during each sampling date.

The number of delta smelt collected at the four stations was highly variable (Figure A4-11). The results demonstrate that daily estimates of abundance are often very different from the monthly averages, which are influenced by relatively few days with high abundance. This difference may be caused by patchiness in the distribution of delta smelt larvae.

DAILY CVP AND SWP OPERATIONS

The averaging period used to simulate Delta conditions may affect estimates of the effects of Delta flows and Delta objectives on operations of the DW project. When DW project operations are simulated using monthly mean flow values, the simulated project is operated as if objectives were monthly average objectives. It is possible, however, that a month might have several days when minimum flow objectives were satisfied and other days when flows were above objectives. Therefore, simulations of project operations based on daily flows and daily objectives might be very different from simulated operations based on monthly mean flows and monthly average objectives.

Capacity limitations of the proposed DW siphons or discharge pumps and the SWP and CVP export pumps would affect DW operations. The averaging period used for simulations of operations could bias estimates of the effects of these capacity limitations on CVP and SWP or DW project operations. Daily flows may often exceed CVP and SWP export pumping capacity and the DW diversion capacity, although mean flow for a month might be well below these capacities.

Simulating proposed DW project operations using a daily time-step model rather than a monthly model could result in either higher or lower estimates of diversions by the DW project, depending on the distribution of flows during the month. The following sections describe examples of averaging-period effects on simulated CVP and SWP operations and on DW project operations.

DCC Gate Closure

Reclamation's standard operating procedure is to close the Delta Cross Channel (DCC) gates to protect Mokelumne River levees and prevent scour damage to the DCC gate structure whenever Sacramento River inflow exceeds 25,000 cfs (Reclamation 1992). Reclamation may not immediately change the DCC gate positions, however, because they are manually operated. A horizontal line represents this flow threshold in Figure A4-7 for Sacramento River inflows. Months in which flows were above or below 25,000 cfs on all days would be adequately simulated, with respect to DCC closure, using a monthly time-step model. However, because the relationship of DCC diversion to Sacramento River inflow is slightly nonlinear, estimated total diversion based on daily flows might be different from the mean monthly diversion estimate.

In most months, there were some days with flows above and some days with flows below 25,000 cfs, so the DCC gates would be closed during a portion of the month. Monthly average simulations would probably not give accurate results for DCC flows in these months.

The 1995 WQCP objectives specify that the DCC will remain closed from February 1 to May 20 to reduce the diversion of fish from the Sacramento River into the central Delta. In addition, the DCC may be closed by the "operations group" for up to 45 days during November-January (50% of the time) and for up to 14 days in the period of May 21 to June 15 for the protection of fish. These partial DCC closure periods cannot be accurately represented with a monthly model, but the selected days of gate closure for fish protection cannot be identified with the daily model either. Therefore, the monthly and daily models simulated complete DCC closure from November through May.

Minimum Required Delta Outflow

The 1995 WQCP outflow objectives are a combination of the following:

- specified minimum monthly outflows that depend on water-year type;
- outflow required to satisfy several 14-day average salinity objectives at specified locations for various periods of time depending on water-year type; and
- outflow required to maintain X2, the position of the mean daily 2-parts-per-thousand (2-ppt) salinity gradient, downstream of three control locations for a specified number of days during February-June that depends on the unimpaired runoff (Eight-River Index) of the previous month.

These outflow objectives are discussed in Appendix A2, "DeltaSOS: Delta Standards and Operations Simulation Model".

A monthly average Delta outflow requirement must be estimated from the daily outflow requirements for monthly simulations models. The results of monthly simulation of CVP and SWP Delta operations using monthly estimates of required Delta outflows may be quite different from simulated daily operations if the variations in daily outflow or daily outflow requirements are large.

The results of daily simulations depend on the assumed equation for estimating daily X2. Because the upstream movement of X2 is slow relative to the changing flow during periods of declining outflow, there may be a considerable delay in the need for Delta ouflow to maintain X2 at a specified location if previous periods of higher outflow have moved X2 downstream. The outflow requirements for maintaining the X2 location estimated with the daily model will be more accurate, because it is difficult to approximate the relationship between previous outflow and outflow requirements for maintaining X2 in the monthly model.

Although the 1995 WQCP objectives allow some averaging of the required salinity and X2 location for compliance purposes, the daily simulations described and evaluated in this appendix assume that the daily requirements specified in the 1995 WQCP must be satisfied each day without averaging. This provides an estimate of CVP and SWP Delta operations and potential DW operations assuming "perfect" daily operations decisions, which is a reasonable approach for evaluating the effects of daily variations in hydrology on Delta operations. DailySOS (the daily version of DeltaSOS, described below) can be used to investigate the possible benefits of allowing the use of various averaging periods for inflows, exports, salinity, and X2 for compliance purposes, but results for different averaging periods were not included in this appendix to support the EIR/EIS impact assessments.

SWP and CVP Export Pumping Capacity and Limits

The 1995 WQCP objectives limit CVP and SWP exports to a specified percentage of total Delta inflow. The 1995 WQCP objectives allow 3-day averaging of inflows (14-day averaging under some "in excess" conditions) and 3-day averaging of exports to be used for compliance purposes. Whenever the inflows change, the export limits will change. Monthly simulations of SWP and CVP Delta operations using monthly average inflows could differ substantially from simulations based on daily inflows. Allowable DW operations simulated with a monthly model may also be substantially different from daily estimates that account for daily variations of inflow and exports.

The 1995 WQCP objectives further limit CVP and SWP exports during the specified San Joaquin River pulse-flow period of April 15 to May 15 (the actual pulse-flow period may be shifted by the "operations group"). Monthly simulations for these two months therefore may not be as accurate as daily simulations.

From mid-March to mid-December, SWP exports are limited by the Corps permit (Section 10 of the Rivers and Harbors Act of 1899) to 6,680 cfs. During mid-December to mid-March, if San Joaquin flow (at Vernalis) exceeds 1,000 cfs, SWP exports are allowed to increase above 6,680 cfs by one-third of San Joaquin River flow. The SWP exports water to the California Aqueduct, which has a maximum conveyance capacity of 10,300 cfs. Therefore, maximum SWP pumping during the period of mid-December to mid-March can exceed the pumping limit for the rest of the year by approximately 3,620 cfs (10,300 cfs - 6,680 cfs = 3,620 cfs). The daily maximum extra SWP pumping constitutes one-third of San Joaquin River flow when the total flow of the river is 10,860 cfs. CVP pumping during this period is limited by the DMC capacity of approximately 4,200 cfs.

The actual amount of water pumped by CVP and SWP export pumps depends on the daily San Joaquin River flows and other applicable objectives (e.g., percent of inflow, Delta outflow). The combined capacity of the CVP and SWP increases from approximately 10,880 cfs to 14,500 cfs as the San Joaquin River flow increases to 10,860 cfs. Estimates of how much San Joaquin River water would be available for increased SWP pumping and how much would be available for possible DW diversions are influenced by the averaging period used to estimate the flows.

In many years, months with mean San Joaquin River flows below the 10,860-cfs threshold that allows maximum SWP pumping have several days with flows exceeding 10,860 cfs (Figure A4-8). Simulations based on monthly mean flows may not accurately estimated SWP pumping capacity, whereas simulations using a daily time step would provide a more accurate estimate of SWP pumping capacity.

If total daily inflow or pumping capacity is limiting CVP and SWP exports, simulations based on monthly mean flows may not provide accurate estimates of CVP and SWP exports, whereas simulations using a daily time step would provide a more accurate estimate of CVP and SWP export pumping.

DAILY COMPLIANCE WITH WATER QUALITY STANDARDS AND FISHERY PROTECTION REQUIREMENTS

All existing and any future Delta water quality objectives or fish and wildlife requirements, as adopted by SWRCB or other regulatory agencies, would apply to the DW project. DW project operations permitted by SWRCB would therefore not be allowed to interfere with the exercise of prior water rights, which may require meeting applicable Delta water quality objectives or fish and wildlife protection requirements.

In the DW project impact assessments, results of the monthly DeltaSOS simulation model are used as the basis for the impact assessment of hydrologic and water quality effects. The monthly model is most appropriate for monthly average objectives and cannot accurately simulate daily or short-term objectives. The terms and conditions that SWRCB establishes for operation of the DW project, however, will consider the likely daily Delta conditions and CVP and SWP operations, in addition to the general monthly effects identified in the impact assessments.

Compliance with Flow and Salinity Objectives

SWRCB's 1995 WQCP set forth most of the currently applicable Delta flow and salinity objectives. Objectives in the 1995 WQCP are based on daily parameter estimates, longer term averages (monthly averages or averages for a specified period), and running averages (averages for some specified previous period).

The averaging period used for defining objectives may affect operations of Delta water projects necessary for compliance with the objectives. Although the DWR Division of Operations and Maintenance and CVOCO establish the "official" Delta water budget on a daily basis, estimates of allowable export pumping each day may be greatly influenced by the averaging period used for compliance with each objective. Use of long-term and running averages for compliance with objectives may allow the CVP and SWP to divert more water on some days than would be allowed if daily or short-term averages were used for compliance.

Specifying DW project operations criteria as daily or short-term requirements is advantageous because DW operations could more closely track actual Delta conditions. Daily operations criteria would provide Delta protection as needed and allow maximum DW diversions and discharges for various beneficial purposes. Storm-related flows with corresponding abrupt reductions of salinity, for instance, could provide conditions allowing DW diversions if daily objectives were used but might not allow DW operations if salinity objectives were based on monthly or long-term averages.

Compliance with Fish Take Limits

Under the Endangered Species Act, federal resource agencies will identify DW project operations criteria, incidental take limits, and facility design criteria (e.g., for fish screens) for protected fish species. The project permits will require that project operations comply with applicable fish protection measures and allowable take limits. In addition, DW operations relating to SWP or CVP facilities (i.e., export of DW discharges) may require satisfying existing fish protection measures controlling operations of the SWP and CVP facilities.

Because the sampling error of salvage data is large, incidental take limits for entrainment of fish at the CVP and SWP pumps are generally specified in terms of a cumulative total (e.g., for winter-run chinook salmon) or running average (e.g., for delta smelt) for the number of fish salvaged.

Sampling errors are also high for data from sampling programs designed to determine fish abundance and distribution in the Delta (e.g., DFG's egg and larval survey). Operations criteria relying on data from such programs would likely use spatial or temporal averages.

Chapter 3F, "Fishery Resources", recommends several operations criteria for the proposed DW project to avoid or mitigate expected impacts on protected fish species. Generally, suggested operations criteria would restrict DW project diversions and discharges during periods of expected or detected presence of sensitive life stages of fish species. The operations criteria would be defined by specified Delta flow and estuarine habitat conditions.

POSSIBLE DAILY MONITORING AND MITIGATION REQUIREMENTS

Most fish populations have very clumped distributions because fish seek out specific habitat conditions and many species travel in schools. Larval fish abundance often varies temporally as well as spatially because spawning activity may vary markedly from day to day and because fish mature quickly through the larval stage and may be highly mobile. The patchiness of fish populations combined with their tendency to use shallow habitat that is difficult to sample results in very high sampling variability, making it difficult to reliably monitor fish abundance.

The monthly time-step model used to assess potential impacts of the DW project on fish populations is probably sufficiently accurate to identify likely potential impacts. Daily fluctuations in Delta flows that were discussed in previous sections of this appendix presumably affect transport of fish eggs and larvae and flow-related habitat conditions of all stages and may therefore affect fish growth and survival. Although daily simulation of fish transport and entrainment using the daily flow data from DailySOS was not used for the DW impact assessments, short-term fluctuations in real fish abundance data were examined to evaluate the potential effects of these fluctuations on project impacts. Daily monitoring and possible mitigation requirements were investigated.

CVP and SWP Delta Export Take Limits

As noted earlier, incidental take limits for entrainment of fish at the CVP and SWP pumps are currently specified in terms of cumulative number or 14-day running average of the number of fish salvaged because daily salvage estimates based on daily counts are extremely variable. A running average may provide a more reliable estimate of the abundance of fish at risk of entrainment than would be provided by daily estimates. The reduced variability of the running average also results in more predictable and consistent project operations. However, the CVP and SWP have had very little experience with adjusting operations to comply with take limits, so the possible effects of basing take limits on running averages are not fully known.

The 1995 WQCP allows the "operations group" to recommend changes in SWP and CVP export pumping for fish protection to the project operators, based on available fish monitoring information. Until decision-making guidelines are developed for this "operations group", however, possible operational changes to comply with "take limits" can be illustrated with monitoring results and salvage records from recent years.

The 1994 U.S. Fish and Wildlife Service (USFWS) biological opinion for delta smelt (USFWS 1994) specifies that if the 14-day running average of delta smelt salvaged at the SWP and CVP facilities exceeds the allowable monthly value of the delta smelt take limit, "operations shall be modified to restore the 14-day running average". The opinion later states that "if reasonable operation of the CVP/SWP cannot correct numbers of fish taken, the Working Group . . . shall meet to develop alternative actions". Modifications to restore the 14-day running average (i.e., to reduce it to below the take limit) presumably would include reduced pumping. The allowable monthly take limit is determined on the basis of a variety of factors, including the month, water-year type, and previous abundance indices (USFWS 1994).

Although use of a 14-day running average for salvage may have certain advantages, it could also lead to serious problems. For instance, the 14-day running average responds so slowly to rapid increases in salvage caused by an increased abundance (density) of delta smelt that a great deal of entrainment could occur before the 14-day average allowable take limit is reached. The 14-day average also responds slowly to decreases in delta smelt abundance and therefore could lead to unnecessary delays in the resumption of pumping. A 14-day average may neither protect delta smelt nor be an efficient basis for determining allowable pumping.

The possible effects of a take limit strategy based on the 14-day running average can be illustrated with 1993 SWP delta smelt daily salvage records, shown in Figure A4-12. If the 1994 biological opinion "formula" for monthly delta smelt take limits had been in effect in 1993, the 14-day average take limit for May 1993 would have allowed the salvage of 600 delta smelt per day.

In early May, SWP and CVP pumping was reduced during a period of San Joaquin flushing flows to benefit migrating chinook salmon. On May 17, 1993, the SWP increased exports from 1,462 cfs to 6,179 cfs, and daily salvage of delta smelt increased from about 200 per day to nearly 900 per day. Another 5 days passed, however, before the 14-day running average of delta smelt salvage exceeded the take limit of 600 per day. Continued pumping during these days caused entrainment of a large number of delta smelt. Note that a 7-day running average would have tracked the increase in salvage more closely than the 14-day average (Figure A4-12).

DW Project Monitoring for Larval Fish

Real-time monitoring of larval fish abundance at stations near the DW project islands would provide the greatest protection for fish. The DW project is designed to respond quickly to changing conditions and therefore could be operated in response to real-time fluctuations in fish numbers. Daily sampling at several stations may be required. There is some delay between sampling and analysis. Net or siphon sampling may be combined with an automated fish counting system, such as hydroacoustic technology, to provide a comprehensive monitoring program. Automated sampling techniques might provide a general indication of larval density, but identification of species would require hand processing by qualified technicians. It is likely that sampling techniques will change and improve in the near future.

COMPARISON OF SIMULATED DAILY AND MONTHLY DW PROJECT OPERATIONS

The DeltaSOS monthly planning model (described in Appendix A2, "DeltaSOS: Delta Standards and Operations Simulation Model") was modified to estimate Delta water supply conditions and possible DW project operations using a daily time-step model; the modified daily model is named DailySOS. DailySOS simulation results for the 1967-1991 period were compared with monthly DeltaSOS results (presented in Appendix A3, "DeltaSOS Simulations of the Delta Wetlands Project Alternatives") for the same period to determine the likely differences in proposed DW operations between daily simulations and monthly average simulations. The daily simulations assumed that all objectives required daily compliance, while the monthly simulations assumed that all objectives required monthly average compliance.

Changes in DeltaSOS Calculations and Standards

Appendix A2 describes the concept and basic calculations of the DeltaSOS monthly model. DailySOS uses these same calculations. Hydraulic flow-split calculations are assumed to be the same for daily flows and monthly average flows. The monthly objectives, as specified in DeltaSOS, are assumed to be applicable each day throughout the entire month.

The following changes in DeltaSOS model calculations were needed for representing the 1995 WQCP objectives, estimating SWP and CVP Delta exports, and evaluating possible DW project operations at a daily time step:

- SWP and CVP daily export limits are calculated as a specified monthly fraction of total daily inflows (the February fraction depends on January's unimpaired runoff); the 3-day averaging of inflows and exports was not simulated.

- The required San Joaquin River inflows and daily export limits (minimum of San Joaquin River inflow or the specified fraction of total inflow) for the pulse-flow period (April 15 to May 15) were accurately simulated in the daily model with daily flows. The required San Joaquin River inflows for February-June depend on the San Joaquin River water-year type and the daily X2 (more inflow is required if X2 is downstream of Chipps Island).

- The Corps permitted maximum daily SWP pumping limit was calculated as 6,680 cfs plus 33% of the daily San Joaquin River inflows for the period of December 15 to March 15 (with a maximum SWP pumping capacity of 10,300 cfs).

- X2 was calculated with the daily X2 equation; the daily required X2 positions for the month were calculated at the beginning of each month between February and June. The required number of days for X2 to be downstream of Chipps Island or Roe Island are specified in the 1995 WQCP, and depend on the previous month's runoff (Eight-River Index). The Chipps Island or Roe Island requirements were simulated starting on the first of each month. The Roe Island requirements were only applicable if the simulated X2 position was downstream of Roe Island at the beginning of the month; the 14-day average EC trigger at Roe Island was not simulated.

- The maximum daily DW diversion and maximum daily DW discharge rates were estimated as a function of the DW storage. The diversion rate was assumed to decrease linearly from 9,000 cfs to 3,000 cfs as the stored volume on the reservoir islands increased to maximum reservoir storage capacity. The discharge rate was assumed to decrease linearly from 6,000 cfs to 2,000 cfs as the stored volume decreased.

DailySOS calculations provide a more accurate estimate than monthly DeltaSOS calculations provide of possible Delta operations with specified Delta facilities, water quality objectives (1995 WQCP), and specified inflows (from historical DAYFLOW records). However, the DeltaSOS monthly model results were used as the basis for impact assessments in the EIR/EIS. The following sections of this appendix illustrate and discuss the DailySOS results for three recent example years (1986-

1988) and compare the DeltaSOS monthly model results with the DailySOS daily model results for 1967-1991.

The monthly results that are compared with the DailySOS results for the 1967-1991 period were obtained from the DeltaSOS model using historical Delta inflows. The simulation of the 1995 WQCP objectives, including the estimation of outflow requirements for X2 objectives, followed the methods and assumptions described in Appendix A2, "DeltaSOS: Delta Standards and Operations Simulation Model". These monthly results are different from the simulations of Delta conditions under the No-Project Alternative used in the EIR/EIS impact assessments (Appendix A3, "DeltaSOS Simulations of the Delta Wetlands Project Alternatives"). These comparisons of daily and monthly model results were performed to identify the differences in likely operations of Delta facilities, including the DW project, that may be caused by consideration of daily variations in Delta hydrology and daily compliance with 1995 WQCP objectives.

Table A4-1 compares the annual DeltaSOS and DailySOS results for water years 1967-1991. The models gave somewhat different results for allowable CVP and SWP exports and DW operations for some years. Table A4-2 gives the DeltaSOS monthly results and monthly average of DailySOS daily results for historical inflows for water years 1967-1991. The results given in these tables indicate that while there are differences in the monthly and daily model results, the simulated Delta conditions are generally similar for both models.

Large changes in Delta conditions associated with fluctuating hydrologic inflows are simulated with both models. Export limits are simulated more often with the daily model; simulated maximum allowable CVP and SWP exports are lower with the daily model than with the monthly model. Periods of excess inflows, which would provide water for DW diversions, are simulated more often with the daily model than with the monthly model. Periods of limited CVP and SWP exports, which would allow DW discharge water to be exported, are simulated more often with the daily model than with the monthly model. Results for the three example years are described in the next section to illustrate the reasons for differences in the results from the monthly and daily models

The differences between the daily and monthly simulation results indicate that the DW project, if operated in response to short-term variations in hydrology (or fish abundance), may be used to "even out" or "top off" the CVP and SWP Delta operations. Although the DailySOS simulations described in this appendix assume the DW project to be independent of the CVP and SWP facilities, it may be possible to implement more integrated Delta operations that might include upstream reservoir releases and discharges from DW project reservoir islands for increased Delta outflow. Use of a daily model such as DailySOS would be necessary for studies of integrated operations.

The daily variations in hydrology (and biology) that have been investigated in this appendix should be considered in the terms and conditions for the DW water rights and should be incorporated into the mitigation measures required for potential DW project impacts.

Nevertheless, the monthly DeltaSOS simulation of the No-Project Alternative and the DW project alternatives will generally provide an adequate representation of likely Delta conditions and the potential changes associated with DW project operations. The wide range of future hydrologic conditions are well represented by the monthly average flows simulated with DeltaSOS. The DeltaSOS results and subsequent monthly impact assessments used to evaluate the DW project in this EIR/EIS are a reasonable basis for lead agency decisions and public disclosure of potential environmental effects of DW project implementation.

DailySOS Results for 1986

DailySOS results for three recent years (1986, 1987, and 1988) are presented here to illustrate the calculations of channel flows and adjustments in historical exports and outflow that are required to satisfy the 1995 WQCP objectives. DailySOS will increase San Joaquin River inflow to satisfy 1995 WQCP objectives. DailySOS will reduce exports from historical levels (and increase historical outflow above historical levels) if necessary to satisfy outflow objectives or pumping limit objectives. DailySOS will increase exports above historical levels (and reduce outflow) if additional exports would be allowable under the 1995 WQCP objectives.

Figure A4-13A shows the historical 1986 Sacramento and San Joaquin River inflows and DailySOS adjustments. The DailySOS-simulated DCC and Georgiana Slough diversions to the central Delta (with the DCC closed during November-May), QWEST flow from the central Delta, and Delta exports (including simulated DW exports) are shown for comparison.

There were no adjustments required in Sacramento River inflows because the 1995 WQCP objectives for

Rio Vista are normally satisfied with historical inflows. Although 1986 was classified as a wet year (Eight-River Index of 29,240 thousand acre-feet [TAF]) and extreme flooding occurred in February, the Sacramento River inflows were only moderately high (10,000 cfs to 20,000 cfs) during fall and summer. Monthly average inflows and monthly model results would be adequate for these periods. During February and March, inflows were much higher than necessary to provide required outflow and supply maximum pumping capacity, so monthly model results would be adequate. Daily simulations might produce different results, however, during the periods of moderate storm-event inflows in December and January.

Even with the DCC closed from November to May, there was considerable diversion of Sacramento River water simulated to the central Delta through Georgiana Slough. The QWEST flow represents the balance between the available San Joaquin River, eastside stream, DCC, and Georgiana Slough water and south Delta exports and agricultural diversions (65% of total). Simulated QWEST was negative (more exports than inflows) during some portions of November-January and August-September.

San Joaquin River inflows were about 2,000 cfs during fall and increased to above 10,000 cfs from February through April. The Corps permit for SWP pumping capacity allowed some additional exports during January-March. The 1995 WQCP objectives for San Joaquin River February-June inflows and pulse flows from April 15 to May 15 were satisfied without any additional simulated releases.

The likely source of Delta exports can be determined through comparison of the San Joaquin River inflow with the simulated exports. Because most San Joaquin River inflows are diverted toward Delta exports, the San Joaquin River would have supplied most of the exports from mid-February to mid-June. The remainder of exports come from the Sacramento River through the DCC and Georgiana Slough. When QWEST is negative, some of the Threemile Slough diversions from the Sacramento River move upstream toward the export pumps.

Figure A4-13B shows the DailySOS adjustments to historical exports for 1986 and the DW project diversions and DW discharges for export simulated for Alternative 2 (DW exports limited by permitted capacity but not by the 1995 WQCP criteria for percentage of Delta inflow diverted).

DailySOS-simulated exports were slightly reduced from historical levels so that 1995 WQCP outflow objectives and percent of inflow limits would be met during fall. Simulated exports were increased substantially above historical exports from mid-January through April because DailySOS assumes that all available water is exported, without checking south-of-Delta storage capacity or demands. Exports were curtailed in May in the simulations because 1995 WQCP objectives for X2 were not satisfied with historical outflow. The Roe Island objective was applicable in May because X2 was downstream at the beginning of May and the April Eight-River index of 5,880 TAF required 28 days of X2 compliance in May.

The DailySOS simulation of DW project operations, starting with empty reservoir islands, showed diversions during the early December storm-event, with discharges for export in December and January. DW diversions filled the reservoir islands by early February, with discharges for export in May. Excess inflow was simulated for September, and simulated DW diversions refilled the reservoir islands to 193 TAF by the end of the year.

Figure A4-13C shows the simulated daily X2 requirements and estimated position of X2, along with the historical and adjusted outflow for 1986. DailySOS adjusted historical outflow to satisfy the 1995 WQCP minimum monthly outflow objectives by reducing exports below historical export levels for several periods in 1986.

Required outflow for X2 objectives is only added to the minimum monthly outflow requirements in DailySOS if the daily X2 is upstream of the location for which the X2 objective is specified. The 1995 WQCP X2 objectives would have required export reductions or additional reservoir releases for a few days in February to satisfy the Chipps Island objective and for about 20 days in May to satisfy the Roe Island objective. Because DailySOS reduces exports to a minimum of 1,500 cfs but does not simulate additional reservoir releases to satisfy X2 requirements, an outflow deficit was simulated during most of May, with the simulated X2 moving upstream.

DailySOS reduced the outflow during several periods to allow increased exports and DW diversions. The magnitude of the simulated reductions in outflow was greatest during periods of relatively high outflow, when the 1995 WQCP percent of inflow limits for exports (and simulated DW diversions) allowed the largest change in exports and DW diversions without reducing outflow to less than the 1995 WQCP objectives for minimum outflow.

Comparison of Daily and Monthly Results for 1986

The monthly and daily results for 1986 were generally similar. Both models simulated allowable exports to be much higher than historical exports in 1986. The periods of potential DW diversions, which depend on relatively large Delta inflows, were simulated for December-April with both models. The periods of potential DW discharges for export, which depend on relatively low Delta inflows, were simulated in June and July with the monthly model but were also simulated in May with the daily model because of the simulated export reductions for outflow requirements to satisfy X2 objectives.

Table A4-1 indicates that the annual historical CVP and SWP exports for 1986 totaled 5,286 TAF. The DeltaSOS monthly model results for historical inflows estimated maximum allowable CVP and SWP exports of 7,120 TAF. The DailySOS model results estimated maximum allowable CVP and SWP exports of 6,592 TAF. Both DeltaSOS and DailySOS allowable exports to be higher than actual historical exports, because south-of-Delta demands and storage capacity (San Luis Reservoir) were not included in the simulations. Additional storage and/or delivery facilities may be required to actually export the maximum allowable under the 1995 WQCP objectives.

The DailySOS daily simulated CVP and SWP exports were substantially less than DeltaSOS monthly simulated exports (528 TAF less) because of two major effects:

- For some months of the simulations, more water was allowed to be exported with the monthly average flows and monthly export limits than with the daily inflows and export limits because the daily export limit exceeded the daily pumping capacity during some storm-events, and because the daily export limit was lower than the monthly average limit during periods of relatively low inflow.

- The DeltaSOS monthly estimated outflow requirements and X2 requirements for the February-June period were often less than the DailySOS daily estimated outflow and X2 requirements. The monthly model only reduced historical 1986 exports in October and July without any reduction in May. The daily model required export reductions for outflow in several months, with major reductions required for satisfying X2 objectives in May.

Table A4-1 indicates that the DeltaSOS monthly model results for DW diversions and discharges for export in 1986 were 489 TAF of diversions and 228 TAF of exports, with 238 TAF carryover storage on the reservoir islands at the end of September. The DailySOS model results were somewhat higher, with 551 TAF of diversions, 328 TAF export, and 193 TAF of carryover storage.

The DailySOS daily simulated DW operations were somewhat greater than DeltaSOS monthly simulated DW operations (62 TAF more in diversion and 100 TAF more in export, but 45 TAF less in carryover storage) because of two major effects:

- For some months of the simulations, the monthly average flows and monthly export limits did not allow any water to be diverted onto the DW reservoir islands, while there may have been at least one storm-event period with excess inflow for some days within the month. During other months, the monthly average flows allowed full CVP and SWP exports, while the daily export limits were sometimes below full capacity and allowed some periods of DW discharge and export.

- The DailySOS simulation of DW diversion and DW discharge capacity, which varied with reservoir island storage, allowed periods of higher diversion and discharge rates than were simulated by the monthly model. During months with opportunities for DW project diversions and discharges in sequence (i.e., December and January 1986), the daily diversion and discharge rates allowed more rapid filling and emptying of the DW reservoir islands.

These differences between the daily and monthly simulation results are generally consistent; reduced allowable CVP and SWP exports will allow greater DW diversions and discharges. The daily variations in hydrology that may exceed pumping capacity or require export reductions to satisfy export limits or outflow requirements will at the same time allow periods of DW diversions (whenever the export capacity is exceeded) or allow DW exports (whenever there is unused CVP or SWP export capacity).

DailySOS Results for 1987

Figure A4-14A shows the historical 1987 Sacramento and San Joaquin River inflows and DailySOS adjustments. Water year 1987 was classified as a dry year (Eight-River Index of 18,880 TAF); the Sacramento River inflows were relatively low (10,000 cfs to 15,000 cfs) during the entire year, with a few small storm-events in the January-March period. Monthly model results would perhaps be adequate for simulating Delta conditions during most of 1987. Daily simulations might produce different results, however, during the periods of moderate storm-event inflows.

San Joaquin River inflows were about 4,000 cfs during fall and declined to about 2,000 cfs by the end of the year. The Corps permit for SWP pumping capacity allowed only a small amount of additional exports in the December-March period. The 1995 WQCP objectives for San Joaquin River pulse flow from April 15 to May 15 required about 1,000 cfs of simulated additional releases from tributaries. DailySOS assumes the water will be supplied, and increases the San Joaquin River inflow above the historical inflow.

Figure A4-14B shows the DailySOS adjustments to historical exports for 1987 and the DW project diversions and DW discharges for export simulated for Alternative 2 (DW exports limited by permitted capacity).

DailySOS generally increased exports above the historical levels to the percent of inflow limits or pumping capacity from October through March. Simulated exports were reduced below the levels of historical exports from April through September for so that required outflow would satisfy X2 objectives.

The DailySOS simulation of DW project operations for 1987 started with nearly full reservoir islands, and DailySOS simulated diversions to fill the reservoir islands in October and simulated some DW exports during November and December because the CVP and SWP export limits were slightly less than pumping capacity. A sequence of DW diversions and discharges was simulated during January, February, and March. Delta inflows were limiting for the rest of the year, and DW reservoir islands remained empty in the simulations from April to the end of the year.

Figure A4-14C shows the daily simulated X2 requirements and estimated X2, along with the historical and adjusted outflow for 1987. DailySOS adjusted historical outflow to the 1995 WQCP minimum monthly outflow objectives by increasing exports above the historical export levels in fall and by reducing historical exports for several periods in spring and summer.

The 1995 WQCP X2 objectives would have required export reductions or additional reservoir releases for a few days in March and for most of April and May to satisfy the Chipps Island X2 objective. The Roe Island X2 objective was not applicable in 1987. Because DailySOS reduces exports to a minimum of 1,500 cfs but does not simulate additional reservoir releases to satisfy X2 requirements, an outflow deficit was simulated during most of April and May, with the simulated X2 moving upstream of Chipps Island (kilometer 74).

Comparison of Daily and Monthly Results for 1987

The monthly and daily results for 1987 were generally similar. Both models simulated maximum allowable CVP and SWP exports to be greater than historical exports. Periods of potential DW diversions, which depend on relatively large Delta inflows, were not simulated with the monthly model in 1987. The daily model simulated periods of potential DW diversions in October, and in the December-March period because of the sequence of storm-event inflows. The monthly model simulated DW discharges for export, which depended on carryover storage from the previous year in November-February. The daily model simulated discharges in October-March because of carryover storage and additional diversion opportunities.

Table A4-1 indicates that the annual historical CVP and SWP exports for 1987 totaled 5,047 TAF. The DeltaSOS monthly model results for historical inflows estimated maximum allowable CVP and SWP exports of 5,742 TAF. The DailySOS model results estimated maximum allowable CVP and SWP exports of 5,382 TAF. Both DeltaSOS and DailySOS simulated allowable exports to be higher than historical exports because south-of-Delta demands and storage capacity (San Luis Reservoir) were not included in the simulations. Additional storage or delivery facilities may be required to actually export the maximum allowable under the 1995 WQCP objectives.

The DailySOS daily simulated CVP and SWP exports were substantially less than DeltaSOS monthly simulated exports (360 TAF less) because inflow and export capacity are limiting more often with daily exports than with monthly exports and because exports may be limited more by daily outflow requirements than by the monthly average outflow requirements.

Table A4-1 indicates that the DeltaSOS monthly model results for DW diversions and discharges for export in 1987 were 3 TAF of diversions and 241 TAF of exports, with no carryover storage on the reservoir islands at the end of September. The DailySOS model results were somewhat higher, with 142 TAF of diversions, 324 TAF export, and no carryover storage.

The DailySOS daily simulated DW operations were somewhat greater than DeltaSOS monthly simulated DW operations (139 TAF more of diversions, 83 TAF more of exports) because of short periods of simulated DW diversions during storm-event inflows in fall and winter.

These differences between the daily and monthly simulation results are generally consistent; reduced allowable CVP and SWP exports will allow greater DW diversions and discharges. The daily variations in hydrology that may exceed pumping capacity or require export reductions to satisfy outflow requirements will at the same time allow periods of DW diversions (whenever the export capacity is exceeded) or allow DW exports (whenever there is unused CVP or SWP export capacity).

DailySOS Results for 1988

Figure A4-15A shows the historical 1988 Sacramento and San Joaquin River inflows and DailySOS adjustments. Water year 1988 was classified as a critical year (Eight-River Index of 11,385 TAF); the Sacramento River inflows were relatively low (10,000 cfs to 15,000 cfs) during the entire year, with a few small storm-events in December-January. Monthly average inflows and monthly model results would perhaps be adequate for this year. Daily simulations might produce different results, however, during the periods of moderate storm-event inflows.

San Joaquin River inflows were between about 1,000 cfs and 2,000 cfs during the entire year. The Corps permit for SWP pumping capacity allowed some additional exports only in January. The 1995 WQCP objectives for San Joaquin River pulse flow from April 15 to May 15 required about 1,000 cfs of additional releases from tributaries.

Figure A4-15B shows the DailySOS adjustments to historical exports for 1988 and the DW project diversions and DW discharges for export simulated for Alternative 2 (DW exports limited by permitted capacity).

The historical exports were adjusted slightly to match the percent of inflow limits or pumping capacity from October through January. Simulated exports were reduced from historical exports from February through June to satisfy outflow requirements for X2 objectives. The April and May storm-event inflows did not increase exports; simulated exports were reduced to satisfy the export limits associated with the San Joaquin River pulse flows.

The DailySOS simulation of DW project operations in 1988 started with empty reservoir islands. DW diversions were simulated in early December and January storm events. DW exports were simulated in late December and February. Delta inflows were limiting for the rest of the year, and DW reservoir islands were simulated to remain empty from March to the end of the year.

Figure A4-15C shows the daily simulated X2 requirements and estimated X2, along with the historical and adjusted outflow for 1988. DailySOS increased outflow above the historical levels to meet the 1995 WQCP minimum monthly outflow objectives by reducing exports during October-January and July-September. Outflow was reduced below historical levels during some storm events to provide increased exports. Simulated X2 objectives controlled outflow requirements in February, March, and June. Inflow limits and pulse-flow export limits resulted in increased simulated outflow during April and May.

Comparison of Daily and Monthly Results for 1988

The monthly and daily results for 1988 were generally similar. Both models simulated reduced allowable exports compared with historical exports. Periods of potential DW diversions, which depend on relatively large Delta inflows, were simulated in January with the monthly model. The daily model simulated periods of potential DW diversions in December and January storm events. The monthly model simulated DW discharges for export in February. The daily model simulated discharges in December and February.

Table A4-1 indicates that the annual historical CVP and SWP exports for 1988 totaled 5,611 TAF. The DeltaSOS monthly model results for historical inflows estimated maximum allowable CVP and SWP exports of only 4,646 TAF. The DailySOS model results estimated maximum allowable CVP and SWP exports of 4,233 TAF. Allowable exports simulated by both DeltaSOS and DailySOS were less than actual historical exports because exports were reduced to satisfy 1995 WQCP objectives for percentage of inflow diverted, San Joaquin River pulse flow, minimum outflow, and X2 position.

The DailySOS daily simulated CVP and SWP exports were again substantially less than DeltaSOS monthly simulated exports (413 TAF less) because daily inflows and export capacity limits on daily exports are greater than monthly inflow limits and because exports may be limited more by daily outflow requirements than by the monthly average outflow requirements.

Table A4-1 indicates that the DeltaSOS monthly model results for DW diversions and discharges for export in 1988 were 234 TAF of diversions and 244 TAF of exports, with no carryover storage on the reservoir islands at the end of September. The DailySOS model results were somewhat higher, with 283 TAF of diversions, 278 TAF of exports, and no carryover storage.

The DailySOS daily simulated DW operations were somewhat greater than DeltaSOS monthly simulated DW operations (49 TAF more of diversions, 34 TAF more of exports) because of short periods of diversions during storm-event inflows in winter.

CONCLUSIONS

This appendix has presented information on daily Delta flow conditions, CVP and SWP operations, fish abundance patterns, and likely DW project operations and has compared daily and monthly conditions and operations. Two major conclusions can be drawn from the information presented above.

- **Impact assessments of the DW project that are based on monthly models of Delta hydrologic, water quality, and fishery conditions and likely CVP and SWP operations provide a good basis for reliable evaluation of major potential impacts on water supply, hydrodynamics, water quality, and fishery resources.**

  DW project impact assessments are based on monthly simulations of the 1922-1991 period, which includes a wide range of likely Delta conditions. Although daily variations in hydrology, water quality, and fishery conditions are expected, monthly average values are representative of the anticipated range of conditions. Simulated average monthly DW operations provide adequate estimates of likely environmental effects of the DW project on Delta conditions.

  Variations in both fish abundance and distribution are relatively unknown and uncertain; monthly average conditions are sufficient for estimates of likely fish conditions for impact assessment.

- **DW project operations should be governed and regulated under SWRCB-adopted water right terms and conditions and possible biological opinion requirements using available daily information on Delta flow and salinity conditions, DW project operating capacities, CVP and SWP operations, and compliance with Delta objectives and available water quality and fishery monitoring information.**

  The magnitude of possible effects of DW project operations will change as daily Delta conditions change. Potential impacts may be minimized through adaptive-management evaluations of the daily effects of DW operations on Delta flows, water quality, or fishery resources.

  Mitigation measures should be designed to reduce the possible daily effects of DW project operations, with appropriate monitoring requirements to allow the effectiveness of daily operational mitigation measures to be evaluated.

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Table A4–1. Comparison of Annual Results from DailySOS and DeltaSOS for Historical Inflows and Exports for 1967–1991

Water Year	Sac Basin Year Type	SJR Basin Year Type	Historical Banks& Tracy Pumping (TAF)	Historical Sac Inflow (TAF)	Historical Yolo Bypass Flow (TAF)	Historical CCWD Pumping (TAF)	Historical Eastside Inflow (TAF)	Historical SJR Basin Inflow (TAF)	Historical Delta Depletion (TAF)	Historical Delta Outflow (TAF)	DailySOS Added SJR Flow (TAF)	DeltaSOS Added SJR Flow (TAF)	DailySOS New SJR Flow (TAF)	DeltaSOS New SJR Flow (TAF)
1967	1	1	1,250	24,233	3,654	71	1,720	5,559	389	33,457	38	24	5,597	5,593
1968	3	4	2,460	13,377	653	96	514	1,423	1,036	12,373	341	376	1,764	1,807
1969	1	1	2,870	23,362	6,270	78	2,387	10,168	424	38,817	13	7	10,180	10,192
1970	1	2	2,064	20,289	8,485	94	1,412	2,996	788	30,237	415	384	3,412	3,385
1971	1	3	2,825	22,811	1,304	75	900	1,778	742	23,151	279	241	2,057	2,022
1972	3	4	3,427	12,470	29	103	362	1,112	1,246	9,145	436	427	1,548	1,546
1973	2	2	3,358	20,758	3,880	92	1,426	2,392	439	24,616	327	249	2,720	2,645
1974	1	1	4,353	30,663	7,554	79	1,548	2,773	688	37,417	321	125	3,094	2,902
1975	1	1	3,898	19,941	949	79	1,123	2,826	854	20,008	348	247	3,174	3,078
1976	5	5	4,815	10,963	14	111	206	1,523	1,225	6,556	149	127	1,672	1,657
1977	5	5	2,075	5,497	1	99	30	416	1,237	2,528	427	420	843	836
1978	2	1	4,342	17,691	2,839	77	1,144	4,490	316	21,411	121	97	4,611	4,595
1979	3	2	4,462	13,034	153	91	1,018	2,625	742	11,535	358	335	2,983	2,965
1980	2	1	4,502	19,248	6,390	87	1,810	5,975	645	28,190	0	0	5,975	6,025
1981	4	4	4,714	11,498	126	107	286	1,763	958	7,895	167	164	1,930	1,930
1982	1	1	4,613	30,150	7,217	75	3,033	5,477	30	41,159	14	7	5,491	5,493
1983	1	1	4,392	34,051	14,936	79	4,549	15,438	(29)	64,531	0	0	15,438	15,464
1984	1	2	3,822	22,437	4,678	97	1,799	6,279	823	30,450	281	242	6,560	6,555
1985	4	4	5,461	12,192	172	112	469	2,119	939	8,438	125	107	2,244	2,229
1986	1	1	5,277	18,112	10,589	110	2,121	5,235	230	30,419	15	0	5,251	5,244
1987	4	5	5,034	10,031	35	131	383	1,810	999	6,094	43	0	1,853	1,813
1988	5	5	5,580	9,653	115	135	142	1,164	965	4,395	78	13	1,241	1,182
1989	4	5	5,957	12,244	44	134	220	1,057	888	6,588	84	60	1,140	1,119
1990	5	5	5,798	9,860	21	135	169	914	1,074	3,957	122	83	1,036	998
1991	5	5	3,180	7,540	75	106	221	655	834	4,371	234	228	889	883
Average			4,021	17,284	3,207	98	1,160	3,519	739	20,310	190	158	3,708	3,686

Note: Negative values shown in parentheses.

C-061419

Table A4-1. Continued

Water Year	DailySOS Added SJR Flow (TAF)	DeltaSOS Added SJR Flow (TAF)	DailySOS New SJR Flow (TAF)	DeltaSOS New SJR Flow (TAF)	DailySOS Required Delta Outflow (TAF)	DeltaSOS Required Delta Outflow (TAF)	DailySOS Export Limits for Inflow (TAF)	DeltaSOS Export Limits for Inflow (TAF)	DailySOS Reduced Export for Objectives (TAF)	DeltaSOS Reduced Export for Objectives (TAF)	DailySOS Outflow Deficit (TAF)	DeltaSOS Outflow Deficit (TAF)	DailySOS Net Export Change (TAF)	DeltaSOS Net Export Change (TAF)
1967	38	24	5,597	5,593	4,121	5,706	15,785	15,739	3	0	14	0	6,303	6,664
1968	341	376	1,764	1,807	5,704	5,922	7,965	7,945	694	554	594	208	2,911	3,355
1969	13	7	10,180	10,192	3,743	5,432	19,049	19,184	25	0	0	0	5,100	5,023
1970	415	384	3,412	3,385	6,353	5,120	17,711	17,682	601	322	1,589	123	4,103	4,436
1971	279	241	2,057	2,022	5,611	6,325	13,825	13,745	159	0	309	0	4,349	5,049
1972	436	427	1,548	1,546	5,696	4,611	7,498	7,443	810	417	776	0	2,125	2,627
1973	327	249	2,720	2,645	5,460	5,345	14,120	14,064	614	220	695	0	3,366	3,776
1974	321	125	3,094	2,902	5,443	5,407	21,230	20,711	524	0	288	0	3,185	3,781
1975	348	247	3,174	3,078	5,430	6,065	11,840	11,497	100	0	68	0	3,622	4,065
1976	149	127	1,672	1,657	4,075	3,942	7,033	7,035	692	647	220	0	313	424
1977	427	420	843	836	3,458	3,272	3,405	3,393	501	310	713	591	(334)	(118)
1978	121	97	4,611	4,595	4,444	5,082	12,074	11,912	568	250	418	21	1,482	1,920
1979	358	335	2,983	2,965	5,261	4,994	8,626	8,303	522	383	294	21	2,073	2,337
1980	0	0	5,975	6,025	5,485	5,482	16,431	16,081	209	0	393	0	2,865	3,334
1981	167	164	1,930	1,930	5,958	4,445	7,125	6,895	686	231	1,078	6	623	1,449
1982	14	7	5,491	5,493	4,758	5,368	21,086	20,912	84	0	319	0	2,875	3,399
1983	0	0	15,438	15,464	3,814	4,873	30,995	30,937	0	0	0	0	4,329	3,978
1984	281	242	6,560	6,555	6,166	5,832	20,211	20,207	575	393	1,088	0	3,467	3,335
1985	125	107	2,244	2,229	5,092	4,427	8,074	8,068	956	434	616	0	285	788
1986	15	0	5,251	5,244	6,240	5,217	15,973	14,983	701	81	1,148	0	1,070	1,834
1987	43	0	1,853	1,813	5,661	4,600	6,408	6,424	896	657	1,533	16	292	699
1988	78	13	1,241	1,182	5,008	3,802	5,732	5,734	1,587	1,180	995	0	(1,337)	(965)
1989	84	60	1,140	1,119	5,376	4,056	6,658	6,594	1,163	780	1,338	2	(829)	(272)
1990	122	83	1,036	998	4,141	3,927	5,845	5,675	1,328	959	321	0	(1,025)	(594)
1991	234	228	889	883	3,767	3,473	4,378	4,335	646	491	538	122	(301)	(4)
Average	190	158	3,708	3,686	5,051	4,909	12,363	12,220	586	332	614	44	2,037	2,413

Table A4–1. Continued

Water Year	DailySOS CVP & SWP Export (TAF)	DeltaSOS CVP & SWP Export (TAF)	DailySOS Available Flow (TAF)	DeltaSOS Available Flow (TAF)	DailySOS Carryover Delta Storage (TAF)	DeltaSOS Carryover Delta Storage (TAF)	DailySOS Delta Storage Diversion (TAF)	DeltaSOS Delta Storage Diversion (TAF)	DailySOS Delta Storage Export (TAF)	DeltaSOS Delta Storage Export (TAF)	DailySOS Final Total Export (TAF)	DeltaSOS Final Total Export (TAF)	DailySOS Final QWEST Flow (TAF)	DeltaSOS Final QWEST Flow (TAF)	DailySOS Final Delta Outflow (TAF)	DeltaSOS Final Delta Outflow (TAF)
1967	7,552	7,916	6,113	6,548	232	231	482	306	200	24	7,753	7,940	3,898	3,639	26,697	26,359
1968	5,371	5,823	1,234	1,215	0	0	117	11	334	236	5,705	6,059	(561)	(923)	9,370	9,117
1969	7,970	7,898	8,617	9,111	238	238	451	447	173	169	8,142	8,067	8,991	9,031	33,289	33,203
1970	6,167	6,503	5,088	5,641	110	0	127	128	234	223	6,401	6,726	2,323	1,914	26,032	25,656
1971	7,174	7,880	3,942	3,680	238	0	647	269	474	97	7,648	7,977	(800)	(1,119)	18,180	17,692
1972	5,552	6,067	691	671	48	(0)	98	55	273	238	5,825	6,305	(1,348)	(1,799)	6,999	6,624
1973	6,724	7,140	4,608	4,814	72	0	295	282	243	206	6,968	7,346	1,329	886	20,931	20,522
1974	7,537	8,141	7,145	7,312	238	179	486	261	281	55	7,818	8,196	1,851	1,500	33,772	33,323
1975	7,520	7,969	3,510	3,224	238	44	292	256	255	207	7,775	8,176	283	(50)	16,119	15,639
1976	5,128	5,264	1,176	1,148	0	0	6	6	244	244	5,373	5,508	(863)	(1,030)	6,261	6,129
1977	1,740	1,961	0	0	0	0	0	0	0	0	1,740	1,961	78	(158)	2,893	2,681
1978	5,825	6,270	4,090	4,052	173	0	465	419	267	234	6,092	6,504	3,268	2,700	19,508	18,917
1979	6,535	6,807	1,232	823	0	0	371	185	521	343	7,056	7,150	(76)	(270)	9,115	8,900
1980	7,367	7,857	5,510	6,014	106	0	426	359	291	218	7,659	8,074	4,186	3,791	24,924	24,772
1981	5,337	6,171	605	289	0	0	379	234	473	344	5,810	6,515	(923)	(1,717)	6,918	6,075
1982	7,488	8,019	8,900	9,220	238	238	487	285	204	0	7,692	8,019	6,449	5,862	37,822	37,163
1983	8,720	8,377	19,927	20,905	238	238	49	49	0	0	8,720	8,377	17,403	17,536	60,178	60,529
1984	7,289	7,176	7,938	8,400	238	0	264	258	231	236	7,520	7,412	5,058	5,192	26,743	26,853
1985	5,746	6,258	1,441	1,554	0	0	35	6	276	252	6,022	6,510	(304)	(813)	8,143	7,640
1986	6,348	7,120	5,862	6,209	193	0	575	489	349	228	6,696	7,348	4,639	3,777	28,819	27,896
1987	5,326	5,742	217	107	0	0	143	3	332	241	5,658	5,983	(741)	(1,126)	5,684	5,263
1988	4,243	4,646	474	451	0	0	287	234	298	244	4,541	4,890	(820)	(1,225)	5,469	5,058
1989	5,128	5,695	665	440	116	0	511	351	367	236	5,494	5,932	(1,395)	(1,948)	6,931	6,309
1990	4,773	5,218	212	93	0	0	181	93	299	210	5,072	5,428	(1,474)	(1,842)	4,826	4,447
1991	2,879	3,176	86	0	0	0	85	0	83	0	2,962	3,176	(18)	(422)	4,612	4,134
Average	6,058	6,444	3,971	4,077	109	47	290	199	268	179	6,326	6,623	2,017	1,655	18,009	17,636

C-061421

Table A4–2. Comparison of DailySOS and DeltaSOS Monthly Results for Historical Inflows and Exports

Water Year	Historical Banks& Tracy Pumping (cfs)	Historical Sac Inflow (cfs)	Historical Yolo Bypass Flow (cfs)	Historical CCWD Pumping (cfs)	Historical Eastside Inflow (cfs)	Historical SJR Basin Inflow (cfs)	Historical Estimated Delta Depletion (cfs)	Historical Delta Outflow (cfs)
1968								
Oct	1,693	16,155	22	101	1,326	2,725	1,685	16,749
Nov	1,040	14,593	15	92	430	3,473	1,178	16,202
Dec	595	17,177	41	79	234	3,635	(86)	20,498
Jan	1,077	20,477	899	91	602	2,940	(507)	24,257
Feb	1,768	39,779	6,613	60	2,516	2,617	(2,364)	52,061
Mar	4,435	36,016	2,843	51	1,869	3,093	(979)	40,314
Apr	5,250	14,437	282	130	623	1,435	1,467	9,932
May	5,452	13,316	51	159	384	891	2,294	6,737
Jun	4,484	11,353	27	224	150	592	3,747	3,666
Jul	4,944	12,594	3	224	103	503	4,352	3,684
Aug	4,674	13,003	8	194	138	768	3,785	5,264
Sep	5,417	13,120	27	185	154	938	2,632	6,004
1969								
Oct	6,099	11,629	21	149	139	1,384	1,473	5,453
Nov	4,928	13,603	14	114	203	1,604	(738)	11,120
Dec	3,677	22,935	857	88	751	2,533	(2,371)	25,682
Jan	5,688	55,403	45,312	60	10,995	13,815	(4,827)	123,140
Feb	4,647	71,793	45,185	60	9,957	32,554	(4,146)	159,046
Mar	3,349	49,729	10,688	53	5,439	30,874	101	93,506
Apr	3,139	45,350	1,070	74	4,731	22,117	960	69,375
May	3,162	40,606	698	108	4,011	24,613	2,374	64,564
Jun	2,381	23,123	148	113	1,388	27,887	3,736	46,596
Jul	3,228	14,216	32	154	695	5,803	4,352	13,143
Aug	4,921	18,345	21	176	570	2,325	3,785	12,458
Sep	2,421	21,017	26	140	736	3,255	2,332	20,188
1970								
Oct	1,902	16,694	25	104	1,094	4,462	784	19,484
Nov	994	16,940	21	78	413	4,628	965	19,964
Dec	727	35,252	6,341	94	1,850	2,658	(910)	46,190
Jan	1,067	70,261	98,162	49	9,355	11,116	(5,343)	193,121
Feb	1,866	66,061	32,998	84	4,510	9,191	(515)	111,326
Mar	2,193	44,206	3,004	72	3,780	7,180	(81)	55,986
Apr	4,524	14,620	123	128	656	1,673	1,392	11,027
May	3,845	14,265	47	166	473	2,393	2,406	10,761
Jun	4,800	11,787	33	197	267	2,737	3,612	6,214
Jul	5,016	13,174	16	212	315	1,330	4,352	5,256
Aug	4,394	14,977	23	214	296	1,044	3,785	7,947
Sep	2,928	18,513	43	161	431	1,319	2,632	14,587

C-061423

Table A4–2. Continued

Water Year	Historical Banks& Tracy Pumping (cfs)	Historical Sac Inflow (cfs)	Historical Yolo Bypass Flow (cfs)	Historical CCWD Pumping (cfs)	Historical Eastside Inflow (cfs)	Historical SJR Basin Inflow (cfs)	Historical Estimated Delta Depletion (cfs)	Historical Delta Outflow (cfs)
1971								
Oct	2,469	15,261	25	116	472	1,466	1,217	13,423
Nov	1,952	22,520	226	78	1,008	1,655	(2,738)	26,117
Dec	1,852	63,971	10,983	63	4,078	5,044	(3,207)	85,369
Jan	1,841	52,323	6,628	63	2,179	5,204	275	64,152
Feb	3,074	31,196	835	65	1,370	4,391	442	34,211
Mar	4,631	30,481	1,269	71	1,766	2,589	(665)	32,069
Apr	4,351	38,270	851	80	1,281	1,961	950	36,983
May	4,452	29,190	589	97	913	1,833	1,570	26,406
Jun	5,627	27,550	184	142	639	2,322	3,709	21,218
Jul	6,344	20,981	14	165	454	1,066	4,352	11,654
Aug	6,520	22,465	5	180	113	892	3,785	12,988
Sep	3,779	24,393	36	128	667	1,096	2,625	19,659
1972								
Oct	3,694	16,071	8	118	978	2,253	1,540	13,957
Nov	2,962	15,853	16	85	318	1,646	1,044	13,743
Dec	2,344	21,758	56	92	937	2,398	(1,252)	23,967
Jan	1,549	20,000	115	66	618	3,117	896	21,339
Feb	3,661	22,117	143	70	897	2,701	160	21,968
Mar	6,588	23,897	96	94	663	1,380	1,276	18,078
Apr	6,196	13,120	6	161	727	1,037	991	7,542
May	6,282	12,848	8	213	378	744	2,344	5,140
Jun	5,121	13,837	17	229	133	587	3,571	2,891
Jul	4,893	15,000	2	181	80	481	4,352	6,211
Aug	6,771	15,658	15	215	112	543	3,785	6,470
Sep	6,817	16,817	7	194	173	1,563	1,978	10,476
1973								
Oct	6,300	16,077	10	112	153	1,992	466	11,919
Nov	3,472	23,203	640	75	281	2,216	(2,912)	25,943
Dec	3,384	27,423	468	67	471	2,502	300	27,133
Jan	2,899	60,132	30,170	63	6,084	4,059	(4,203)	101,685
Feb	1,114	65,257	20,132	64	7,528	7,988	(2,438)	102,165
Mar	1,216	51,642	12,122	66	4,606	7,611	(2,208)	76,907
Apr	3,268	20,670	668	84	1,574	4,203	1,572	22,191
May	6,311	16,416	89	190	1,161	2,937	2,404	11,699
Jun	7,161	14,937	37	194	764	2,576	3,747	7,211
Jul	7,461	15,168	14	233	379	1,082	4,352	4,599
Aug	7,557	16,123	13	217	319	1,067	3,785	5,963
Sep	5,601	17,487	33	167	355	1,471	2,425	11,153

Table A4–2. Continued

Water Year	Historical Banks& Tracy Pumping (cfs)	Historical Sac Inflow (cfs)	Historical Yolo Bypass Flow (cfs)	Historical CCWD Pumping (cfs)	Historical Eastside Inflow (cfs)	Historical SJR Basin Inflow (cfs)	Historical Estimated Delta Depletion (cfs)	Historical Delta Outflow (cfs)
1974								
Oct	5,822	16,723	11	105	471	2,546	(246)	14,071
Nov	4,819	48,037	10,932	84	2,041	2,281	(1,557)	59,945
Dec	3,283	61,632	10,389	56	3,404	3,586	(732)	76,406
Jan	1,917	74,826	51,191	58	5,475	7,781	(1,400)	138,699
Feb	5,397	52,389	6,017	58	1,256	5,094	123	59,178
Mar	6,209	64,681	9,011	66	4,614	4,817	(727)	77,575
Apr	4,125	66,283	37,497	78	3,828	5,850	(291)	109,547
May	7,015	29,177	174	114	1,650	4,106	2,434	25,544
Jun	8,942	24,413	51	188	1,247	3,860	3,499	16,943
Jul	10,493	21,752	24	198	545	1,636	3,901	9,365
Aug	9,281	23,948	12	192	467	1,615	3,785	12,783
Sep	4,940	25,060	61	115	701	2,846	2,632	20,981
1975								
Oct	4,496	20,119	20	98	761	3,497	1,274	18,529
Nov	1,878	22,003	15	71	903	3,891	872	23,991
Dec	2,755	25,645	127	59	788	4,162	(110)	28,017
Jan	5,405	19,432	38	67	303	3,766	579	17,489
Feb	6,634	47,518	3,983	83	2,529	6,212	(3,805)	57,330
Mar	6,005	50,942	9,408	73	5,327	5,685	(1,551)	66,834
Apr	6,207	33,173	1,716	97	2,626	3,957	650	34,519
May	5,471	30,265	286	112	2,290	3,972	2,434	28,796
Jun	4,353	23,710	28	167	1,309	5,708	3,726	22,508
Jul	5,010	18,284	13	175	550	1,718	4,252	11,129
Aug	8,817	19,497	7	171	561	1,681	3,235	9,523
Sep	7,662	20,380	109	137	697	2,652	2,621	13,419
1976								
Oct	7,474	19,174	18	87	912	4,543	186	16,900
Nov	7,949	22,250	13	61	890	3,906	1,128	17,921
Dec	7,778	25,545	40	42	344	3,745	1,901	19,953
Jan	8,158	15,132	37	101	120	3,326	1,010	9,346
Feb	7,628	12,772	34	166	160	2,115	(208)	7,495
Mar	8,207	14,574	51	144	169	1,823	409	7,858
Apr	4,865	12,724	0	172	183	1,293	329	8,833
May	5,280	10,910	40	207	99	939	2,434	4,066
Jun	3,930	10,935	1	222	49	798	3,716	3,915
Jul	3,876	12,077	0	233	55	671	4,352	4,343
Aug	6,624	13,348	4	212	74	1,055	3,135	4,509
Sep	8,140	12,510	4	190	357	1,067	1,937	3,670

Table A4−2. Continued

Water Year	Historical Banks& Tracy Pumping (cfs)	Historical Sac Inflow (cfs)	Historical Yolo Bypass Flow (cfs)	Historical CCWD Pumping (cfs)	Historical Eastside Inflow (cfs)	Historical SJR Basin Inflow (cfs)	Historical Estimated Delta Depletion (cfs)	Historical Delta Outflow (cfs)
1977								
Oct	4,471	8,103	1	135	28	1,274	1,176	3,623
Nov	4,082	7,823	6	162	94	1,136	1,172	3,644
Dec	2,659	7,743	1	125	58	965	1,770	4,213
Jan	6,927	9,802	3	115	51	1,091	(461)	4,365
Feb	4,175	8,003	1	160	40	789	(426)	4,924
Mar	3,688	6,573	4	125	50	524	267	3,070
Apr	1,176	5,961	1	120	25	212	1,820	3,083
May	2,877	7,597	1	110	31	400	1,043	3,999
Jun	557	6,865	1	182	23	118	3,747	2,521
Jul	701	8,248	1	145	67	93	4,352	3,212
Aug	1,388	7,687	1	141	16	124	3,785	2,514
Sep	1,734	6,838	1	123	13	179	2,280	2,791
1978								
Oct	628	4,494	0	135	9	246	1,821	2,075
Nov	2,527	6,687	0	123	34	430	390	4,004
Dec	5,802	11,745	0	110	274	506	(1,945)	8,488
Jan	9,794	45,490	18,701	51	4,430	2,276	(5,159)	66,171
Feb	10,273	44,704	8,618	36	3,065	7,319	(2,764)	56,159
Mar	5,883	55,571	18,368	36	3,174	11,475	(2,874)	85,544
Apr	3,209	38,883	1,378	63	3,451	20,030	(806)	61,276
May	2,968	25,194	21	90	1,912	19,119	2,314	40,874
Jun	7,484	12,660	17	137	706	7,069	3,747	9,086
Jul	7,895	14,300	17	193	189	1,908	4,352	3,974
Aug	8,247	15,968	7	178	745	1,418	3,785	5,927
Sep	7,364	17,933	1	124	999	2,730	2,384	11,793
1979								
Oct	5,023	12,487	1	100	804	3,327	1,863	9,633
Nov	5,484	12,443	3	89	470	3,498	(87)	10,928
Dec	5,963	13,203	7	88	312	2,812	1,504	8,779
Jan	4,038	23,190	425	66	1,943	5,233	(3,835)	30,522
Feb	2,885	32,443	1,662	54	4,441	7,138	(3,597)	46,341
Mar	4,280	29,165	334	67	3,476	8,652	(807)	38,086
Apr	5,794	16,547	30	88	1,535	3,506	1,252	14,485
May	6,088	17,984	31	157	1,500	2,524	2,358	13,435
Jun	6,143	12,207	18	198	935	2,254	3,747	5,326
Jul	9,116	16,413	15	223	463	1,334	3,501	5,384
Aug	10,153	15,677	13	209	481	1,451	3,785	3,475
Sep	9,090	14,567	7	172	537	1,841	2,632	5,058

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Table A4-2. Continued

Water Year	Historical Banks& Tracy Pumping (cfs)	Historical Sac Inflow (cfs)	Historical Yolo Bypass Flow (cfs)	Historical CCWD Pumping (cfs)	Historical Eastside Inflow (cfs)	Historical SJR Basin Inflow (cfs)	Historical Estimated Delta Depletion (cfs)	Historical Delta Outflow (cfs)
1980								
Oct	7,578	12,577	9	152	658	2,790	485	7,821
Nov	5,745	15,203	10	112	648	2,320	149	12,176
Dec	5,894	20,319	919	79	591	2,487	(685)	19,029
Jan	6,318	58,635	40,646	59	8,640	13,069	(3,598)	118,212
Feb	6,131	52,576	46,505	54	8,048	18,648	(2,061)	121,653
Mar	4,286	55,339	17,793	54	4,917	25,232	(230)	99,171
Apr	5,269	22,587	56	75	1,781	10,249	640	28,689
May	4,494	15,894	36	136	1,744	9,912	2,044	20,912
Jun	5,796	17,813	29	165	1,430	5,305	3,747	14,870
Jul	6,695	17,726	27	174	715	3,384	3,792	11,191
Aug	9,015	14,916	21	197	344	1,969	3,785	4,253
Sep	7,502	15,887	8	181	520	3,802	2,632	9,902
1981								
Oct	6,529	11,344	7	165	458	4,072	1,818	7,368
Nov	6,338	10,879	11	118	555	3,278	1,596	6,670
Dec	6,687	16,687	17	76	264	2,949	666	12,488
Jan	8,178	18,510	975	86	551	3,251	(3,304)	18,326
Feb	7,162	24,239	717	77	345	2,879	(234)	21,174
Mar	4,755	24,494	260	79	1,357	3,122	(2,069)	26,467
Apr	7,983	17,224	32	106	438	2,532	485	11,653
May	4,267	13,781	21	211	277	1,967	2,425	9,143
Jun	3,793	10,729	18	239	129	1,499	3,747	4,596
Jul	6,808	15,294	17	238	119	1,265	4,353	5,296
Aug	9,112	14,865	13	203	114	1,269	3,785	3,161
Sep	6,625	12,797	4	172	136	1,182	2,632	4,690
1982								
Oct	5,787	9,895	5	143	154	1,386	293	5,218
Nov	4,632	32,909	3,761	85	1,101	1,564	(1,352)	35,971
Dec	5,127	62,349	24,454	40	3,199	1,851	108	86,579
Jan	5,127	64,610	21,287	49	8,326	3,889	(4,771)	97,706
Feb	9,402	59,646	26,362	50	7,895	6,645	(1,673)	92,770
Mar	10,369	62,813	5,265	48	8,210	10,062	(4,156)	80,089
Apr	9,550	76,580	38,218	53	11,595	22,963	(2,450)	142,203
May	5,859	42,358	316	135	4,976	18,654	2,434	57,876
Jun	3,765	26,076	50	171	2,334	7,584	3,594	28,515
Jul	3,860	17,632	30	172	1,185	6,163	4,130	16,849
Aug	7,913	20,629	23	182	650	4,017	3,785	13,438
Sep	5,167	24,917	11	117	709	6,122	549	25,926

C-061426

Table A4–2. Continued

Water Year	Historical Banks& Tracy Pumping (cfs)	Historical Sac Inflow (cfs)	Historical Yolo Bypass Flow (cfs)	Historical CCWD Pumping (cfs)	Historical Eastside Inflow (cfs)	Historical SJR Basin Inflow (cfs)	Historical Estimated Delta Depletion (cfs)	Historical Delta Outflow (cfs)
1983								
Oct	5,202	19,229	17	83	1,392	8,179	547	22,986
Nov	6,004	31,523	453	69	3,818	6,974	(2,457)	39,152
Dec	8,367	57,735	12,298	61	9,025	16,494	(1,814)	88,937
Jan	10,045	47,513	21,640	40	8,640	19,068	(2,979)	89,755
Feb	10,155	79,039	60,480	91	11,923	31,604	(2,956)	175,757
Mar	5,221	78,290	130,358	150	17,937	40,035	(5,438)	266,688
Apr	3,755	60,500	17,919	59	6,927	36,447	(131)	118,109
May	3,198	62,303	3,519	96	5,438	31,771	1,030	98,707
Jun	4,841	48,380	1,106	170	4,226	26,083	3,747	71,038
Jul	5,035	30,990	50	171	3,150	19,227	4,352	43,860
Aug	7,016	25,039	34	174	1,435	9,035	3,785	24,567
Sep	4,050	24,617	27	154	1,589	11,310	1,839	31,501
1984								
Oct	2,415	21,148	188	82	1,491	13,323	1,362	32,293
Nov	1,686	48,820	5,985	68	5,993	10,876	(4,217)	74,138
Dec	2,088	75,384	51,892	54	9,166	19,126	(2,033)	155,458
Jan	1,674	56,803	16,700	46	4,199	25,729	805	100,906
Feb	5,700	32,372	1,301	67	2,325	10,833	(452)	41,515
Mar	6,856	31,426	1,080	60	2,140	7,502	302	34,929
Apr	7,542	17,933	333	143	1,229	4,285	1,364	14,732
May	5,739	15,406	64	189	856	3,240	2,434	11,204
Jun	5,950	14,990	38	215	626	2,297	3,747	8,038
Jul	9,204	21,632	21	254	504	1,904	4,352	10,252
Aug	9,265	18,784	16	250	586	2,179	3,778	8,272
Sep	5,312	17,693	18	186	739	2,917	2,219	13,650
1985								
Oct	5,456	13,235	20	149	772	4,029	535	11,916
Nov	7,893	26,280	1,489	103	1,184	2,865	(2,130)	25,953
Dec	8,407	32,558	1,131	57	1,269	4,775	203	31,067
Jan	5,756	16,790	48	79	472	4,070	426	15,120
Feb	7,517	18,271	157	97	1,012	3,243	(522)	15,590
Mar	8,487	14,310	5	129	952	2,743	(1,040)	10,432
Apr	7,194	12,495	0	147	891	2,445	1,576	6,913
May	5,997	13,432	0	218	461	2,134	2,434	7,378
Jun	6,300	13,310	0	230	230	1,751	3,546	5,215
Jul	9,209	16,035	0	256	148	2,567	4,352	4,934
Aug	9,884	13,448	0	227	157	2,616	3,785	2,325
Sep	8,545	12,192	0	174	231	1,929	2,422	3,211

Table A4–2. Continued

Water Year	Historical Banks& Tracy Pumping (cfs)	Historical Sac Inflow (cfs)	Historical Yolo Bypass Flow (cfs)	Historical CCWD Pumping (cfs)	Historical Eastside Inflow (cfs)	Historical SJR Basin Inflow (cfs)	Historical Estimated Delta Depletion (cfs)	Historical Delta Outflow (cfs)
1986								
Oct	7,518	9,711	20	185	209	2,072	931	3,378
Nov	7,202	10,418	25	127	309	1,929	(1,539)	6,891
Dec	9,751	16,106	182	107	598	2,205	(197)	9,431
Jan	8,925	19,965	142	145	1,150	2,060	(963)	15,209
Feb	6,002	68,893	115,391	72	14,793	8,744	(7,415)	205,414
Mar	3,141	74,984	58,664	58	9,913	25,035	(3,082)	169,448
Apr	4,612	25,827	1,151	84	3,505	19,590	227	46,572
May	6,080	12,761	43	180	1,962	8,764	2,258	15,911
Jun	5,954	11,820	43	222	1,048	6,233	3,747	9,322
Jul	8,378	16,881	43	230	488	2,894	4,315	7,384
Aug	9,727	15,113	34	224	541	3,183	3,785	5,135
Sep	10,296	18,140	20	194	680	4,181	1,753	10,778
1987								
Oct	7,432	15,445	20	134	852	3,741	1,865	10,628
Nov	6,712	12,680	25	148	737	2,842	1,692	7,732
Dec	7,112	13,110	25	148	565	3,706	1,160	8,987
Jan	6,130	13,171	25	121	484	2,305	(1,085)	10,819
Feb	6,737	17,404	31	109	580	2,136	(3,554)	16,859
Mar	5,468	21,577	219	132	1,110	3,415	(2,194)	22,916
Apr	6,837	11,826	46	184	427	2,867	1,853	6,291
May	5,075	9,996	43	238	378	2,178	2,330	4,951
Jun	4,940	10,067	43	244	325	1,990	3,747	3,496
Jul	8,707	15,142	43	245	316	1,632	4,352	3,829
Aug	9,560	14,439	34	239	337	1,627	3,785	2,851
Sep	8,845	11,625	20	224	250	1,597	2,632	1,790
1988								
Oct	5,726	9,509	20	182	126	1,370	1,328	3,789
Nov	5,307	8,129	25	153	112	1,548	64	4,291
Dec	8,861	15,744	25	125	155	1,278	(1,239)	9,454
Jan	10,289	25,400	1,571	128	335	1,483	(1,222)	19,593
Feb	9,895	12,188	16	128	170	1,389	695	3,045
Mar	8,256	11,348	26	185	265	2,241	897	4,542
Apr	8,364	16,887	46	206	292	2,146	(700)	11,499
May	6,069	10,974	43	194	193	1,781	1,981	4,748
Jun	5,691	10,578	43	209	205	1,711	3,441	3,197
Jul	7,720	14,642	43	247	197	1,357	4,352	3,920
Aug	8,539	13,287	34	255	173	1,557	3,785	2,472
Sep	7,897	11,537	20	223	133	1,452	2,632	2,391

C—061428

Table A4-2. Continued

Water Year	Historical Banks& Tracy Pumping (cfs)	Historical Sac Inflow (cfs)	Historical Yolo Bypass Flow (cfs)	Historical CCWD Pumping (cfs)	Historical Eastside Inflow (cfs)	Historical SJR Basin Inflow (cfs)	Historical Estimated Delta Depletion (cfs)	Historical Delta Outflow (cfs)
1989								
Oct	5,435	9,314	20	197	58	1,127	1,661	3,226
Nov	5,936	11,356	25	152	84	1,274	(9)	6,660
Dec	7,037	12,388	25	147	102	1,372	(556)	7,259
Jan	10,057	12,825	25	138	131	1,255	407	3,635
Feb	8,065	12,057	16	137	204	1,234	(1,095)	6,405
Mar	10,136	43,374	427	125	1,469	2,023	(1,919)	38,951
Apr	10,302	21,273	46	145	663	1,915	1,643	11,808
May	6,014	13,799	33	205	356	1,949	2,388	7,531
Jun	5,044	13,287	33	228	165	1,583	3,479	6,317
Jul	9,252	18,768	40	264	132	1,284	4,352	6,356
Aug	11,057	18,319	29	262	147	1,169	3,711	4,634
Sep	10,534	16,463	18	219	147	1,353	673	6,555
1990								
Oct	10,351	14,274	17	178	110	1,401	348	4,926
Nov	10,224	14,830	25	154	244	1,404	622	5,503
Dec	10,297	15,397	25	146	142	1,381	2,081	4,422
Jan	10,484	18,910	25	137	179	1,242	(177)	9,913
Feb	10,405	13,804	20	148	285	1,365	(1,894)	6,815
Mar	10,405	12,868	26	153	482	1,760	672	3,906
Apr	9,465	15,271	46	201	340	1,309	1,259	6,041
May	3,175	10,402	33	217	285	1,279	771	7,837
Jun	3,276	10,519	33	215	233	1,116	3,410	4,999
Jul	6,007	13,506	33	238	163	1,009	4,352	4,115
Aug	6,446	13,839	26	230	176	1,033	3,785	4,612
Sep	5,692	10,029	36	226	164	876	2,594	2,594
1991								
Oct	3,364	7,620	15	185	234	993	1,816	3,498
Nov	3,708	7,723	26	149	202	1,115	650	4,558
Dec	5,057	10,818	25	148	65	918	196	6,425
Jan	4,766	8,984	25	146	69	816	969	4,013
Feb	4,384	8,133	16	137	86	758	(2,948)	7,420
Mar	9,652	25,755	893	111	1,225	1,779	(4,737)	24,626
Apr	7,399	10,879	46	100	509	1,168	1,316	3,787
May	2,555	7,332	43	130	471	1,049	2,212	3,998
Jun	1,770	8,930	43	155	269	568	3,716	4,169
Jul	2,401	9,514	43	173	181	594	4,279	3,479
Aug	3,650	9,515	34	167	166	537	3,739	2,696
Sep	4,074	9,948	36	161	192	574	2,632	3,884

C-061429

Table A4-2. Continued

Water Year	DailySOS Added SJR Flow (cfs)	DeltaSOS Added SJR Flow (cfs)	DailySOS New SJR Flow (cfs)	DeltaSOS New SJR Flow (cfs)	DailySOS Required Delta Outflow (cfs)	DeltaSOS Required Delta Outflow (cfs)	DailySOS Export Limits for Inflow (cfs)	DeltaSOS Direct Export Limits (cfs)	DailySOS Reduced Export for Objectives (cfs)	DeltaSOS Reduced Export for Objectives (cfs)	DailySOS Outflow Deficit (cfs)	DeltaSOS Outflow Deficit (cfs)	DailySOS Net Export Change (cfs)	DeltaSOS Net Export Change (cfs)
1968														
Oct	0	0	2,725	2,730	4,000	4,000	13,148	13,172	0	0	0	0	9,587	9,584
Nov	0	0	3,473	3,479	4,500	4,500	12,033	12,052	0	0	0	0	10,207	10,238
Dec	0	0	3,635	3,641	4,500	4,500	13,706	13,731	0	0	0	0	10,919	10,903
Jan	0	0	2,940	2,946	4,500	5,225	16,197	16,226	0	0	0	0	10,629	10,773
Feb	89	0	2,706	2,715	18,531	11,271	18,864	18,711	64	0	518	0	7,066	9,941
Mar	1	0	3,094	3,099	7,813	24,947	15,338	15,365	135	0	208	0	6,404	6,964
Apr	2,436	2,203	3,871	3,641	19,265	14,236	6,133	5,550	3,065	3,258	6,253	1,027	(3,065)	(3,258)
May	1,759	2,687	2,650	3,580	12,168	7,580	4,863	5,250	3,480	835	2,403	0	(3,238)	(835)
Jun	811	828	1,403	1,420	6,014	8,534	4,656	4,539	2,002	2,492	478	2,421	(1,914)	(2,492)
Jul	397	396	900	900	6,419	6,500	8,840	8,855	2,670	2,608	0	0	(2,658)	(2,608)
Aug	159	130	928	900	3,968	4,000	9,150	9,147	32	0	0	0	1,355	2,731
Sep	12	0	950	940	3,000	3,000	9,263	9,270	66	0	0	0	3,030	3,739
1969														
Oct	208	113	1,593	1,500	4,000	4,000	8,698	8,652	249	0	0	0	1,300	1,657
Nov	0	0	1,604	1,607	4,500	4,500	10,026	10,042	0	0	0	0	4,714	5,106
Dec	0	0	2,533	2,537	4,500	4,500	17,599	17,631	0	0	0	0	7,315	7,628
Jan	0	0	13,815	13,839	4,500	5,092	81,591	81,736	0	0	0	0	7,476	7,002
Feb	0	0	32,554	32,611	7,100	21,409	55,821	55,919	0	0	0	0	9,853	8,045
Mar	0	0	30,874	30,929	7,100	10,250	33,855	33,916	0	0	0	0	9,282	8,345
Apr	0	0	22,117	22,152	7,100	7,580	23,400	23,918	0	0	0	0	8,141	8,136
May	0	0	24,613	24,657	4,000	10,241	23,212	24,518	0	0	0	0	8,118	8,113
Jun	0	0	27,887	27,931	4,000	7,580	18,391	18,421	0	0	0	0	8,850	8,895
Jul	0	0	5,803	5,813	8,329	8,000	13,485	13,509	160	0	0	0	4,525	5,238
Aug	0	0	2,325	2,329	4,000	4,000	13,820	13,844	0	0	0	0	6,205	6,350
Sep	0	0	3,255	3,260	3,000	3,000	16,272	16,298	0	0	0	0	8,859	8,855
1970														
Oct	0	0	4,462	4,470	4,000	4,000	14,478	14,504	0	0	0	0	9,378	9,375
Nov	0	0	4,628	4,635	4,500	4,500	14,301	14,324	0	0	0	0	10,286	10,285
Dec	317	0	2,976	2,663	4,500	4,500	30,172	30,019	0	0	0	0	10,552	10,604
Jan	0	0	11,116	11,136	4,500	4,500	122,782	123,000	0	0	0	0	12,280	11,631
Feb	0	0	9,191	9,207	7,100	13,933	39,466	39,535	0	0	0	0	12,015	10,831
Mar	18	0	7,198	7,192	7,100	10,123	20,366	20,396	0	0	0	0	10,086	9,503
Apr	3,667	3,545	5,340	5,220	25,775	9,868	7,259	6,595	2,580	0	13,524	0	(1,983)	1,022
May	2,763	2,823	5,156	5,220	18,735	7,580	6,435	6,381	1,579	0	7,955	0	(1,080)	2,529
Jun	130	0	2,867	2,741	14,120	10,970	5,234	5,197	3,115	2,808	4,808	2,038	(3,090)	(2,808)
Jul	0	0	1,330	1,333	8,110	8,000	9,643	9,660	2,695	2,532	80	0	(2,695)	(2,532)
Aug	0	0	1,044	1,046	4,000	4,000	10,622	10,640	0	0	0	0	3,999	4,833
Sep	0	0	1,319	1,321	3,000	3,000	13,200	13,221	0	0	0	0	8,352	8,347

C-061430

Table A4−2. Continued

Water Year	DailySOS Added SJR Flow (cfs)	DeltaSOS Added SJR Flow (cfs)	DailySOS New SJR Flow (cfs)	DeltaSOS New SJR Flow (cfs)	DailySOS Required Delta Outflow (cfs)	DeltaSOS Required Delta Outflow (cfs)	DailySOS Export Limits for Inflow (cfs)	DeltaSOS Direct Export Limits (cfs)	DailySOS Reduced Export for Objectives (cfs)	DeltaSOS Reduced Export for Objectives (cfs)	DailySOS Outflow Deficit (cfs)	DeltaSOS Outflow Deficit (cfs)	DailySOS Net Export Change (cfs)	DeltaSOS Net Export Change (cfs)
1971														
Oct	94	31	1,560	1,500	4,000	4,000	11,257	11,236	0	0	0	0	8,466	8,763
Nov	0	0	1,655	1,658	4,500	4,500	16,516	16,542	0	0	0	0	9,280	9,325
Dec	0	0	5,044	5,053	4,500	4,500	54,649	54,747	0	0	0	0	10,092	9,845
Jan	0	0	5,204	5,213	6,000	4,500	43,116	43,193	0	0	0	0	10,756	10,756
Feb	0	0	4,391	4,399	7,889	21,052	13,227	13,250	102	0	246	0	8,164	9,252
Mar	0	0	2,589	2,594	24,483	13,885	12,637	12,659	1,686	0	4,024	0	865	6,682
Apr	2,025	1,916	3,987	3,880	7,884	20,281	11,482	10,221	68	0	225	0	3,703	4,022
May	1,997	2,044	3,830	3,880	5,626	9,683	8,644	8,520	89	0	223	0	3,552	3,920
Jun	219	0	2,541	2,326	13,240	7,580	10,820	10,761	701	0	409	0	1,813	5,125
Jul	240	0	1,306	1,068	8,000	8,000	14,790	14,661	0	0	0	0	3,238	3,877
Aug	50	7	941	900	4,000	4,000	15,290	15,290	0	0	0	0	4,751	4,748
Sep	1	0	1,096	1,097	3,000	3,000	17,025	17,052	0	0	0	0	7,501	7,494
1972														
Oct	0	0	2,253	2,257	4,000	4,000	12,551	12,574	0	0	0	0	7,564	7,579
Nov	0	0	1,646	1,649	4,500	4,500	11,591	11,610	0	0	0	0	7,762	8,313
Dec	0	0	2,398	2,403	4,500	4,500	16,347	16,377	0	0	0	0	9,038	8,941
Jan	0	0	3,117	3,122	4,500	4,500	15,502	15,530	0	0	0	0	10,360	10,359
Feb	136	0	2,838	2,803	8,624	11,324	10,145	9,390	175	0	101	0	5,681	5,592
Mar	904	898	2,284	2,280	17,794	9,933	9,429	9,443	2,165	0	1,337	0	(1,304)	2,843
Apr	2,683	2,603	3,720	3,641	15,629	9,848	5,262	5,288	3,343	2,833	5,951	0	(3,157)	(2,833)
May	1,850	1,974	2,594	2,720	9,923	7,580	4,699	4,579	3,464	2,630	2,324	0	(3,387)	(2,630)
Jun	816	832	1,403	1,420	11,683	6,845	5,569	5,400	3,586	1,309	3,159	0	(3,011)	(1,309)
Jul	419	418	900	900	6,419	6,500	10,389	10,406	719	149	0	0	(204)	(149)
Aug	357	356	900	900	3,968	4,000	10,845	10,863	0	0	0	0	1,648	2,438
Sep	77	0	1,641	1,566	3,000	3,000	12,114	12,083	0	0	0	0	4,282	4,453
1973														
Oct	2	0	1,994	1,995	4,000	4,000	11,852	11,872	0	0	0	0	4,924	4,969
Nov	0	0	2,216	2,220	4,500	4,500	17,121	17,149	0	0	0	0	7,634	7,802
Dec	0	0	2,502	2,506	4,500	4,500	20,062	20,097	0	0	0	0	7,943	7,916
Jan	0	0	4,059	4,066	6,000	4,500	65,289	65,405	0	0	0	0	9,320	9,318
Feb	0	0	7,988	8,002	7,100	19,995	35,317	35,379	0	0	0	0	12,316	11,584
Mar	0	0	7,611	7,625	7,100	12,499	26,593	26,641	0	0	0	0	10,913	10,482
Apr	2,205	1,010	6,408	5,220	15,761	8,556	8,904	8,124	1,059	0	3,129	0	3,323	4,851
May	2,489	2,278	5,426	5,220	15,381	7,580	7,765	7,206	1,920	0	6,626	0	(1,154)	884
Jun	740	840	3,316	3,420	11,278	7,580	6,668	6,714	3,889	459	1,776	0	(3,734)	(459)
Jul	0	0	1,082	1,084	8,000	8,000	10,818	10,838	3,323	3,191	0	0	(3,323)	(3,191)
Aug	0	0	1,067	1,069	4,000	4,000	11,389	11,410	0	0	0	0	2,023	2,845
Sep	0	0	1,471	1,473	3,000	3,000	12,575	12,595	0	0	0	0	5,679	5,670

C-061431

Table A4–2. Continued

Water Year	DailySOS Added SJR Flow (cfs)	DeltaSOS Added SJR Flow (cfs)	DailySOS New SJR Flow (cfs)	DeltaSOS New SJR Flow (cfs)	DailySOS Required Delta Outflow (cfs)	DeltaSOS Required Delta Outflow (cfs)	DailySOS Export Limits for Inflow (cfs)	DeltaSOS Direct Export Limits (cfs)	DailySOS Reduced Export for Objectives (cfs)	DeltaSOS Reduced Export for Objectives (cfs)	DailySOS Outflow Deficit (cfs)	DeltaSOS Outflow Deficit (cfs)	DailySOS Net Export Change (cfs)	DeltaSOS Net Export Change (cfs)
1974														
Oct	0	0	2,546	2,551	4,000	4,000	12,838	12,861	0	0	0	0	5,458	5,448
Nov	26	0	2,307	2,285	4,500	4,500	41,156	41,205	0	0	0	0	6,461	6,453
Dec	0	0	3,586	3,593	4,500	4,500	51,358	51,449	0	0	0	0	8,343	8,202
Jan	0	0	7,781	7,795	6,000	4,500	90,528	90,689	0	0	0	0	11,531	10,780
Feb	0	0	5,094	5,102	7,100	13,106	22,665	22,704	0	0	0	0	7,164	7,157
Mar	0	0	4,817	4,826	7,100	10,633	29,093	29,145	0	0	0	0	5,490	5,480
Apr	2,180	161	8,030	6,020	7,100	15,895	32,318	23,770	0	0	0	0	5,737	5,819
May	2,232	1,906	6,338	6,020	5,626	10,030	10,470	10,343	439	0	12	0	2,305	2,922
Jun	387	0	4,247	3,866	27,520	7,580	10,485	10,366	6,582	0	4,281	0	(6,582)	1,410
Jul	500	0	2,137	1,639	9,890	8,000	15,897	15,600	1,673	0	483	0	(1,391)	769
Aug	0	0	1,615	1,618	4,000	4,000	16,927	16,957	0	0	0	0	1,999	1,982
Sep	0	0	2,846	2,850	3,000	3,000	18,634	18,664	0	0	0	0	6,340	6,332
1975														
Oct	10	0	3,507	3,503	4,000	4,000	15,865	15,887	0	0	0	0	6,784	6,776
Nov	0	0	3,891	3,897	4,500	4,500	17,428	17,456	0	0	0	0	9,402	9,399
Dec	0	0	4,162	4,169	4,500	4,500	19,969	20,004	0	0	0	0	8,801	8,829
Jan	0	0	3,766	3,773	6,000	4,500	15,301	15,328	0	0	0	0	6,718	6,711
Feb	0	0	6,212	6,223	7,100	10,703	25,475	21,121	0	0	0	0	6,212	6,055
Mar	0	0	5,685	5,695	9,146	20,210	24,976	25,021	0	0	0	0	5,586	5,684
Apr	2,895	2,057	6,852	6,020	7,268	18,011	12,795	11,484	0	0	0	0	3,655	3,733
May	2,501	2,041	6,472	6,020	10,966	8,642	10,764	10,666	341	0	162	0	3,480	4,470
Jun	237	0	5,945	5,717	21,640	10,602	10,847	10,781	1,314	0	967	0	191	6,421
Jul	136	0	1,855	1,721	8,000	8,000	13,456	13,391	0	0	0	0	3,207	3,332
Aug	0	0	1,681	1,684	4,000	4,000	14,135	14,160	0	0	0	0	2,463	2,447
Sep	0	0	2,652	2,657	3,000	3,000	15,495	15,520	0	0	0	0	3,618	3,606
1976														
Oct	0	0	4,543	4,551	4,000	4,000	16,020	16,049	0	0	0	0	3,806	3,793
Nov	0	0	3,906	3,912	4,500	4,500	17,588	17,617	0	0	0	0	3,331	3,318
Dec	0	0	3,745	3,752	4,500	4,500	19,288	19,322	0	0	0	0	3,815	3,726
Jan	0	0	3,326	3,332	4,500	4,500	12,100	12,121	42	0	0	0	3,014	3,807
Feb	0	0	2,115	2,194	9,386	11,400	6,722	7,041	1,614	4,267	1,603	0	(1,520)	(4,267)
Mar	0	0	1,823	1,826	11,377	8,068	5,816	5,826	3,703	2,395	986	0	(3,703)	(2,395)
Apr	1,134	710	2,427	2,005	7,283	9,967	4,224	3,975	1,503	2,322	279	0	(1,027)	(2,322)
May	976	1,064	1,915	2,005	5,247	4,000	3,733	3,649	2,335	1,640	0	0	(2,335)	(1,640)
Jun	104	101	901	900	6,870	4,000	4,274	4,166	2,100	110	788	0	(2,098)	(110)
Jul	229	228	900	900	3,968	4,000	8,471	8,485	10	0	0	0	453	553
Aug	24	0	1,079	1,057	3,000	3,500	9,428	9,429	26	0	0	0	1,371	1,661
Sep	11	0	1,078	1,068	3,000	3,000	9,067	9,074	158	0	0	0	97	921

C-061432

Table A4-2. Continued

Water Year	DailySOS Added SJR Flow (cfs)	DeltaSOS Added SJR Flow (cfs)	DailySOS New SJR Flow (cfs)	DeltaSOS New SJR Flow (cfs)	DailySOS Required Delta Outflow (cfs)	DeltaSOS Required Delta Outflow (cfs)	DailySOS Export Limits for Inflow (cfs)	DeltaSOS Direct Export Limits (cfs)	DailySOS Reduced Export for Objectives (cfs)	DeltaSOS Reduced Export for Objectives (cfs)	DailySOS Outflow Deficit (cfs)	DeltaSOS Outflow Deficit (cfs)	DailySOS Net Export Change (cfs)	DeltaSOS Net Export Change (cfs)
1977														
Oct	0	0	1,274	1,276	3,000	3,000	6,114	6,124	249	0	0	0	145	560
Nov	0	0	1,136	1,138	3,500	3,500	5,888	5,898	493	0	0	0	(6)	453
Dec	13	0	977	967	3,500	3,500	5,707	5,709	98	0	0	0	537	1,593
Jan	0	0	1,091	1,093	4,500	4,500	7,115	7,128	1,544	493	0	0	(1,011)	(493)
Feb	173	110	961	900	7,889	7,100	4,053	4,031	2,153	2,182	1,179	948	(2,047)	(2,182)
Mar	376	375	900	900	7,100	7,100	2,634	2,638	1,931	1,695	2,284	2,869	(1,931)	(1,695)
Apr	1,867	1,793	2,079	2,005	7,100	7,100	2,755	2,414	135	0	3,831	3,872	(135)	0
May	1,570	1,605	1,969	2,005	6,800	4,000	2,909	2,990	1,118	779	1,985	0	(1,033)	(779)
Jun	782	782	900	900	4,000	4,000	2,726	2,730	0	0	1,410	1,491	0	0
Jul	807	807	900	900	4,000	4,000	5,991	6,000	54	0	693	547	(17)	0
Aug	776	776	900	900	3,000	3,500	5,593	5,601	312	0	297	78	(129)	0
Sep	721	721	900	900	3,000	3,000	5,039	5,046	222	0	161	0	80	591
1978														
Oct	754	753	1,000	1,000	3,000	3,000	3,577	3,582	0	0	892	353	48	0
Nov	470	470	900	900	3,500	3,500	4,954	4,961	414	0	112	0	310	289
Dec	394	393	900	900	3,500	3,500	8,398	8,412	426	0	211	0	467	2,600
Jan	70	0	2,345	2,280	4,500	6,000	46,128	46,165	69	0	0	0	1,530	1,821
Feb	319	0	7,638	7,331	7,100	7,486	22,408	22,336	127	0	0	0	2,546	2,409
Mar	0	0	11,475	11,495	7,100	17,509	31,006	31,061	0	0	0	0	6,304	5,807
Apr	0	0	20,030	20,062	7,100	13,194	22,238	21,204	0	0	0	0	8,071	8,066
May	0	0	19,119	19,153	5,132	7,580	17,981	16,215	80	0	2	0	7,942	8,307
Jun	4	0	7,074	7,081	17,285	7,580	7,160	7,170	3,999	326	5,550	0	(3,999)	(326)
Jul	0	0	1,908	1,911	8,548	8,000	10,669	10,688	4,318	3,816	178	0	(4,318)	(3,816)
Aug	0	0	1,418	1,421	4,000	4,000	11,790	11,811	0	0	0	0	1,784	2,809
Sep	0	0	2,730	2,735	3,000	3,000	14,081	14,104	0	0	0	0	3,916	3,905
1979														
Oct	0	0	3,327	3,333	4,000	4,000	10,803	10,822	0	0	0	0	5,176	5,790
Nov	0	0	3,498	3,503	4,500	4,500	10,669	10,686	0	0	0	0	4,582	5,194
Dec	0	0	2,812	2,817	4,500	4,500	10,618	10,636	0	0	0	0	4,005	4,662
Jan	0	0	5,233	5,243	4,500	4,500	20,014	20,050	0	0	0	0	8,202	8,564
Feb	0	0	7,138	7,150	9,468	11,398	20,557	16,017	0	0	0	0	8,276	9,810
Mar	0	0	8,652	8,667	9,952	7,436	14,569	14,595	0	0	0	0	7,698	7,412
Apr	2,526	1,708	6,032	5,220	13,749	15,049	8,077	7,283	1,259	499	1,245	0	(7)	(499)
May	2,837	2,692	5,361	5,220	12,511	8,223	7,948	7,530	853	0	1,808	0	476	1,431
Jun	576	1,163	2,830	3,420	10,478	9,776	5,596	5,810	3,716	4,153	1,811	355	(3,707)	(4,153)
Jul	0	0	1,334	1,336	6,658	6,500	11,846	11,867	1,908	1,707	23	0	(1,588)	(1,707)
Aug	0	0	1,451	1,454	4,000	4,000	11,455	11,475	931	0	0	0	(464)	353
Sep	0	0	1,841	1,844	3,000	3,000	11,019	11,036	0	0	0	0	1,763	1,932

C—061433

Table A4–2. Continued

Water Year	DailySOS Added SJR Flow (cfs)	DeltaSOS Added SJR Flow (cfs)	DailySOS New SJR Flow (cfs)	DeltaSOS New SJR Flow (cfs)	DailySOS Required Delta Outflow (cfs)	DeltaSOS Required Delta Outflow (cfs)	DailySOS Export Limits for Inflow (cfs)	DeltaSOS Direct Export Limits (cfs)	DailySOS Reduced Export for Objectives (cfs)	DeltaSOS Reduced Export for Objectives (cfs)	DailySOS Outflow Deficit (cfs)	DeltaSOS Outflow Deficit (cfs)	DailySOS Net Export Change (cfs)	DeltaSOS Net Export Change (cfs)
1980														
Oct	0	0	2,790	2,795	4,000	4,000	10,423	10,441	0	0	0	0	2,410	2,850
Nov	0	0	2,320	2,324	4,500	4,500	11,818	11,837	0	0	0	0	4,731	5,526
Dec	0	0	2,487	2,491	4,500	4,500	15,806	15,834	0	0	0	0	4,977	5,399
Jan	0	0	13,069	13,092	6,000	5,266	78,644	78,784	0	0	0	0	7,305	6,370
Feb	0	0	18,648	19,348	7,100	22,183	51,171	45,674	0	0	0	0	8,352	6,339
Mar	0	0	25,232	25,277	7,100	12,796	36,148	36,213	0	0	0	0	8,241	7,406
Apr	0	0	10,249	10,266	10,335	7,580	11,511	11,210	446	0	518	0	4,081	5,496
May	0	0	9,912	9,930	24,323	7,580	9,784	9,672	2,136	0	4,156	0	(1,345)	5,170
Jun	0	0	5,305	5,314	8,333	7,580	8,858	8,616	599	0	1,854	0	1,804	2,811
Jul	0	0	3,384	3,390	7,871	8,000	14,204	14,229	0	0	0	0	2,878	3,064
Aug	0	0	1,969	1,973	3,968	4,000	11,213	11,233	286	0	0	0	344	1,132
Sep	0	0	3,802	3,808	3,000	3,000	13,141	13,162	0	0	0	0	3,778	3,766
1981														
Oct	0	0	4,072	4,080	4,000	4,000	10,322	10,341	24	0	0	0	2,826	3,792
Nov	0	0	3,278	3,283	4,500	4,500	9,570	9,585	0	0	0	0	2,158	2,842
Dec	0	0	2,949	2,955	4,500	4,500	12,946	12,969	0	0	0	0	4,175	4,683
Jan	0	0	3,251	3,256	4,500	4,500	15,136	15,163	181	0	0	0	2,122	3,762
Feb	14	0	2,893	2,884	10,257	11,400	12,687	9,880	758	0	1,217	0	2,264	2,706
Mar	6	0	3,128	3,127	12,803	10,351	10,234	10,250	820	0	1,172	0	3,214	5,486
Apr	1,239	1,105	3,772	3,641	22,570	9,020	6,820	5,962	5,188	2,034	8,072	0	(5,021)	(2,034)
May	1,493	1,610	3,459	3,580	15,441	7,580	5,606	5,307	1,827	0	5,124	0	(1,366)	1,033
Jun	19	0	1,518	1,501	8,816	6,428	4,338	4,338	1,842	1,799	2,309	92	(1,842)	(1,799)
Jul	0	0	1,265	1,267	5,000	5,000	10,852	10,871	154	0	0	0	374	509
Aug	0	0	1,269	1,272	3,500	3,500	10,570	10,589	584	0	0	0	(279)	538
Sep	0	0	1,182	1,184	3,000	3,000	9,177	9,192	0	0	0	0	1,715	2,540
1982														
Oct	169	111	1,556	1,500	4,000	4,000	7,547	7,522	517	0	0	0	449	582
Nov	4	0	1,568	1,567	4,500	4,500	25,571	25,609	58	0	0	0	4,257	6,641
Dec	61	0	1,912	1,854	4,500	4,500	59,744	59,811	0	0	0	0	6,088	6,059
Jan	0	0	3,889	3,896	6,000	4,500	63,773	63,886	0	0	0	0	7,037	7,030
Feb	3	0	6,648	6,657	7,100	14,623	35,193	35,254	0	0	0	0	3,672	3,282
Mar	0	0	10,062	10,080	7,100	13,669	30,222	30,276	5	0	0	0	2,007	1,313
Apr	0	0	22,963	23,000	7,100	10,265	40,913	37,679	0	0	0	0	1,730	1,715
May	0	0	18,654	18,687	4,000	10,460	21,041	20,967	0	0	0	0	5,421	5,410
Jun	0	0	7,584	7,596	7,360	7,580	12,615	12,636	192	0	542	0	6,260	7,509
Jul	0	0	6,163	6,174	20,310	8,000	16,257	16,286	624	0	4,751	0	1,323	7,413
Aug	0	0	4,017	4,024	4,000	4,000	16,457	16,487	0	0	0	0	3,367	3,353
Sep	0	0	6,122	6,132	3,000	3,000	20,643	20,676	0	0	0	0	6,113	6,105

Table A4–2. Continued

Water Year	DailySOS Added SJR Flow (cfs)	DeltaSOS Added SJR Flow (cfs)	DailySOS New SJR Flow (cfs)	DeltaSOS New SJR Flow (cfs)	DailySOS Required Delta Outflow (cfs)	DeltaSOS Required Delta Outflow (cfs)	DailySOS Export Limits for Inflow (cfs)	DeltaSOS Direct Export Limits (cfs)	DailySOS Reduced Export for Objectives (cfs)	DeltaSOS Reduced Export for Objectives (cfs)	DailySOS Outflow Deficit (cfs)	DeltaSOS Outflow Deficit (cfs)	DailySOS Net Export Change (cfs)	DeltaSOS Net Export Change (cfs)
1983														
Oct	0	0	8,179	8,194	4,000	4,000	18,731	18,765	0	0	0	0	6,078	6,069
Nov	0	0	6,974	6,986	4,500	4,500	27,800	27,844	0	0	0	0	5,276	5,267
Dec	0	0	16,494	16,523	4,500	4,500	62,109	62,219	0	0	0	0	4,498	3,318
Jan	0	0	19,068	19,102	6,000	4,500	62,959	63,071	0	0	0	0	4,455	2,637
Feb	0	0	31,604	31,659	7,100	15,007	64,066	64,178	0	0	0	0	4,345	2,528
Mar	0	0	40,035	40,107	7,100	8,552	93,317	93,484	0	0	0	0	7,411	6,470
Apr	0	0	36,447	36,505	7,100	7,580	42,560	39,601	0	0	0	0	7,525	7,519
May	0	0	31,771	31,828	4,000	7,844	32,736	33,976	0	0	0	0	8,082	8,076
Jun	0	0	26,083	26,125	4,000	9,397	27,928	27,973	0	0	0	0	6,439	6,431
Jul	0	0	19,227	19,262	8,000	8,000	34,722	34,783	0	0	0	0	6,245	6,236
Aug	0	0	9,035	9,051	4,000	4,000	23,103	23,144	0	0	0	0	4,264	4,251
Sep	0	0	11,310	11,328	3,000	3,000	24,403	24,442	0	0	0	0	7,230	7,224
1984														
Oct	0	0	13,323	13,346	4,000	4,000	23,498	23,540	0	0	0	0	8,865	8,861
Nov	0	0	10,876	10,894	4,500	4,500	46,588	46,663	0	0	0	0	9,594	9,591
Dec	0	0	19,126	19,160	4,500	4,500	101,119	101,299	0	0	0	0	10,777	9,608
Jan	0	0	25,729	25,775	6,000	4,500	67,230	67,350	0	0	0	0	12,826	11,023
Feb	0	0	10,833	11,240	7,100	11,954	16,391	17,006	0	0	0	0	8,067	6,786
Mar	0	0	7,502	7,515	9,177	15,536	14,752	14,778	0	0	0	0	4,957	4,832
Apr	1,708	928	5,993	5,220	21,349	19,623	8,410	7,526	4,059	4,949	6,045	0	(3,410)	(4,949)
May	1,886	1,975	5,126	5,220	12,473	7,580	7,052	6,921	1,829	0	5,009	0	(408)	1,172
Jun	1,076	1,120	3,373	3,420	18,406	9,599	6,866	6,684	3,641	1,582	7,005	0	(3,511)	(1,582)
Jul	0	0	1,904	1,907	7,871	8,000	15,640	15,667	9	0	0	0	1,816	2,060
Aug	0	0	2,179	2,183	3,968	4,000	14,018	14,042	0	0	0	0	2,008	1,998
Sep	0	0	2,917	2,922	3,000	3,000	13,889	13,911	0	0	0	0	5,968	5,959
1985														
Oct	0	0	4,029	4,037	4,000	4,000	11,737	11,758	0	0	0	0	5,578	5,814
Nov	0	0	2,865	2,870	4,500	4,500	20,682	20,715	0	0	0	0	3,350	3,374
Dec	0	0	4,775	4,783	4,500	4,500	25,827	25,873	0	0	0	0	3,427	3,271
Jan	0	0	4,070	4,078	6,000	4,500	13,898	13,922	0	0	0	0	6,389	6,459
Feb	0	0	3,243	3,248	11,046	10,885	7,939	7,953	1,601	0	2,025	0	(736)	422
Mar	0	0	2,743	2,747	22,071	10,306	6,303	6,314	5,765	2,188	6,703	0	(5,763)	(2,188)
Apr	1,262	1,192	3,707	3,641	11,467	8,842	5,280	5,207	3,700	1,999	1,369	0	(3,696)	(1,999)
May	801	582	2,935	2,720	4,239	7,993	4,923	4,694	1,244	1,314	62	0	(1,156)	(1,314)
Jun	8	0	1,759	1,754	5,192	6,454	5,355	5,361	1,685	1,397	71	0	(1,531)	(1,397)
Jul	0	0	2,567	2,572	5,000	5,000	12,188	12,210	303	0	0	0	12	144
Aug	0	0	2,616	2,621	3,500	3,500	10,544	10,563	1,205	299	0	0	(1,115)	(299)
Sep	0	0	1,929	1,932	3,000	3,000	9,329	9,344	367	0	0	0	(28)	785

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Table A4-2. Continued

Water Year	DailySOS Added SJR Flow (cfs)	DeltaSOS Added SJR Flow (cfs)	DailySOS New SJR Flow (cfs)	DeltaSOS New SJR Flow (cfs)	DailySOS Required Delta Outflow (cfs)	DeltaSOS Required Delta Outflow (cfs)	DailySOS Export Limits for Inflow (cfs)	DeltaSOS Direct Export Limits (cfs)	DailySOS Reduced Export for Objectives (cfs)	DeltaSOS Reduced Export for Objectives (cfs)	DailySOS Outflow Deficit (cfs)	DeltaSOS Outflow Deficit (cfs)	DailySOS Net Export Change (cfs)	DeltaSOS Net Export Change (cfs)
1986														
Oct	0	0	2,072	2,076	4,000	4,000	7,808	7,822	1,545	915	0	0	(1,202)	(915)
Nov	0	0	1,929	1,932	4,500	4,500	8,242	8,256	891	0	0	0	(322)	360
Dec	0	0	2,205	2,209	4,500	4,500	12,409	12,431	1,243	0	0	0	(910)	1,487
Jan	0	0	2,060	2,063	6,000	6,000	15,156	15,183	84	0	0	0	2,122	2,620
Feb	257	0	9,000	8,759	7,100	11,400	87,119	72,864	0	0	0	0	6,985	6,688
Mar	0	0	25,035	25,080	7,100	17,290	59,009	59,114	0	0	0	0	9,491	8,554
Apr	0	0	19,590	19,621	7,100	8,732	19,206	17,554	0	0	0	0	6,665	6,660
May	0	0	8,764	8,779	24,835	7,580	9,027	8,250	3,564	0	7,802	0	(3,128)	2,160
Jun	0	0	6,233	6,243	23,441	7,580	6,701	6,711	3,529	0	11,256	0	(3,455)	747
Jul	0	0	2,894	2,899	8,000	8,000	13,199	13,222	757	422	0	0	(538)	(422)
Aug	0	0	3,183	3,189	4,000	4,000	12,266	12,288	24	0	0	0	1,076	1,536
Sep	0	0	4,181	4,187	3,000	3,000	14,964	14,988	3	0	0	0	984	968
1987														
Oct	0	0	3,741	3,748	4,000	4,000	13,038	13,061	0	0	0	0	3,552	3,835
Nov	0	0	2,842	2,846	4,500	4,500	10,584	10,601	0	0	0	0	3,220	3,878
Dec	0	0	3,706	3,713	4,500	4,500	11,314	11,334	0	0	0	0	3,708	4,209
Jan	0	0	2,305	2,309	4,500	4,500	10,390	10,409	0	0	0	0	3,620	4,268
Feb	0	0	2,136	2,140	10,257	11,400	9,068	9,084	971	0	2,411	0	999	2,335
Mar	0	0	3,415	3,421	9,952	11,400	9,213	9,229	954	0	1,531	0	2,489	3,752
Apr	281	0	3,148	2,872	10,783	10,317	4,103	4,311	3,027	3,759	2,953	0	(3,020)	(3,759)
May	434	0	2,611	2,182	19,200	7,580	3,707	3,601	3,521	2,750	10,700	0	(3,498)	(2,750)
Jun	0	0	1,990	1,993	14,773	6,651	4,349	4,356	3,356	2,948	7,852	269	(3,356)	(2,948)
Jul	0	0	1,632	1,635	5,000	5,000	11,136	11,156	1,093	962	0	0	(1,093)	(962)
Aug	0	0	1,627	1,630	3,500	3,500	10,684	10,703	732	0	0	0	(589)	228
Sep	0	0	1,597	1,599	3,000	3,000	8,770	8,784	1,212	482	0	0	(1,184)	(482)
1988														
Oct	0	0	1,370	1,372	4,000	4,000	7,166	7,179	577	90	0	0	(239)	(90)
Nov	0	0	1,548	1,551	4,500	4,500	6,380	6,391	1,011	873	0	0	(709)	(873)
Dec	0	0	1,278	1,280	4,500	4,500	11,181	11,200	626	0	0	0	881	2,222
Jan	0	0	1,483	1,486	4,500	6,000	18,713	18,746	19	0	0	0	988	1,063
Feb	0	0	1,389	1,441	11,672	11,400	4,817	4,998	5,701	7,786	4,193	0	(5,701)	(7,786)
Mar	0	0	2,241	2,245	21,319	7,100	4,858	4,867	6,301	3,404	10,586	0	(6,301)	(3,404)
Apr	669	0	2,814	2,150	11,643	7,100	4,834	4,783	4,283	3,596	1,518	0	(4,283)	(3,596)
May	624	221	2,405	2,005	4,121	4,000	3,785	3,678	2,521	2,402	0	0	(2,393)	(2,402)
Jun	0	0	1,711	1,714	6,897	4,000	4,518	4,396	3,410	1,305	221	0	(3,410)	(1,305)
Jul	0	0	1,357	1,359	3,968	4,000	10,555	10,574	548	0	0	0	30	146
Aug	0	0	1,557	1,560	3,000	3,500	9,784	9,800	594	137	0	0	(469)	(137)
Sep	0	0	1,452	1,455	3,000	3,000	8,542	8,557	744	0	0	0	(584)	138

Table A4–2. Continued

Water Year	DailySOS Added SJR Flow (cfs)	DeltaSOS Added SJR Flow (cfs)	DailySOS New SJR Flow (cfs)	DeltaSOS New SJR Flow (cfs)	DailySOS Required Delta Outflow (cfs)	DeltaSOS Required Delta Outflow (cfs)	DailySOS Export Limits for Inflow (cfs)	DeltaSOS Direct Export Limits (cfs)	DailySOS Reduced Export for Objectives (cfs)	DeltaSOS Reduced Export for Objectives (cfs)	DailySOS Outflow Deficit (cfs)	DeltaSOS Outflow Deficit (cfs)	DailySOS Net Export Change (cfs)	DeltaSOS Net Export Change (cfs)
1989														
Oct	0	0	1,127	1,129	3,000	3,000	6,837	6,849	323	0	0	0	193	516
Nov	0	0	1,274	1,276	3,500	3,500	8,280	8,294	345	0	0	0	519	2,348
Dec	0	0	1,372	1,374	3,500	3,500	9,026	9,042	393	0	0	0	721	1,993
Jan	0	0	1,255	1,257	6,000	4,500	9,254	9,270	2,796	805	0	0	(2,594)	(805)
Feb	0	0	1,234	1,236	11,836	11,400	6,080	6,091	3,291	6,079	3,829	33	(3,272)	(6,079)
Mar	0	0	2,023	2,027	9,952	7,100	16,553	16,582	533	0	760	0	24	1,071
Apr	797	517	2,713	2,435	7,100	8,263	6,760	5,856	4,088	4,463	0	0	(3,923)	(4,463)
May	593	483	2,542	2,435	8,877	8,431	4,828	4,490	2,494	1,536	3,239	0	(2,041)	(1,536)
Jun	0	0	1,583	1,586	23,960	6,120	5,274	5,283	3,287	59	14,383	0	(3,287)	(59)
Jul	0	0	1,284	1,286	5,000	5,000	13,145	13,169	468	0	0	0	458	1,570
Aug	0	0	1,169	1,171	3,500	3,500	12,782	12,804	693	0	0	0	(502)	205
Sep	0	0	1,353	1,355	3,000	3,000	11,687	11,708	598	0	0	0	(55)	728
1990														
Oct	0	0	1,401	1,403	4,000	4,000	10,272	10,290	1,319	79	0	0	(1,098)	(79)
Nov	0	0	1,404	1,313	4,500	4,500	10,727	10,029	646	0	0	0	(274)	457
Dec	0	0	1,381	1,383	4,500	4,500	11,014	11,034	636	0	0	0	(351)	719
Jan	0	0	1,242	1,204	4,500	4,500	13,231	12,827	609	0	0	0	(88)	1,114
Feb	0	0	1,365	1,514	7,889	11,400	6,963	6,007	3,896	5,630	586	0	(3,896)	(5,630)
Mar	0	0	1,760	1,706	11,377	7,100	5,298	5,136	5,826	4,951	3,510	0	(5,826)	(4,951)
Apr	1,088	650	2,397	2,005	10,683	10,683	4,586	4,549	6,072	5,249	6	0	(6,072)	(5,249)
May	881	724	2,161	2,005	5,479	4,000	4,136	3,592	743	0	58	0	(134)	411
Jun	0	0	1,116	1,118	5,805	4,000	4,165	4,173	1,178	0	1,167	0	(752)	806
Jul	0	0	1,009	1,011	4,000	4,000	9,563	9,579	327	0	0	0	193	339
Aug	2	0	1,034	1,001	3,000	3,500	9,799	9,499	7	0	0	0	1,672	1,737
Sep	51	0	927	907	3,000	3,000	7,252	7,472	785	0	0	0	(381)	475
1991														
Oct	49	7	1,042	1,000	3,000	3,000	5,793	5,765	249	0	0	0	488	1,016
Nov	0	0	1,115	1,115	3,500	3,500	5,892	5,892	238	0	0	0	617	803
Dec	7	0	925	918	3,500	3,500	7,692	7,686	74	0	0	0	1,698	2,268
Jan	93	84	909	900	4,500	4,500	6,492	6,485	621	0	0	0	(472)	463
Feb	152	142	909	900	7,889	7,100	4,115	4,111	1,786	2,384	2,018	634	(1,778)	(2,384)
Mar	19	0	1,797	1,779	7,100	7,100	10,385	10,379	1,123	0	0	0	(702)	727
Apr	1,226	1,267	2,394	2,435	7,100	10,438	4,469	4,004	3,785	5,399	556	1,383	(3,785)	(5,399)
May	1,021	956	2,070	2,005	8,118	4,000	3,266	3,061	1,039	0	3,063	0	(998)	184
Jun	332	332	900	900	7,817	4,000	3,550	3,550	435	0	3,144	0	(435)	873
Jul	306	306	900	900	4,000	4,000	6,915	6,915	521	367	148	0	(296)	(367)
Aug	363	363	900	900	3,000	3,500	6,900	6,900	622	0	0	0	(244)	112
Sep	326	326	900	900	3,000	3,000	7,200	7,199	232	0	0	0	909	1,638

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Table A4–2. Continued

Water Year	DailySOS CVP & SWP Export (cfs)	DeltaSOS CVP & SWP Export (cfs)	DailySOS Available Flow (cfs)	DeltaSOS Available Flow (cfs)	DailySOS Delta Storage (TAF)	DeltaSOS Delta Storage (TAF)	DailySOS Delta Storage Diversion (cfs)	DeltaSOS Delta Storage Diversion (cfs)	DailySOS Delta Storage Export (cfs)	DeltaSOS Delta Storage Export (cfs)	DailySOS Final Total Export (cfs)	DeltaSOS Final Total Export (cfs)	DailySOS Final QWEST Flow (cfs)	DeltaSOS Final QWEST Flow (cfs)	DailySOS Final Delta Outflow (cfs)	DeltaSOS Final Delta Outflow (cfs)
1968																
Oct	11,280	11,280	1,868	1,892	238	238	155	53	0	0	11,280	11,280	(1,093)	(769)	6,997	7,451
Nov	11,248	11,280	752	772	238	238	58	25	32	0	11,280	11,280	(5,177)	(4,957)	5,925	6,307
Dec	11,514	11,499	2,192	2,232	238	238	13	13	0	0	11,514	11,499	(4,296)	(4,875)	9,545	8,681
Jan	11,706	11,852	4,486	4,374	238	238	15	15	0	0	11,706	11,852	(4,092)	(3,878)	13,628	14,095
Feb	8,834	11,776	6,933	6,935	232	238	1,576	30	1,642	0	10,476	11,776	2,695	305	43,444	41,957
Mar	10,839	11,407	4,254	3,958	214	238	129	49	381	0	11,220	11,407	575	(606)	33,854	32,433
Apr	2,184	2,000	0	0	24	(0)	0	0	3,117	3,924	5,301	5,924	1,925	2,057	13,048	13,210
May	2,214	4,627	0	0	0	0	0	0	369	0	2,583	4,627	519	(2,064)	10,036	7,580
Jun	2,571	2,000	0	0	0	0	0	0	0	0	2,571	2,000	1,608	2,117	5,649	6,113
Jul	2,286	2,345	0	0	0	0	0	0	0	0	2,286	2,345	1,794	1,823	6,419	6,500
Aug	6,030	7,414	0	0	0	0	0	0	0	0	6,030	7,414	(1,143)	(1,608)	3,968	4,000
Sep	8,447	9,165	0	0	0	0	0	0	0	0	8,447	9,165	(2,621)	(2,866)	3,000	3,000
1969																
Oct	7,399	7,767	0	0	0	0	0	0	0	0	7,399	7,767	(867)	(1,085)	4,143	4,000
Nov	9,643	10,042	0	0	0	0	0	0	0	0	9,643	10,042	(4,504)	(5,841)	6,394	4,607
Dec	10,992	11,311	6,111	6,319	209	238	3,407	3,871	0	0	10,992	11,311	(5,524)	(8,070)	14,938	11,523
Jan	13,164	12,700	35,893	38,865	238	238	486	15	0	0	13,164	12,700	23,080	23,850	116,656	117,761
Feb	14,500	12,700	41,296	43,219	238	238	31	31	0	0	14,500	12,700	41,776	43,258	149,067	150,572
Mar	12,632	11,700	21,224	22,216	238	238	49	49	0	0	12,632	11,700	31,449	32,164	83,968	84,700
Apr	11,280	11,280	12,120	12,638	238	238	76	76	0	0	11,280	11,280	22,035	21,903	60,928	60,777
May	11,280	11,280	11,932	13,238	238	238	99	99	0	0	11,280	11,280	22,171	22,240	56,127	56,279
Jun	11,231	11,280	7,160	7,141	235	238	110	118	49	0	11,280	11,280	22,946	24,658	37,425	37,317
Jul	7,753	8,472	237	0	67	57	70	0	2,662	2,808	10,415	11,280	2,715	2,165	8,496	8,000
Aug	11,126	11,280	2,055	2,564	177	208	2,055	2,564	154	0	11,280	11,280	(4,785)	(4,909)	4,178	4,357
Sep	11,280	11,280	4,992	5,018	238	238	1,110	593	0	0	11,280	11,280	(1,262)	(445)	10,197	11,201
1970																
Oct	11,280	11,280	3,198	3,224	238	238	53	53	0	0	11,280	11,280	1,241	1,104	10,043	9,840
Nov	11,280	11,280	3,021	3,044	238	238	25	25	0	0	11,280	11,280	(3,605)	(3,511)	9,641	9,816
Dec	11,279	11,333	10,523	13,820	238	238	13	13	0	0	11,279	11,333	(401)	(1,193)	35,603	34,689
Jan	13,347	12,700	36,474	36,602	238	238	15	15	0	0	13,347	12,700	21,504	21,588	180,841	181,011
Feb	13,881	12,700	21,220	26,306	238	238	31	31	0	0	13,881	12,700	10,331	11,275	99,304	100,311
Mar	12,279	11,700	8,087	8,696	229	238	41	49	140	0	12,419	11,700	5,777	5,963	45,932	46,069
Apr	2,542	5,554	0	0	14	159	0	0	3,539	1,254	6,081	6,808	1,907	(1,256)	13,060	9,868
May	2,765	6,381	0	0	0	133	0	0	212	319	2,977	6,701	1,489	(2,198)	11,902	8,229
Jun	1,711	2,000	0	0	0	(0)	0	0	0	2,120	1,711	4,120	4,996	4,613	9,373	8,932
Jul	2,321	2,493	0	0	0	0	0	0	0	0	2,321	2,493	2,992	2,910	8,030	8,000
Aug	8,393	9,234	9	0	0	0	9	0	0	0	8,393	9,234	(2,511)	(2,807)	4,000	4,000
Sep	11,280	11,280	1,920	1,941	110	116	1,920	1,941	0	0	11,280	11,280	(5,171)	(4,718)	4,340	5,064

C-061438

Table A4–2. Continued

Water Year	DailySOS CVP & SWP Export (cfs)	DeltaSOS CVP & SWP Export (cfs)	DailySOS Available Flow (cfs)	DeltaSOS Available Flow (cfs)	DailySOS Delta Storage (TAF)	DeltaSOS Delta Storage (TAF)	DailySOS Delta Storage Diversion (cfs)	DeltaSOS Delta Storage Diversion (cfs)	DailySOS Delta Storage Export (cfs)	DeltaSOS Delta Storage Export (cfs)	DailySOS Final Total Export (cfs)	DeltaSOS Final Total Export (cfs)	DailySOS Final QWEST Flow (cfs)	DeltaSOS Final QWEST Flow (cfs)	DailySOS Final Delta Outflow (cfs)	DeltaSOS Final Delta Outflow (cfs)
1971																
Oct	10,935	11,236	224	0	99	110	224	0	345	44	11,280	11,280	(2,890)	(2,968)	4,724	4,655
Nov	11,232	11,280	5,268	5,262	238	238	2,412	2,184	48	0	11,280	11,280	(5,203)	(6,720)	14,413	12,030
Dec	11,944	11,700	24,130	23,472	238	238	13	13	0	0	11,944	11,700	9,117	8,459	75,242	74,253
Jan	12,597	12,600	17,790	18,318	238	238	15	15	0	0	12,597	12,600	2,775	3,303	53,396	54,357
Feb	11,238	12,332	1,750	919	208	238	17	31	523	0	11,761	12,332	(590)	(1,646)	26,053	25,093
Mar	5,496	11,321	2,819	1,338	140	238	1,532	49	2,593	0	8,089	11,321	2,950	(2,134)	29,745	24,410
Apr	8,054	8,380	3,295	1,841	228	238	1,683	76	133	0	8,187	8,380	(930)	45	31,648	32,549
May	8,004	8,380	272	140	209	238	272	99	470	0	8,474	8,380	(1,647)	(2,063)	22,642	22,143
Jun	7,439	10,761	0	0	53	200	0	0	2,514	519	9,953	11,280	(836)	(5,606)	19,474	16,107
Jul	9,582	10,232	494	0	0	128	494	0	1,237	1,048	10,818	11,280	(2,888)	(2,787)	8,000	8,000
Aug	11,272	11,280	3,632	4,010	200	238	3,358	1,910	0	0	11,272	11,280	(8,133)	(5,109)	4,939	7,224
Sep	11,280	11,280	5,745	5,772	238	238	724	87	0	0	11,280	11,280	(4,994)	(1,354)	11,460	12,828
1972																
Oct	11,258	11,280	1,293	1,294	236	238	48	53	22	0	11,280	11,280	(1,742)	(1,631)	6,336	6,515
Nov	10,724	11,280	628	330	238	238	609	25	556	0	11,280	11,280	(6,898)	(6,746)	5,360	5,618
Dec	11,381	11,288	4,966	5,088	238	238	13	13	0	0	11,381	11,288	(3,376)	(4,313)	14,895	13,439
Jan	11,909	11,910	3,594	3,619	238	238	15	15	0	0	11,909	11,910	(5,066)	(4,319)	10,979	12,160
Feb	9,342	9,390	115	0	154	97	69	0	1,493	2,415	10,834	11,805	(1,935)	(1,683)	16,242	17,227
Mar	5,284	9,443	0	0	0	0	0	0	2,465	1,535	7,749	10,978	170	(3,891)	19,455	15,494
Apr	3,039	3,373	0	0	0	0	0	0	0	0	3,039	3,373	892	150	10,749	9,848
May	2,895	3,664	0	0	0	0	0	0	0	0	2,895	3,664	(451)	(1,525)	8,587	7,580
Jun	2,111	3,820	0	0	0	0	0	0	0	0	2,111	3,820	2,951	1,132	8,731	6,845
Jul	4,689	4,753	0	0	0	0	0	0	0	0	4,689	4,753	111	137	6,419	6,500
Aug	8,419	9,221	0	0	0	0	0	0	0	0	8,419	9,221	(3,021)	(3,289)	3,968	4,000
Sep	11,098	11,280	872	803	48	48	872	803	0	0	11,098	11,280	(4,011)	(3,879)	4,443	4,721
1973																
Oct	11,223	11,280	616	592	79	81	616	592	57	0	11,280	11,280	(2,645)	(2,849)	5,804	5,520
Nov	11,106	11,280	5,944	5,869	238	238	2,866	2,665	174	0	11,280	11,280	(5,488)	(6,981)	15,193	12,940
Dec	11,327	11,306	7,917	8,791	238	238	13	13	0	0	11,327	11,306	(3,923)	(3,531)	19,135	19,789
Jan	12,219	12,222	24,220	25,720	238	238	15	15	0	0	12,219	12,222	10,063	10,705	92,365	93,682
Feb	13,430	12,700	21,795	22,679	238	238	31	31	0	0	13,430	12,700	13,746	14,879	89,842	91,359
Mar	12,128	11,700	14,465	14,941	238	238	49	49	0	0	12,128	11,700	9,650	8,767	66,019	64,635
Apr	6,591	8,124	228	0	108	234	15	0	2,124	0	8,715	8,124	1,957	486	18,904	17,485
May	5,157	7,206	0	0	0	227	0	0	1,686	0	6,842	7,206	567	(1,523)	12,913	10,844
Jun	3,427	6,714	0	0	0	191	0	0	0	492	3,427	7,206	4,495	1,143	11,014	7,615
Jul	4,138	4,283	0	0	0	3	0	0	0	2,923	4,138	7,206	1,562	1,504	8,000	8,000
Aug	9,580	10,415	0	0	0	0	0	0	0	0	9,580	10,415	(3,321)	(3,624)	4,000	4,000
Sep	11,280	11,280	1,293	1,315	72	78	1,293	1,315	0	0	11,280	11,280	(4,608)	(4,270)	4,206	4,754

Table A4–2. Continued

Water Year	DailySOS CVP & SWP Export (cfs)	DeltaSOS CVP & SWP Export (cfs)	DailySOS Available Flow (cfs)	DeltaSOS Available Flow (cfs)	DailySOS Delta Storage (TAF)	DeltaSOS Delta Storage (TAF)	DailySOS Delta Storage Diversion (cfs)	DeltaSOS Delta Storage Diversion (cfs)	DailySOS Delta Storage Export (cfs)	DeltaSOS Delta Storage Export (cfs)	DailySOS Final Total Export (cfs)	DeltaSOS Final Total Export (cfs)	DailySOS Final QWEST Flow (cfs)	DeltaSOS Final QWEST Flow (cfs)	DailySOS Final Delta Outflow (cfs)	DeltaSOS Final Delta Outflow (cfs)
1974																
Oct	11,280	11,280	1,558	1,581	164	172	1,558	1,581	0	0	11,280	11,280	(2,123)	(2,854)	7,044	5,946
Nov	11,280	11,280	13,402	15,485	238	238	1,261	1,131	0	0	11,280	11,280	431	(645)	52,211	50,818
Dec	11,625	11,491	20,362	20,694	238	238	13	13	0	0	11,625	11,491	5,349	5,681	68,029	68,615
Jan	13,448	12,700	27,289	28,106	238	238	15	15	0	0	13,448	12,700	12,275	13,092	127,168	128,279
Feb	12,561	12,564	10,004	10,140	238	238	31	31	0	0	12,561	12,564	1,880	1,754	52,007	51,952
Mar	11,699	11,700	17,341	17,445	238	238	49	49	0	0	11,699	11,700	8,223	8,063	72,110	72,018
Apr	9,861	9,950	13,779	13,820	236	238	35	76	0	0	9,861	9,950	10,289	9,438	103,826	102,847
May	9,320	9,950	489	393	212	238	137	99	419	0	9,740	9,950	(399)	(869)	23,162	22,786
Jun	2,360	10,366	0	0	(0)	177	0	0	3,447	914	5,808	11,280	7,709	1,825	23,593	15,412
Jul	9,102	11,280	1,367	641	28	208	1,354	641	801	0	9,903	11,280	(2,702)	(3,473)	9,479	8,000
Aug	11,280	11,280	5,640	5,677	238	238	3,525	603	0	0	11,280	11,280	(7,216)	(2,368)	7,319	11,092
Sep	11,280	11,280	7,354	7,384	238	238	87	87	0	0	11,280	11,280	(2,994)	(4,756)	14,579	15,320
1975																
Oct	11,280	11,280	4,585	4,607	238	238	53	53	0	0	11,280	11,280	527	650	11,683	11,892
Nov	11,280	11,280	6,148	6,176	238	238	25	25	0	0	11,280	11,280	(3,147)	(3,144)	14,552	14,591
Dec	11,555	11,589	8,392	8,416	238	238	13	13	0	0	11,555	11,589	(2,144)	(2,695)	19,183	18,393
Jan	12,123	12,125	3,173	3,203	238	238	15	15	0	0	12,123	12,125	(4,810)	(4,334)	10,771	11,537
Feb	12,846	12,700	12,251	8,421	238	238	64	31	34	0	12,879	12,700	5,794	4,465	51,077	49,090
Mar	11,592	11,700	13,350	13,321	238	238	49	49	0	0	11,592	11,700	8,443	8,075	61,272	60,960
Apr	9,861	9,950	2,934	1,534	236	238	35	76	0	0	9,861	9,950	1,717	1,266	30,880	30,322
May	8,950	9,950	851	716	210	238	470	99	787	0	9,737	9,950	293	(235)	24,906	24,463
Jun	4,544	10,781	0	0	0	201	0	0	3,412	499	7,956	11,280	6,906	3,071	22,386	16,052
Jul	8,217	8,351	0	0	0	13	0	0	0	2,929	8,217	11,280	(747)	(801)	8,000	8,000
Aug	11,280	11,280	2,365	2,880	139	183	2,365	2,880	0	0	11,280	11,280	(5,235)	(5,449)	4,755	4,728
Sep	11,280	11,280	4,215	4,240	238	238	1,759	1,008	0	0	11,280	11,280	(2,900)	(1,693)	8,067	9,541
1976																
Oct	11,280	11,280	4,740	4,769	238	238	53	53	0	0	11,280	11,280	2,204	1,820	13,031	12,462
Nov	11,280	11,280	6,308	6,337	238	238	25	25	0	0	11,280	11,280	(3,274)	(3,121)	14,553	14,815
Dec	11,593	11,518	7,695	7,805	238	238	13	13	0	0	11,593	11,518	(4,354)	(3,651)	16,104	17,172
Jan	11,172	11,980	779	142	204	238	8	15	551	0	11,723	11,980	(5,316)	(5,524)	6,339	6,502
Feb	6,108	3,647	0	0	3	6	0	0	3,463	4,000	9,571	7,647	(960)	1,180	9,040	11,400
Mar	4,504	5,826	0	0	0	0	0	0	43	52	4,546	5,879	254	(1,672)	11,633	9,446
Apr	3,838	2,551	0	0	0	0	0	0	0	0	3,838	2,551	179	622	9,911	9,967
May	2,945	3,649	0	0	0	0	0	0	0	0	2,945	3,649	(868)	(1,970)	6,462	5,393
Jun	1,832	3,827	0	0	0	0	0	0	0	0	1,832	3,827	2,330	284	6,082	4,000
Jul	4,329	4,436	0	0	0	0	0	0	0	0	4,329	4,436	(312)	(325)	3,968	4,000
Aug	7,995	8,297	0	0	0	0	0	0	0	0	7,995	8,297	(2,376)	(2,285)	3,198	3,500
Sep	8,237	9,074	0	0	0	0	0	0	0	0	8,237	9,074	(1,831)	(2,455)	3,599	3,071

C-061440

Table A4–2. Continued

Water Year	DailySOS CVP & SWP Export (cfs)	DeltaSOS CVP & SWP Export (cfs)	DailySOS Available Flow (cfs)	DeltaSOS Available Flow (cfs)	DailySOS Delta Storage (TAF)	DeltaSOS Delta Storage (TAF)	DailySOS Delta Storage Diversion (cfs)	DeltaSOS Delta Storage Diversion (cfs)	DailySOS Delta Storage Export (cfs)	DeltaSOS Delta Storage Export (cfs)	DailySOS Final Total Export (cfs)	DeltaSOS Final Total Export (cfs)	DailySOS Final QWEST Flow (cfs)	DeltaSOS Final QWEST Flow (cfs)	DailySOS Final Delta Outflow (cfs)	DeltaSOS Final Delta Outflow (cfs)
1977																
Oct	4,617	5,039	0	0	0	0	0	0	0	0	4,617	5,039	273	59	3,468	3,000
Nov	4,076	4,541	0	0	0	0	0	0	0	0	4,076	4,541	(1,464)	(1,820)	3,638	3,500
Dec	3,196	4,257	0	0	0	0	0	0	0	0	3,196	4,257	(1,161)	(1,739)	3,654	3,500
Jan	5,916	6,447	0	0	0	0	0	0	0	0	5,916	6,447	(2,037)	(2,872)	5,391	4,500
Feb	2,128	2,000	0	0	0	0	0	0	0	0	2,128	2,000	1,179	575	6,995	6,152
Mar	1,757	2,000	0	0	0	0	0	0	0	0	1,757	2,000	780	7	5,074	4,231
Apr	1,040	1,177	0	0	0	0	0	0	0	0	1,040	1,177	74	(163)	3,269	3,228
May	1,844	2,104	0	0	0	0	0	0	0	0	1,844	2,104	155	(758)	5,092	4,000
Jun	557	558	0	0	0	0	0	0	0	0	557	558	1,105	1,081	2,590	2,509
Jul	684	702	0	0	0	0	0	0	0	0	684	702	1,375	1,472	3,307	3,453
Aug	1,259	1,390	0	0	0	0	0	0	0	0	1,259	1,390	862	1,294	2,703	3,422
Sep	1,813	2,328	0	0	0	0	0	0	0	0	1,813	2,328	156	236	2,839	3,000
1978																
Oct	675	629	0	0	0	0	0	0	0	0	675	629	(148)	206	2,108	2,647
Nov	2,837	2,821	0	0	0	0	0	0	0	0	2,837	2,821	(560)	(879)	3,789	3,500
Dec	6,269	8,412	773	0	37	0	773	0	159	0	6,427	8,412	(2,341)	(5,091)	7,298	3,923
Jan	11,324	11,632	18,796	20,575	238	238	3,513	3,871	237	0	11,560	11,632	2,507	1,704	61,183	60,583
Feb	12,820	12,700	9,589	9,636	238	238	207	31	179	0	12,998	12,700	6,316	5,918	53,429	52,858
Mar	12,187	11,700	17,972	19,361	238	238	51	49	0	0	12,187	11,700	13,069	12,828	79,262	78,858
Apr	11,280	11,280	10,958	9,924	238	238	76	76	0	0	11,280	11,280	18,906	18,076	53,180	51,937
May	10,910	11,280	6,783	4,935	222	238	86	99	246	0	11,156	11,280	12,935	12,624	32,906	32,671
Jun	3,485	7,170	0	0	0	(0)	0	0	3,614	3,882	7,099	11,052	8,250	4,502	13,154	9,359
Jul	3,577	4,092	0	0	0	0	0	0	0	0	3,577	4,092	2,545	2,121	8,370	8,000
Aug	10,031	11,071	203	0	12	0	203	0	0	0	10,031	11,071	(3,206)	(3,505)	4,000	4,000
Sep	11,280	11,280	2,801	2,824	173	168	2,801	2,824	0	0	11,280	11,280	(4,028)	(3,690)	5,100	5,644
1979																
Oct	10,199	10,822	306	0	122	137	306	0	1,081	458	11,280	11,280	(1,300)	(1,280)	4,142	4,315
Nov	10,066	10,686	167	0	59	100	167	0	1,214	594	11,280	11,280	(3,468)	(4,440)	6,167	4,980
Dec	9,968	10,636	7	0	2	55	7	0	912	722	10,880	11,359	(5,008)	(5,313)	4,746	4,690
Jan	12,241	12,610	7,662	7,440	215	238	3,501	2,998	34	0	12,275	12,610	(1,919)	(2,811)	18,833	17,484
Feb	11,161	12,700	9,396	3,317	238	238	1,636	31	1,186	0	12,347	12,700	6,627	5,811	36,452	35,437
Mar	11,978	11,700	2,591	2,895	238	238	232	49	183	0	12,161	11,700	5,416	5,271	30,230	29,827
Apr	5,787	5,303	0	0	89	(0)	0	0	2,426	3,924	8,212	9,227	1,742	2,210	14,542	15,049
May	6,564	7,530	0	0	0	0	0	0	1,364	0	7,928	7,530	(663)	(1,586)	13,019	12,153
Jun	2,436	2,000	0	0	0	0	0	0	0	0	2,436	2,000	4,502	4,870	9,102	9,420
Jul	7,528	7,425	244	0	0	0	244	0	211	0	7,738	7,425	(829)	(915)	6,806	6,500
Aug	9,689	10,524	0	0	0	0	0	0	0	0	9,689	10,524	(3,012)	(3,301)	4,000	4,000
Sep	10,853	11,036	67	0	0	0	67	0	32	0	10,885	11,036	(3,353)	(3,003)	3,253	3,859

Table A4–2. Continued

Water Year	DailySOS CVP & SWP Export (cfs)	DeltaSOS CVP & SWP Export (cfs)	DailySOS Available Flow (cfs)	DeltaSOS Available Flow (cfs)	DailySOS Delta Storage (TAF)	DeltaSOS Delta Storage (TAF)	DailySOS Delta Storage Diversion (cfs)	DeltaSOS Delta Storage Diversion (cfs)	DailySOS Delta Storage Export (cfs)	DeltaSOS Delta Storage Export (cfs)	DailySOS Final Total Export (cfs)	DeltaSOS Final Total Export (cfs)	DailySOS Final QWEST Flow (cfs)	DeltaSOS Final QWEST Flow (cfs)	DailySOS Final Delta Outflow (cfs)	DeltaSOS Final Delta Outflow (cfs)
1980																
Oct	9,988	10,441	175	0	8	0	175	0	41	0	10,029	10,441	(771)	(1,288)	5,226	4,548
Nov	10,476	11,280	1,066	557	62	33	1,066	557	135	0	10,612	11,280	(5,623)	(6,336)	6,366	5,475
Dec	10,870	11,304	3,984	4,530	148	238	1,791	3,345	383	0	11,254	11,304	(5,397)	(7,825)	12,241	9,676
Jan	13,624	12,700	33,654	34,926	238	238	1,477	15	0	0	13,624	12,700	18,119	19,911	109,445	111,200
Feb	14,483	12,700	25,423	32,974	238	238	30	30	0	0	14,483	12,700	21,871	25,794	113,295	121,343
Mar	12,528	11,700	23,621	24,513	238	238	50	49	0	0	12,528	11,700	26,434	26,969	90,952	91,507
Apr	9,349	10,773	1,077	437	190	238	33	76	756	0	10,105	10,773	6,293	4,476	24,627	22,643
May	3,149	9,672	0	0	0	232	0	0	3,001	0	6,150	9,672	10,480	3,762	22,318	15,720
Jun	7,600	8,616	64	0	4	66	64	0	0	2,664	7,600	11,280	4,462	3,478	13,071	12,049
Jul	9,573	9,771	520	0	0	(0)	520	0	517	949	10,090	10,720	(636)	(449)	7,871	8,000
Aug	9,359	10,163	0	0	0	0	0	0	0	0	9,359	10,163	(2,501)	(2,762)	3,968	4,000
Sep	11,280	11,280	1,861	1,882	106	112	1,861	1,882	0	0	11,280	11,280	(3,262)	(2,817)	4,288	4,995
1981																
Oct	9,355	10,332	374	0	29	50	374	0	1,564	948	10,919	11,280	(768)	(836)	4,159	4,000
Nov	8,496	9,190	0	0	0	0	0	0	486	823	8,983	10,012	(3,172)	(3,469)	4,500	4,500
Dec	10,862	11,382	1,777	1,587	99	98	1,666	1,587	47	0	10,909	11,382	(6,490)	(7,025)	6,626	6,089
Jan	10,300	11,955	4,552	3,208	143	238	1,673	2,298	945	0	11,245	11,955	(2,467)	(6,375)	14,545	9,883
Feb	9,425	9,880	2,065	0	142	128	1,288	0	1,263	1,951	10,688	11,832	(3,069)	(2,509)	17,646	18,133
Mar	7,969	10,250	1,281	0	101	53	1,281	0	1,905	1,162	9,873	11,412	924	(1,201)	22,046	19,387
Apr	2,962	5,962	0	0	0	0	0	0	1,646	823	4,608	6,785	3,074	(587)	16,724	12,777
May	2,900	5,307	0	0	0	0	0	0	0	0	2,900	5,307	618	(1,789)	10,569	8,220
Jun	1,951	2,000	0	0	0	0	0	0	0	0	1,951	2,000	2,868	2,758	6,507	6,336
Jul	7,183	7,330	0	0	0	0	0	0	0	0	7,183	7,330	(1,550)	(1,589)	5,000	5,000
Aug	8,833	9,666	0	0	0	0	0	0	0	0	8,833	9,666	(2,922)	(3,217)	3,500	3,500
Sep	8,340	9,176	0	0	0	0	0	0	0	0	8,340	9,176	(2,373)	(2,662)	3,000	3,000
1982																
Oct	6,236	6,379	0	0	0	0	0	0	0	0	6,236	6,379	166	(81)	4,759	4,000
Nov	8,889	11,280	8,500	11,668	201	238	3,391	4,000	0	0	8,889	11,280	(3,185)	(7,332)	28,310	23,904
Dec	11,215	11,195	18,459	18,819	238	238	615	13	0	0	11,215	11,195	2,844	3,806	79,855	81,253
Jan	12,163	12,166	28,193	27,914	238	238	15	15	0	0	12,163	12,166	13,178	12,899	90,670	90,454
Feb	13,074	12,700	19,762	22,554	238	238	31	31	0	0	13,074	12,700	11,866	11,549	89,090	88,671
Mar	12,376	11,700	17,846	18,576	238	238	49	49	0	0	12,376	11,700	18,353	18,169	78,106	77,597
Apr	11,280	11,280	29,165	26,399	238	238	76	76	0	0	11,280	11,280	36,677	35,020	140,448	138,103
May	11,280	11,280	9,761	9,687	238	238	99	99	0	0	11,280	11,280	17,373	17,532	52,416	52,736
Jun	10,025	11,280	1,523	1,356	185	238	67	118	839	0	10,864	11,280	3,924	524	22,256	20,832
Jul	5,183	11,280	45	1,446	23	238	45	130	2,544	0	7,727	11,280	7,232	1,007	15,559	9,316
Aug	11,280	11,280	5,105	5,207	238	238	3,605	115	0	0	11,280	11,280	(4,135)	(106)	6,526	10,865
Sep	11,280	11,280	9,363	9,396	238	238	87	87	0	0	11,280	11,280	2,745	4,300	19,751	19,088

C—061442

Table A4–2. Continued

Water Year	DailySOS CVP & SWP Export (cfs)	DeltaSOS CVP & SWP Export (cfs)	DailySOS Available Flow (cfs)	DeltaSOS Available Flow (cfs)	DailySOS Delta Storage (TAF)	DeltaSOS Delta Storage (TAF)	DailySOS Delta Storage Diversion (cfs)	DeltaSOS Delta Storage Diversion (cfs)	DailySOS Delta Storage Export (cfs)	DeltaSOS Delta Storage Export (cfs)	DailySOS Final Total Export (cfs)	DeltaSOS Final Total Export (cfs)	DailySOS Final QWEST Flow (cfs)	DeltaSOS Final QWEST Flow (cfs)	DailySOS Final Delta Outflow (cfs)	DeltaSOS Final Delta Outflow (cfs)
1983																
Oct	11,280	11,280	7,451	7,485	238	238	53	53	0	0	11,280	11,280	6,090	5,930	16,845	16,595
Nov	11,280	11,280	15,833	16,564	238	238	25	25	0	0	11,280	11,280	6,294	5,236	33,839	32,293
Dec	12,865	11,700	36,709	38,332	238	238	13	13	0	0	12,865	11,700	22,808	23,319	84,405	84,774
Jan	14,500	12,700	34,120	40,509	238	238	15	15	0	0	14,500	12,700	22,705	25,495	85,300	88,871
Feb	14,500	12,700	49,500	51,478	238	238	31	31	0	0	14,500	12,700	43,109	45,278	171,404	174,013
Mar	12,632	11,700	69,352	76,371	238	238	49	49	0	0	12,632	11,700	60,891	61,323	259,302	259,815
Apr	11,280	11,280	31,280	28,321	238	238	76	76	0	0	11,280	11,280	41,525	41,433	110,559	110,539
May	11,280	11,280	21,456	22,696	238	238	99	99	0	0	11,280	11,280	34,830	34,186	90,586	89,714
Jun	11,280	11,280	16,648	16,693	238	238	118	118	0	0	11,280	11,280	24,007	23,990	64,550	64,587
Jul	11,280	11,280	23,442	23,503	238	238	130	130	0	0	11,280	11,280	13,754	13,354	37,563	37,774
Aug	11,280	11,280	11,823	11,864	238	238	115	115	0	0	11,280	11,280	5,014	1,468	20,248	21,148
Sep	11,280	11,280	13,123	13,162	238	238	87	87	0	0	11,280	11,280	7,821	10,048	24,209	24,508
1984																
Oct	11,280	11,280	12,218	12,260	238	238	53	53	0	0	11,280	11,280	9,705	11,394	23,364	23,519
Nov	11,280	11,280	26,510	28,194	238	238	25	25	0	0	11,280	11,280	16,084	13,168	64,507	60,354
Dec	12,865	11,700	43,372	44,550	238	238	13	13	0	0	12,865	11,700	28,359	29,537	144,647	146,076
Jan	14,500	12,700	38,434	41,227	238	238	15	15	0	0	14,500	12,700	23,765	26,213	88,080	91,048
Feb	13,767	12,700	2,624	4,306	238	238	30	30	0	0	13,767	12,700	4,997	6,506	33,442	35,957
Mar	11,813	11,700	2,939	3,078	238	238	50	49	0	0	11,813	11,700	2,843	2,815	29,995	29,932
Apr	4,132	2,604	140	0	65	(0)	8	0	2,836	3,924	6,968	6,528	3,908	5,349	18,184	19,623
May	5,331	6,921	0	0	0	0	0	0	989	0	6,321	6,921	374	(1,377)	11,672	10,074
Jun	2,439	4,378	0	0	0	0	0	0	0	0	2,439	4,378	5,069	3,076	11,619	9,599
Jul	11,019	11,280	636	412	35	25	636	412	0	0	11,019	11,280	(3,329)	(3,284)	7,878	8,000
Aug	11,273	11,280	2,270	2,762	167	188	2,270	2,762	7	0	11,280	11,280	(5,229)	(5,185)	4,053	4,406
Sep	11,280	11,280	2,609	2,631	238	238	1,279	926	0	0	11,280	11,280	(2,601)	(2,044)	6,429	7,099
1985																
Oct	11,034	11,280	659	478	222	238	36	53	246	0	11,280	11,280	(134)	(636)	6,292	5,651
Nov	11,243	11,280	8,701	9,435	238	238	334	25	37	0	11,280	11,280	(1,660)	(2,589)	22,257	20,769
Dec	11,835	11,693	12,722	14,180	238	238	13	13	0	0	11,835	11,693	(608)	(366)	27,605	27,955
Jan	12,145	12,226	1,639	1,697	238	238	11	15	0	0	12,145	12,226	(4,595)	(4,114)	8,735	9,555
Feb	6,781	7,953	154	0	68	14	154	0	3,189	3,999	9,970	11,952	1,136	(120)	16,196	14,858
Mar	2,724	6,314	0	0	0	(0)	0	0	1,077	182	3,801	6,496	4,654	703	16,269	12,175
Apr	3,498	5,207	0	0	0	0	0	0	0	0	3,498	5,207	1,564	(120)	10,659	9,054
May	4,842	4,694	0	0	0	0	0	0	0	0	4,842	4,694	(1,028)	(896)	8,594	8,776
Jun	4,769	4,913	0	0	0	0	0	0	0	0	4,769	4,913	1,407	1,131	6,815	6,454
Jul	9,221	9,370	0	0	0	0	0	0	0	0	9,221	9,370	(2,049)	(2,109)	5,000	5,000
Aug	8,769	9,602	0	0	0	0	0	0	0	0	8,769	9,602	(1,913)	(2,203)	3,500	3,500
Sep	8,517	9,344	34	0	0	0	34	0	24	0	8,541	9,344	(1,823)	(2,183)	3,230	3,064

C—061443

Table A4-2. Continued

Water Year	DailySOS CVP & SWP Export (cfs)	DeltaSOS CVP & SWP Export (cfs)	DailySOS Available Flow (cfs)	DeltaSOS Available Flow (cfs)	DailySOS Delta Storage (TAF)	DeltaSOS Delta Storage (TAF)	DailySOS Delta Storage Diversion (cfs)	DeltaSOS Delta Storage Diversion (cfs)	DailySOS Delta Storage Export (cfs)	DeltaSOS Delta Storage Export (cfs)	DailySOS Final Total Export (cfs)	DeltaSOS Final Total Export (cfs)	DailySOS Final QWEST Flow (cfs)	DeltaSOS Final QWEST Flow (cfs)	DailySOS Final Delta Outflow (cfs)	DeltaSOS Final Delta Outflow (cfs)
1986																
Oct	6,316	6,616	0	0	0	0	0	0	0	0	6,316	6,616	299	119	4,571	4,000
Nov	6,880	7,574	121	0	7	0	121	0	0	0	6,880	7,574	(1,291)	(3,233)	7,081	4,500
Dec	8,841	11,256	2,542	1,176	37	72	2,161	1,176	1,655	0	10,496	11,256	(4,904)	(6,568)	8,159	6,435
Jan	11,047	11,561	3,871	3,622	187	238	2,770	2,709	321	0	11,368	11,561	(6,342)	(6,458)	10,332	10,456
Feb	12,986	12,700	37,340	40,386	238	238	946	31	0	0	12,986	12,700	25,153	25,355	201,254	201,374
Mar	12,632	11,700	41,693	47,414	238	238	49	49	0	0	12,632	11,700	35,933	35,954	159,013	158,808
Apr	11,277	11,280	7,928	6,274	238	238	73	76	0	0	11,277	11,280	16,097	15,517	38,462	37,636
May	2,951	8,250	0	0	17	232	0	0	3,499	0	6,450	8,250	9,065	3,795	18,200	13,002
Jun	2,500	6,711	0	0	0	0	0	0	263	3,780	2,763	10,491	8,357	4,117	12,745	8,439
Jul	7,840	7,971	0	0	0	0	0	0	0	0	7,840	7,971	281	226	8,000	8,000
Aug	10,803	11,280	119	480	1	30	119	480	54	0	10,857	11,280	(2,619)	(2,915)	4,000	4,000
Sep	11,280	11,280	3,684	3,708	193	238	3,313	3,591	0	0	11,280	11,280	(3,040)	(3,219)	6,506	6,351
1987																
Oct	10,983	11,280	1,996	1,781	218	238	767	53	297	0	11,280	11,280	(1,272)	(478)	6,299	7,215
Nov	9,932	10,601	0	0	137	196	0	0	1,348	679	11,280	11,280	(4,744)	(4,939)	4,500	4,622
Dec	10,820	11,334	184	0	135	184	184	0	206	177	11,026	11,511	(4,736)	(4,891)	5,074	5,071
Jan	9,750	10,409	318	0	71	108	318	0	1,340	1,233	11,091	11,642	(3,751)	(4,703)	6,895	5,678
Feb	7,736	9,084	575	0	2	0	575	0	1,792	1,909	9,527	10,992	83	(2,619)	15,309	11,630
Mar	7,957	9,229	530	0	0	0	530	0	526	0	8,484	9,229	1,386	(617)	19,970	17,357
Apr	3,817	3,089	0	0	0	0	0	0	0	0	3,817	3,089	908	1,737	9,362	10,317
May	1,577	2,334	0	0	0	0	0	0	0	0	1,577	2,334	1,846	909	8,509	7,580
Jun	1,583	2,000	0	0	0	0	0	0	0	0	1,583	2,000	3,677	3,194	6,921	6,382
Jul	7,614	7,760	0	0	0	0	0	0	0	0	7,614	7,760	(1,448)	(1,506)	5,000	5,000
Aug	8,972	9,805	0	0	0	0	0	0	0	0	8,972	9,805	(2,640)	(2,934)	3,500	3,500
Sep	7,661	8,378	0	0	0	0	0	0	0	0	7,661	8,378	(1,602)	(1,847)	3,000	3,000
1988																
Oct	5,487	5,647	0	0	0	0	0	0	0	0	5,487	5,647	(184)	126	4,018	4,000
Nov	4,598	4,443	0	0	0	0	0	0	0	0	4,598	4,443	(793)	(1,153)	4,988	4,500
Dec	9,742	11,098	1,359	103	33	6	1,359	103	816	0	10,558	11,098	(5,766)	(6,848)	7,193	5,640
Jan	11,278	11,370	6,510	7,375	238	238	3,402	3,783	48	0	11,326	11,370	(7,713)	(7,997)	15,217	15,105
Feb	4,194	2,481	0	0	20	6	0	0	3,760	4,000	7,954	6,481	(375)	1,672	8,770	11,400
Mar	1,955	4,867	0	0	0	0	0	0	317	52	2,272	4,919	2,571	(367)	10,915	8,046
Apr	4,081	4,783	0	0	0	0	0	0	0	0	4,081	4,783	2,028	26	15,833	13,170
May	3,676	3,678	0	0	0	0	0	0	0	0	3,676	3,678	(348)	(563)	7,201	7,116
Jun	2,281	4,396	0	0	0	0	0	0	0	0	2,281	4,396	2,984	846	6,676	4,472
Jul	7,749	7,879	0	0	0	0	0	0	0	0	7,749	7,879	(2,131)	(2,154)	3,968	4,000
Aug	8,070	8,417	0	0	0	0	0	0	0	0	8,070	8,417	(2,348)	(2,130)	3,000	3,500
Sep	7,312	8,048	0	0	0	0	0	0	0	0	7,312	8,048	(1,540)	(1,795)	3,000	3,000

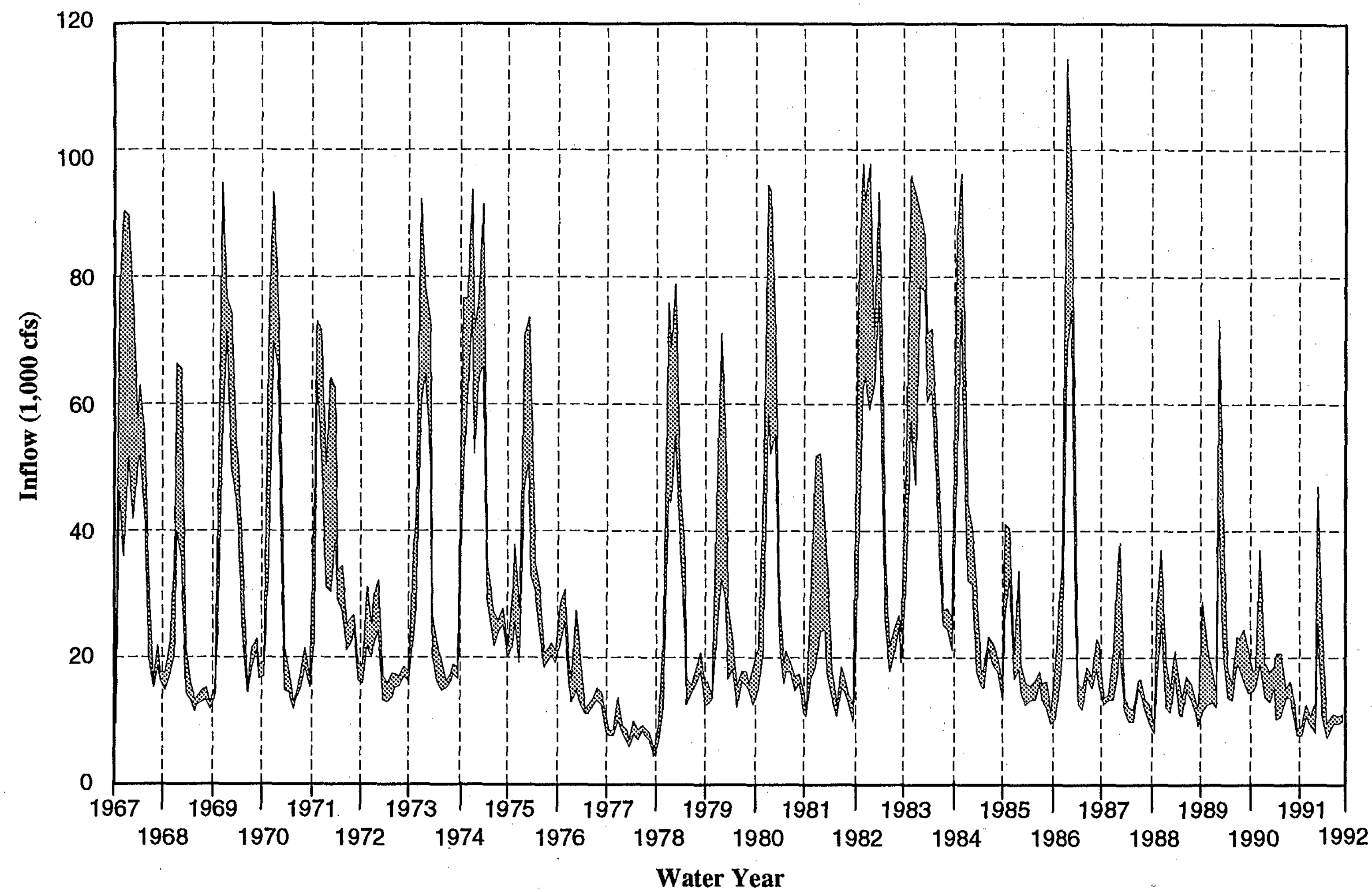
C-061444

Table A4–2. Continued

Water Year	DailySOS CVP & SWP Export (cfs)	DeltaSOS CVP & SWP Export (cfs)	DailySOS Available Flow (cfs)	DeltaSOS Available Flow (cfs)	DailySOS Delta Storage (TAF)	DeltaSOS Delta Storage (TAF)	DailySOS Delta Storage Diversion (cfs)	DeltaSOS Delta Storage Diversion (cfs)	DailySOS Delta Storage Export (cfs)	DeltaSOS Delta Storage Export (cfs)	DailySOS Final Total Export (cfs)	DeltaSOS Final Total Export (cfs)	DailySOS Final QWEST Flow (cfs)	DeltaSOS Final QWEST Flow (cfs)	DailySOS Final Delta Outflow (cfs)	DeltaSOS Final Delta Outflow (cfs)
1989																
Oct	5,628	5,961	0	0	0	0	0	0	0	0	5,628	5,961	(727)	(593)	3,023	3,000
Nov	6,454	8,294	712	0	36	0	712	0	105	0	6,559	8,294	(3,235)	(4,895)	5,418	3,578
Dec	7,758	9,042	300	0	13	0	300	0	666	0	8,424	9,042	(3,552)	(5,332)	6,216	4,082
Jan	7,463	9,270	70	0	0	0	70	0	277	0	7,739	9,270	(3,646)	(5,029)	6,174	5,047
Feb	4,792	2,000	0	0	0	0	0	0	0	0	4,792	2,000	41	2,054	9,701	11,367
Mar	10,160	11,225	6,108	5,357	228	238	3,745	3,871	0	0	10,160	11,225	(2,242)	(4,655)	35,256	32,359
Apr	6,379	5,856	381	0	188	(0)	176	0	773	3,924	7,152	9,780	(1,201)	(543)	15,605	16,304
May	3,973	4,490	0	0	56	0	0	0	2,045	0	6,019	4,490	(360)	(999)	9,632	8,988
Jun	1,756	4,994	0	0	0	0	0	0	904	0	2,661	4,994	4,223	790	9,673	6,120
Jul	9,710	10,838	976	0	57	0	976	0	0	0	9,710	10,838	(4,106)	(4,159)	5,000	5,000
Aug	10,554	11,280	1,547	1,524	100	94	1,547	1,524	726	0	11,280	11,280	(5,343)	(5,489)	3,649	3,793
Sep	10,480	11,280	948	428	116	114	948	428	590	0	11,069	11,280	(3,003)	(3,477)	5,686	5,083
1990																
Oct	9,253	10,290	415	0	36	50	415	0	1,670	990	10,923	11,280	(1,649)	(2,658)	5,599	4,326
Nov	9,951	10,016	164	0	8	0	164	0	625	813	10,576	10,829	(5,913)	(6,138)	5,601	4,500
Dec	9,946	11,034	251	0	3	0	251	0	327	0	10,273	11,034	(7,002)	(7,099)	4,500	4,845
Jan	10,396	11,277	2,693	1,550	91	95	2,171	1,550	720	0	11,115	11,277	(7,511)	(7,696)	7,845	7,294
Feb	6,510	5,910	0	0	0	(0)	0	0	1,619	1,685	8,129	7,595	(750)	(868)	10,734	11,400
Mar	4,579	5,136	0	0	0	0	0	0	0	0	4,579	5,136	40	(744)	9,806	8,664
Apr	3,393	4,549	0	0	0	0	0	0	0	0	3,393	4,549	465	(845)	12,164	11,205
May	3,040	3,592	0	0	0	0	0	0	0	0	3,040	3,592	484	(401)	8,032	7,082
Jun	2,525	4,089	0	0	0	0	0	0	0	0	2,525	4,089	2,074	468	5,820	4,000
Jul	6,200	6,357	0	0	0	0	0	0	0	0	6,200	6,357	(1,296)	(1,343)	4,000	4,000
Aug	8,119	7,986	0	0	0	0	0	0	0	0	8,119	7,986	(2,710)	(2,195)	3,000	3,500
Sep	5,311	6,367	0	0	0	0	0	0	0	0	5,311	6,367	(694)	(1,056)	3,000	3,000
1991																
Oct	3,852	4,380	0	0	0	0	0	0	0	0	3,852	4,380	174	149	3,000	3,000
Nov	4,325	4,512	0	0	0	0	0	0	0	0	4,325	4,512	(1,284)	(1,730)	3,929	3,500
Dec	6,755	7,325	0	0	0	0	0	0	0	0	6,755	7,325	(3,415)	(4,448)	4,706	3,500
Jan	4,294	5,229	0	0	0	0	0	0	0	0	4,294	5,229	(1,723)	(2,127)	4,500	4,500
Feb	2,606	2,000	0	0	0	0	0	0	0	0	2,606	2,000	2,397	722	9,222	6,466
Mar	8,951	10,379	1,434	0	70	0	1,406	0	241	0	9,191	10,379	218	(2,357)	23,995	20,100
Apr	3,614	2,000	0	0	0	0	0	0	1,143	0	4,757	2,000	(165)	1,267	7,623	9,055
May	1,558	2,740	0	0	0	0	0	0	0	0	1,558	2,740	723	(490)	5,055	4,000
Jun	1,335	2,643	0	0	0	0	0	0	0	0	1,335	2,643	2,085	1,215	4,673	4,000
Jul	2,106	2,034	0	0	0	0	0	0	0	0	2,106	2,034	1,130	1,268	3,852	4,000
Aug	3,406	3,762	0	0	0	0	0	0	0	0	3,406	3,762	105	314	3,000	3,500
Sep	4,983	5,712	0	0	0	0	0	0	0	0	4,983	5,712	(546)	(793)	3,000	3,000

Note: Negative values shown in parentheses.

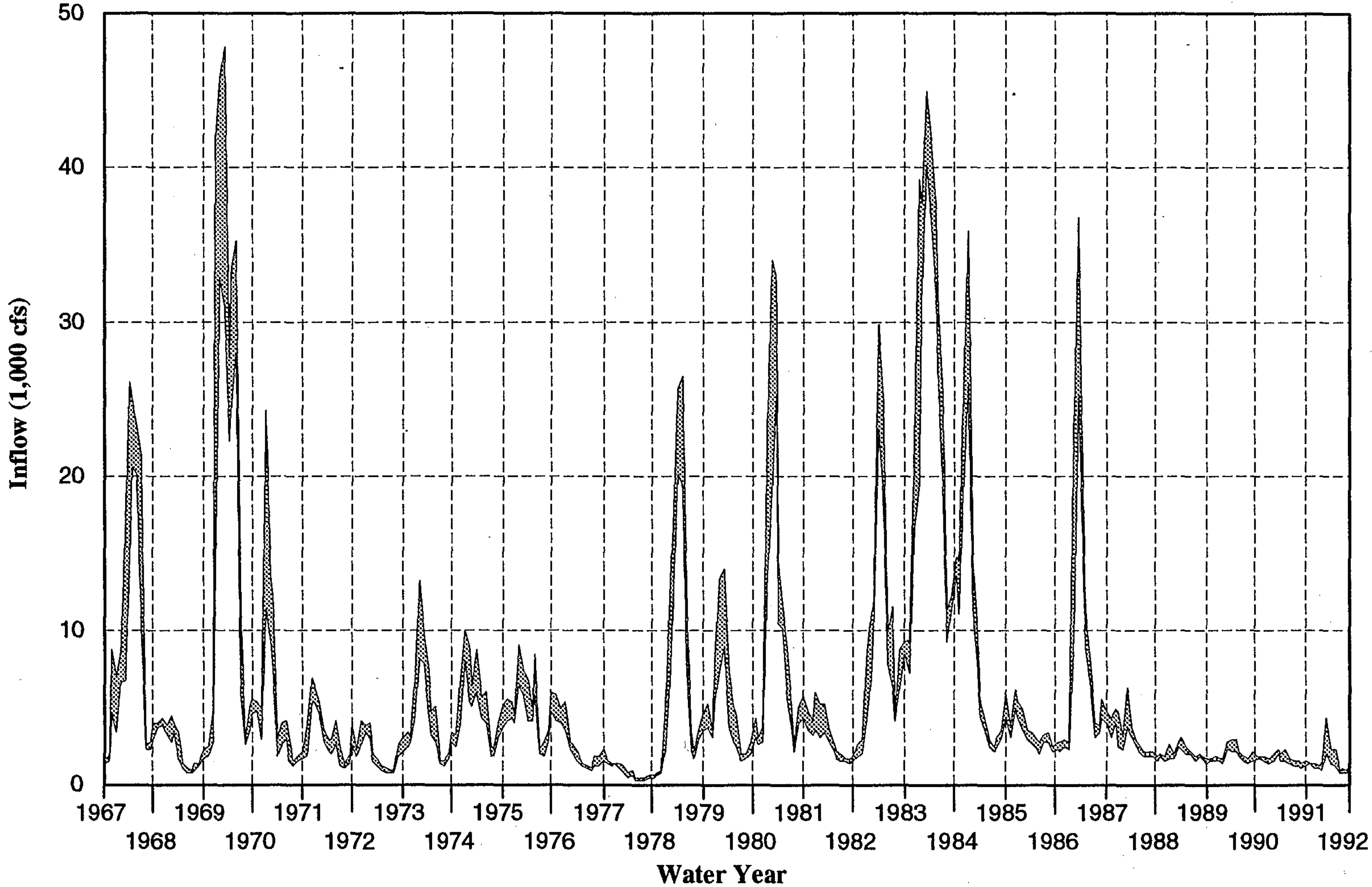
C-061445



Source: DWR Central District DAYFLOW records.

Figure A4-1.
Monthly Range of Daily Sacramento River Flow
at Freeport for 1967-1991

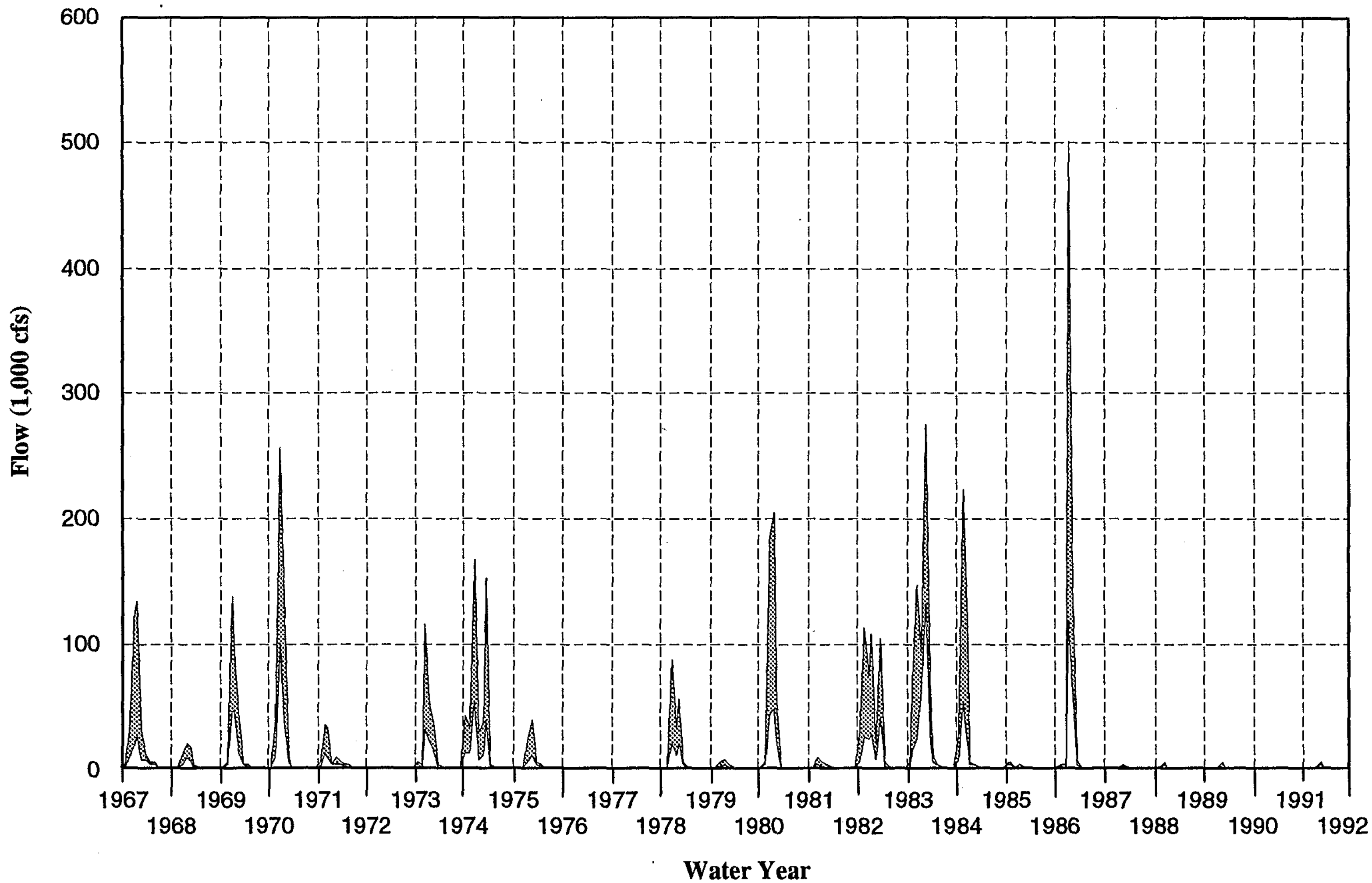
DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



Source: DWR Central District DAYFLOW records.

Figure A4-2.
Monthly Range of Daily San Joaquin River Flow at Vernalis for 1967-1991

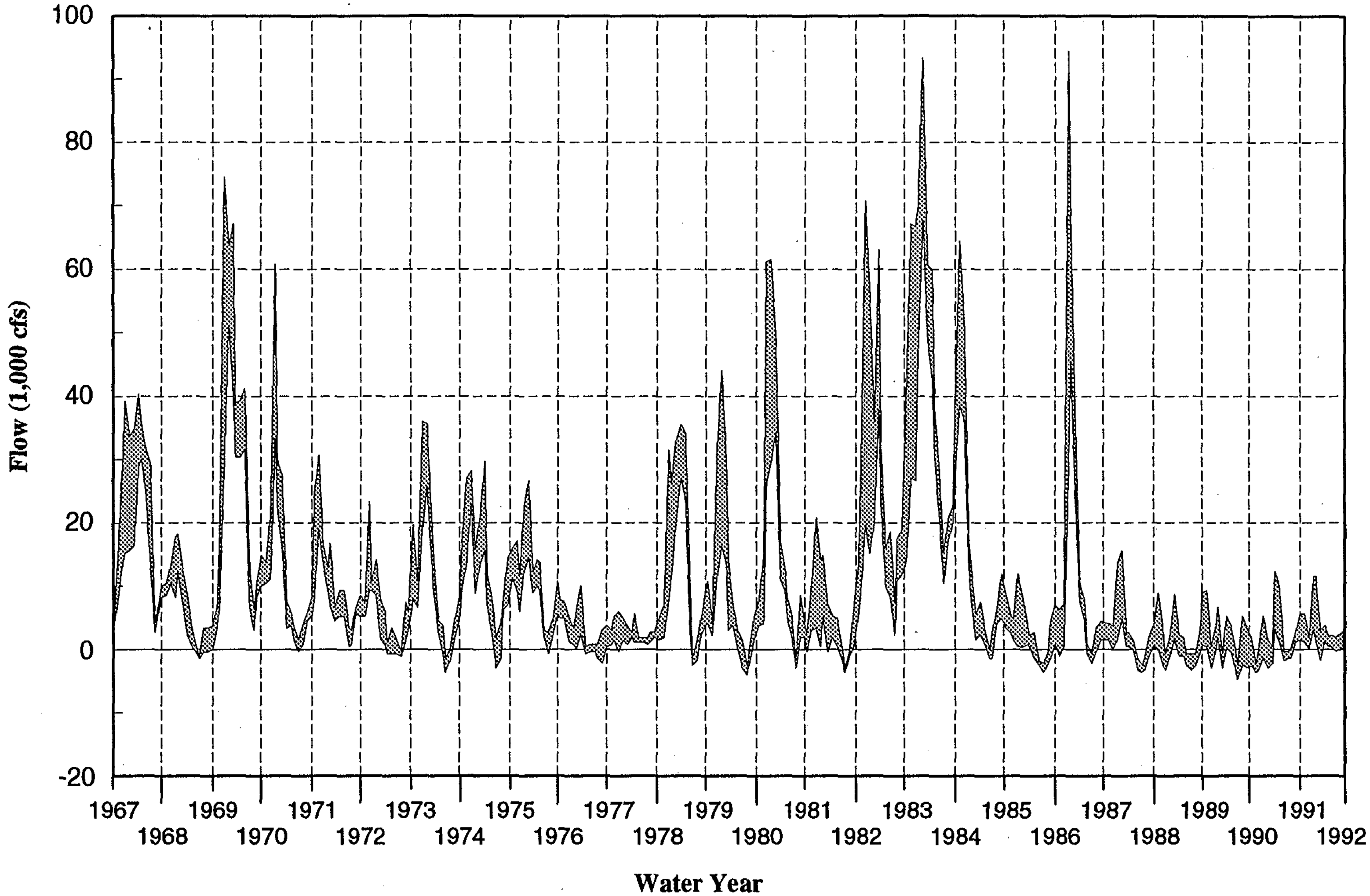
DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



Source: DWR Central District DAYFLOW records.

Figure A4-3.
Monthly Range of Daily Yolo Bypass Flows
for 1967-1991

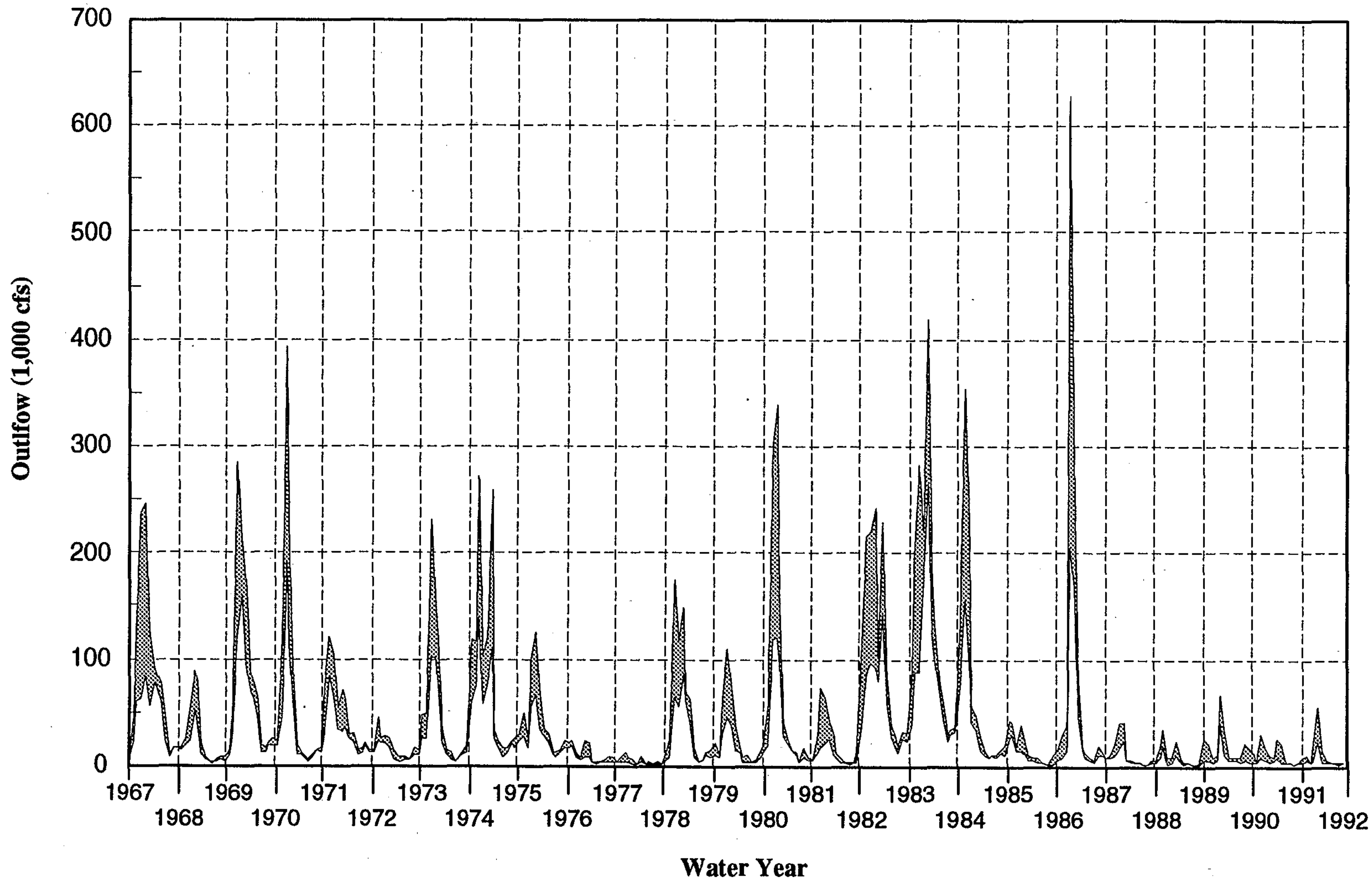
DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



Source: DWR Central District DAYFLOW records.

Figure A4-4.
Monthly Range of Daily QWEST Flows for 1967-1991

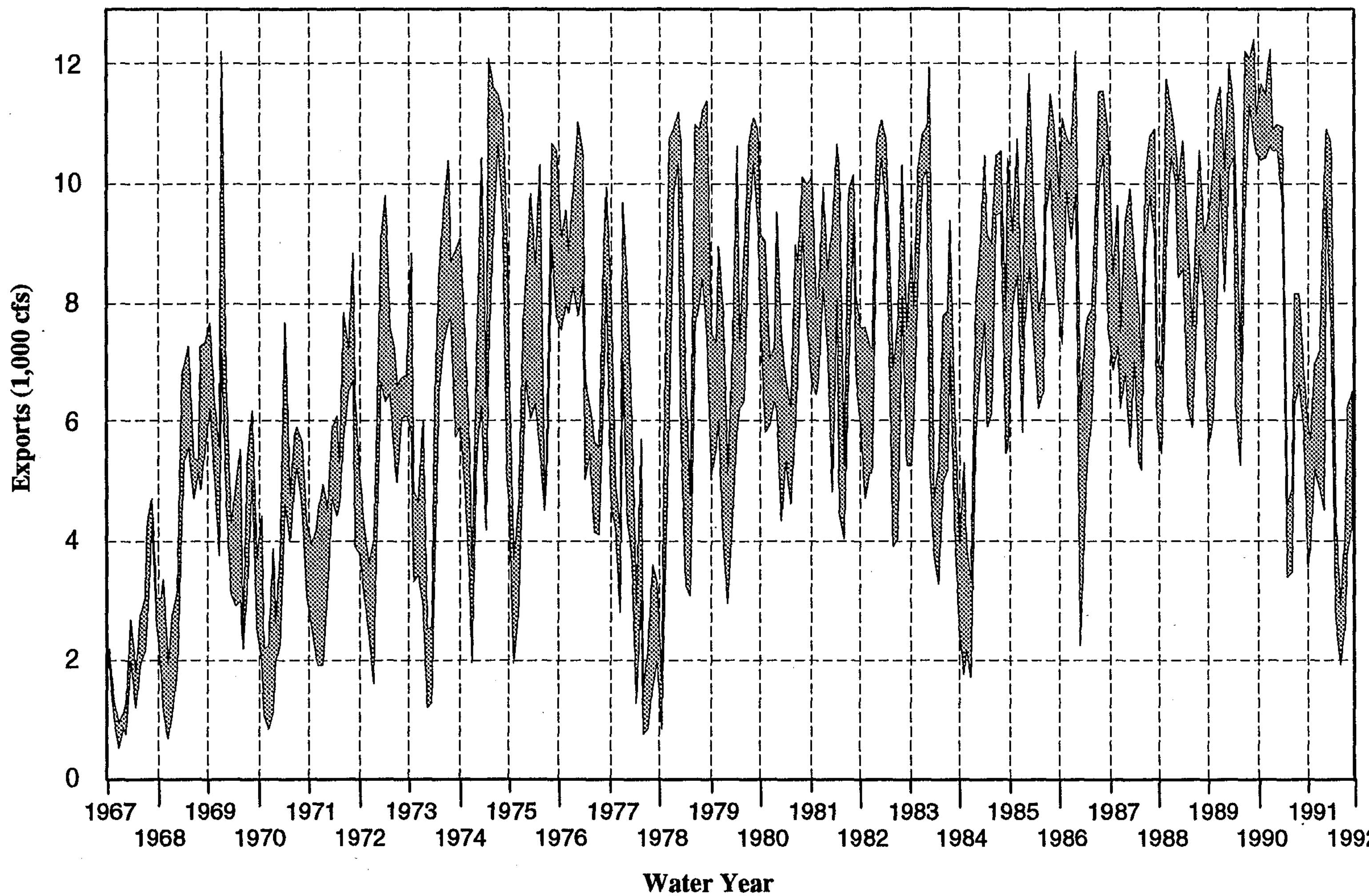
DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



Source: DWR Central District DAYFLOW records.

Figure A4-5.
Monthly Range of Daily Delta Outflow
for 1967-1991

DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates

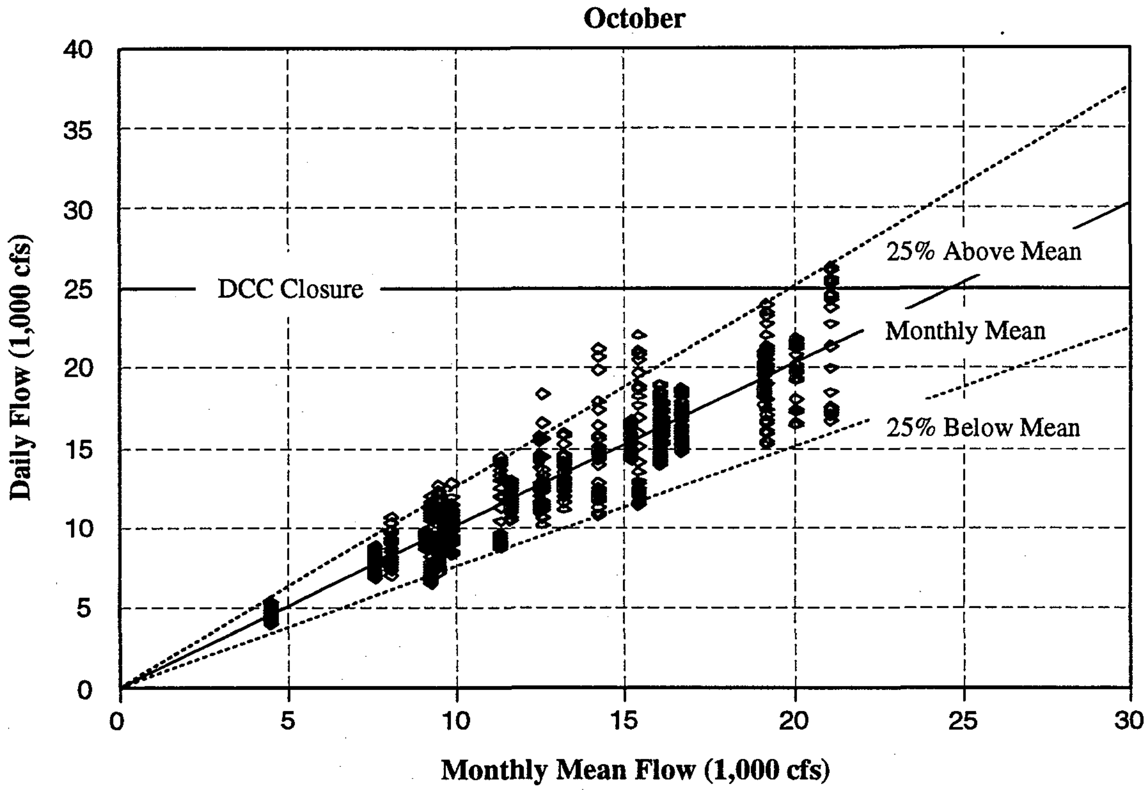


Source: DWR Central District DAYFLOW records.

Figure A4-6.
Monthly Range of Daily Total Delta Exports for 1967-1991

DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates

C-061451



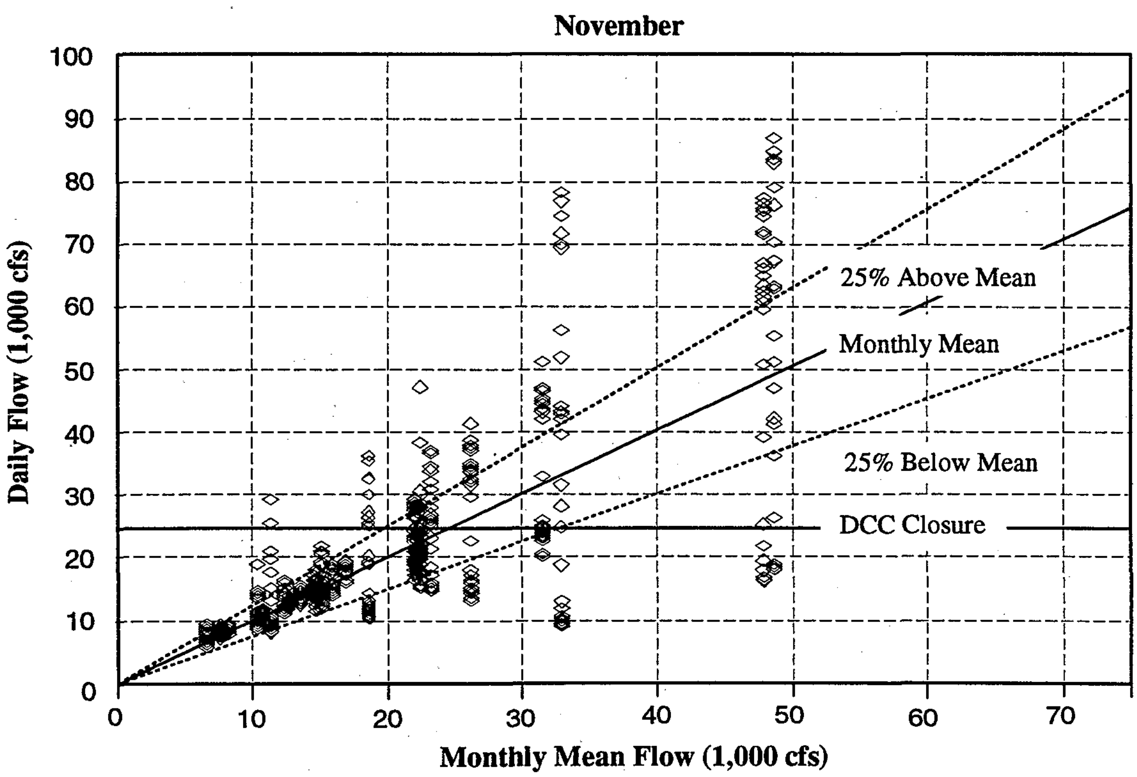
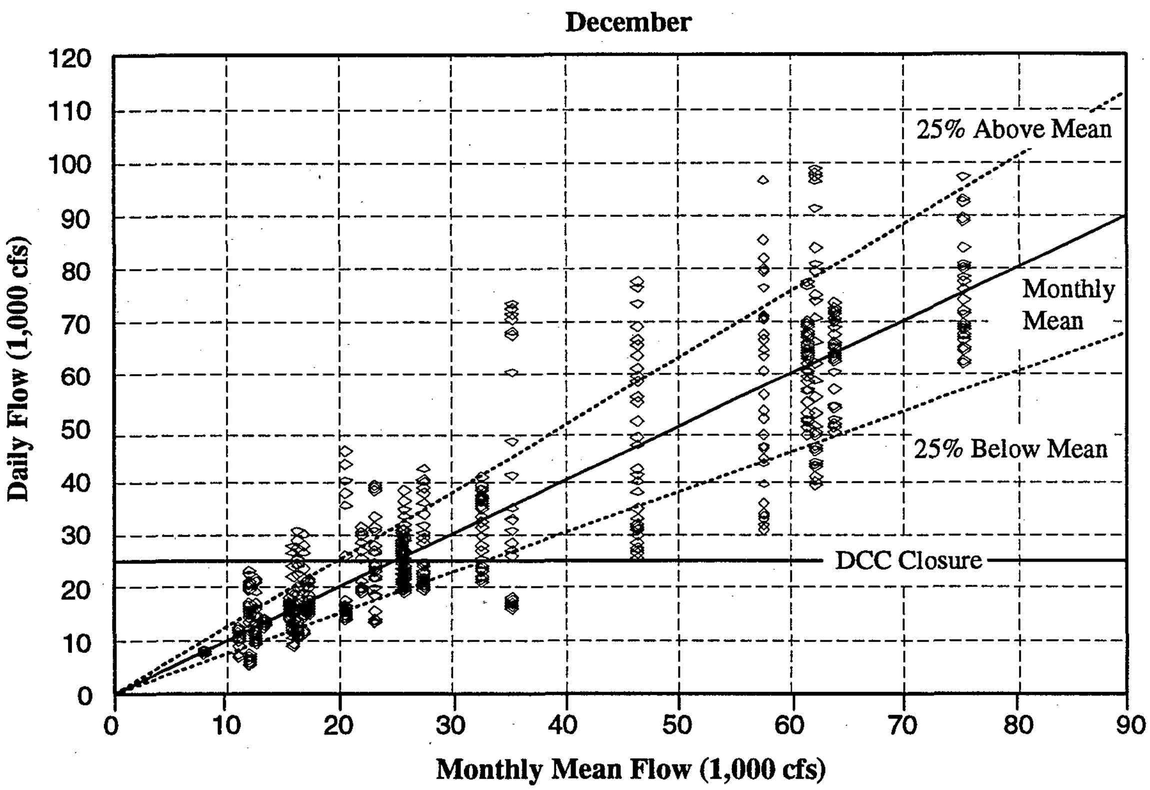


Figure A4-7.
Daily versus Monthly Mean Sacramento River Inflow at Freeport

DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



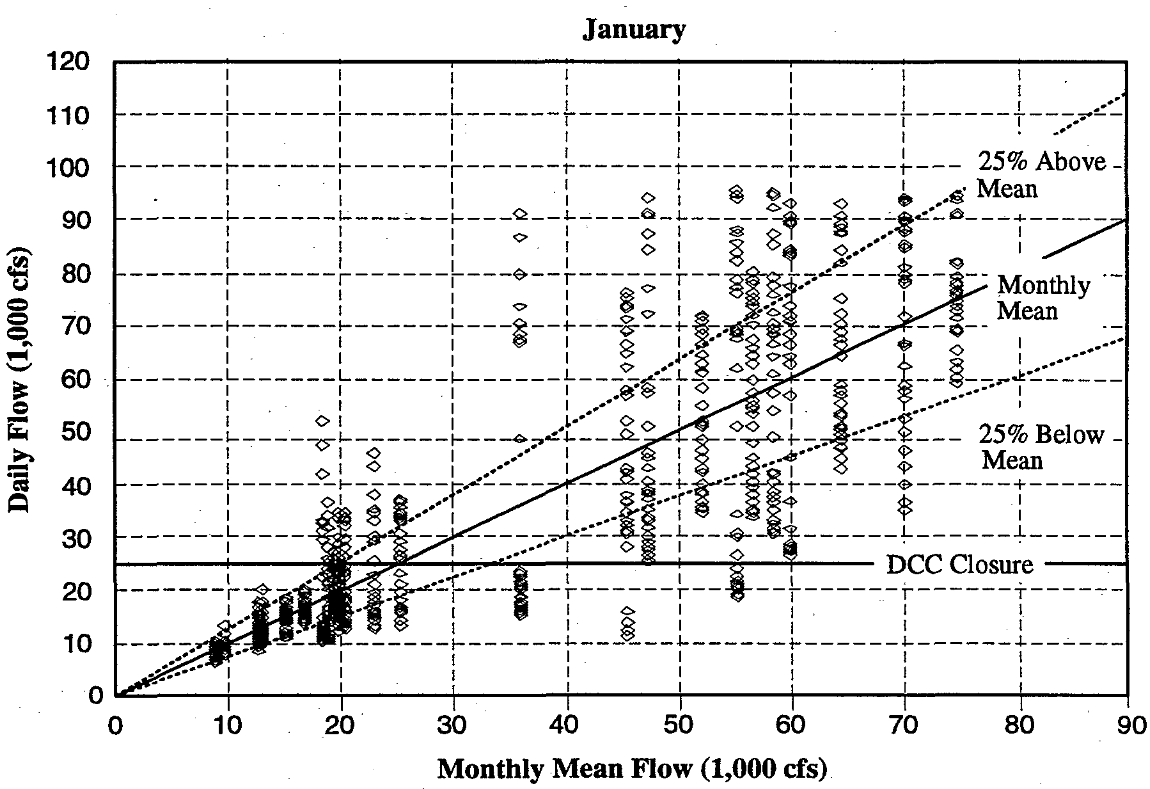


Figure A4-7.
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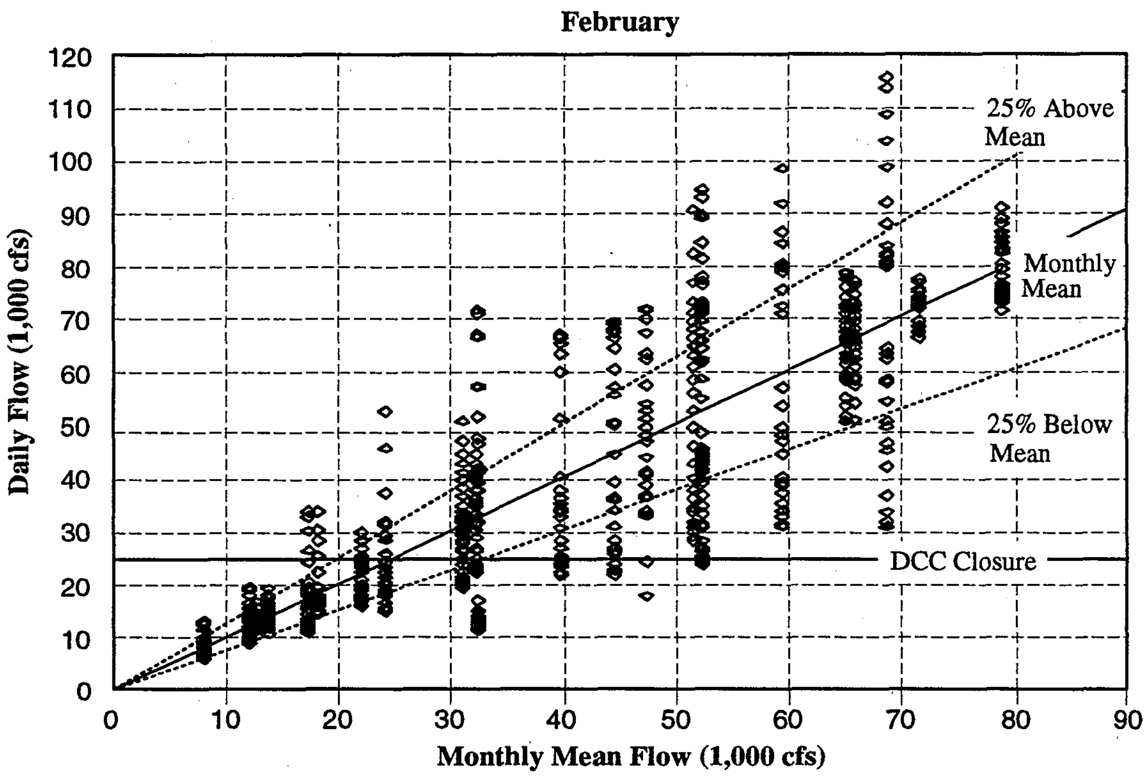
DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



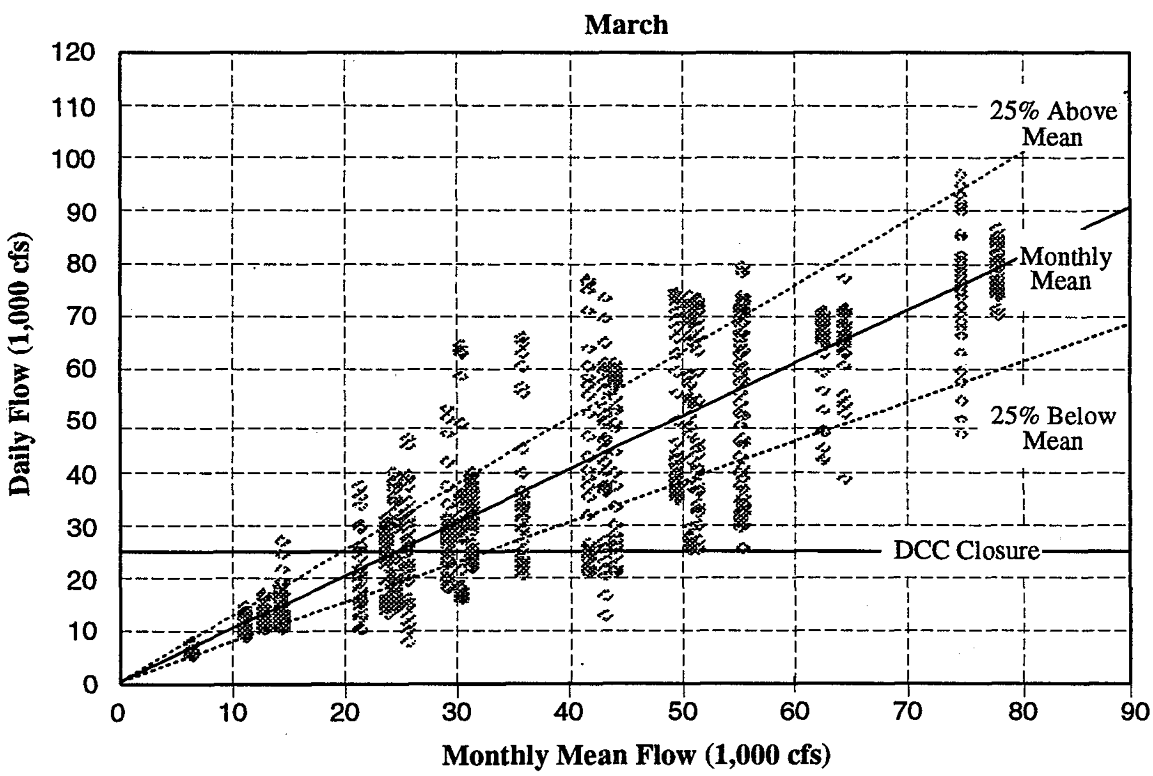


Figure A4-7.
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DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates

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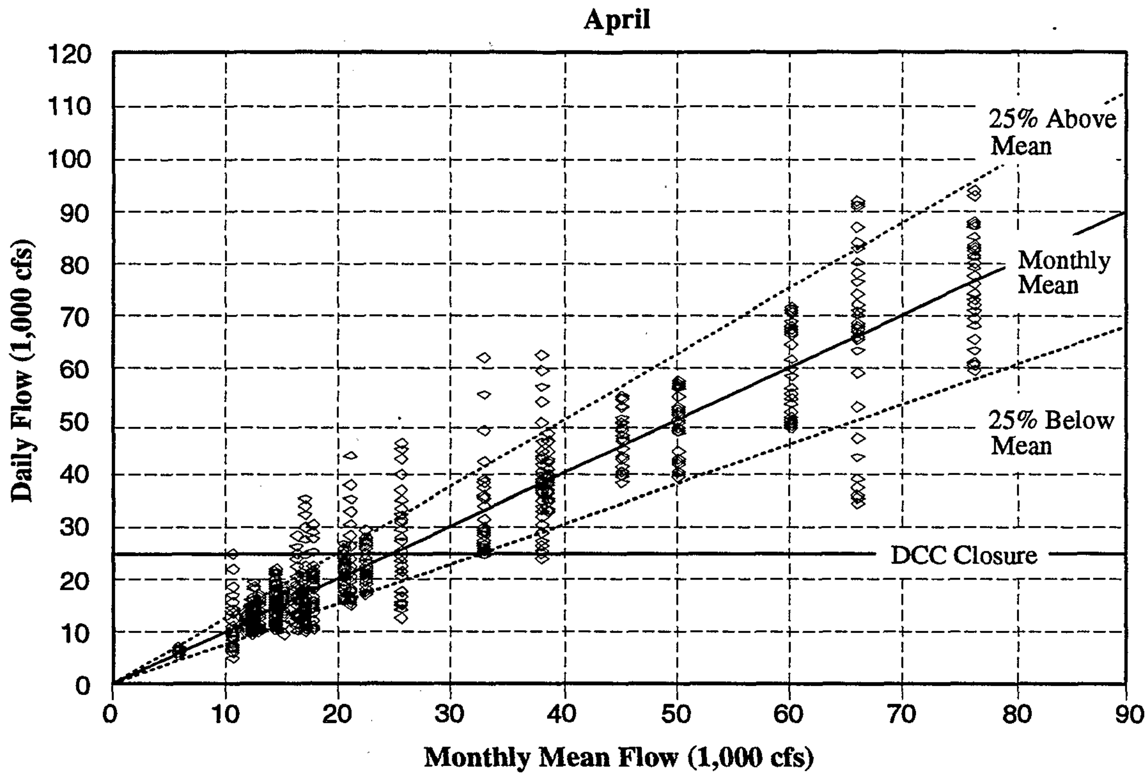

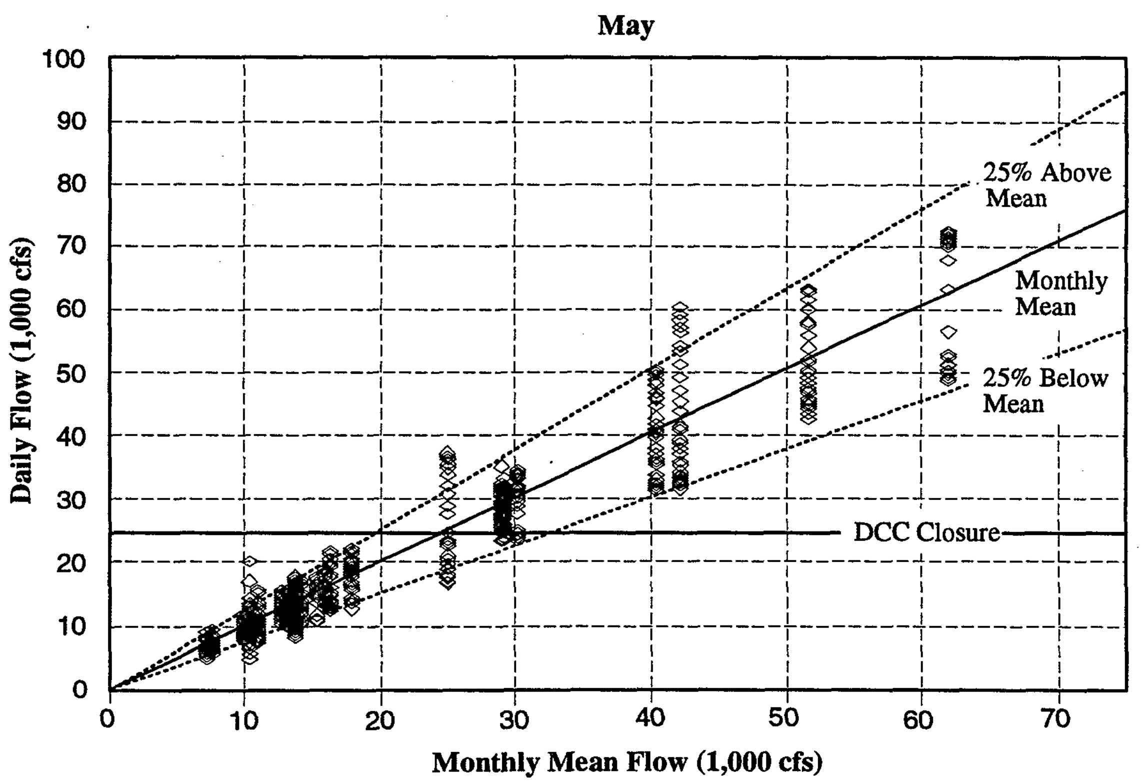

Figure A4-7.
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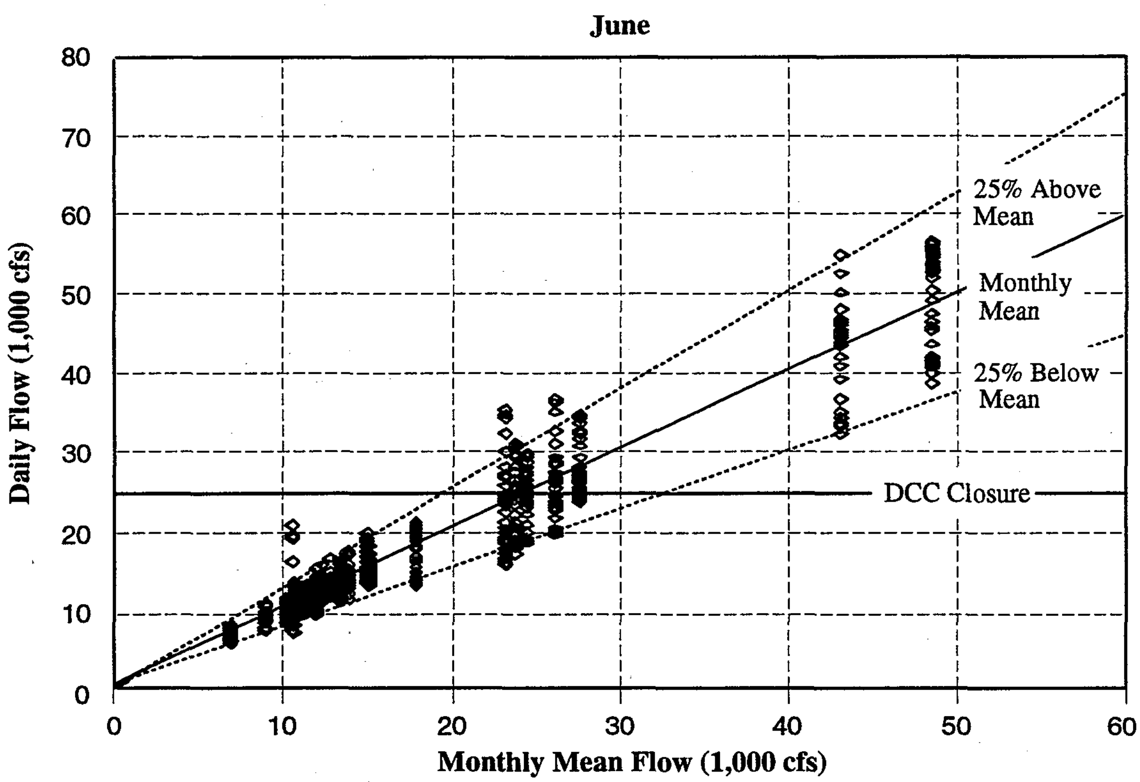
DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



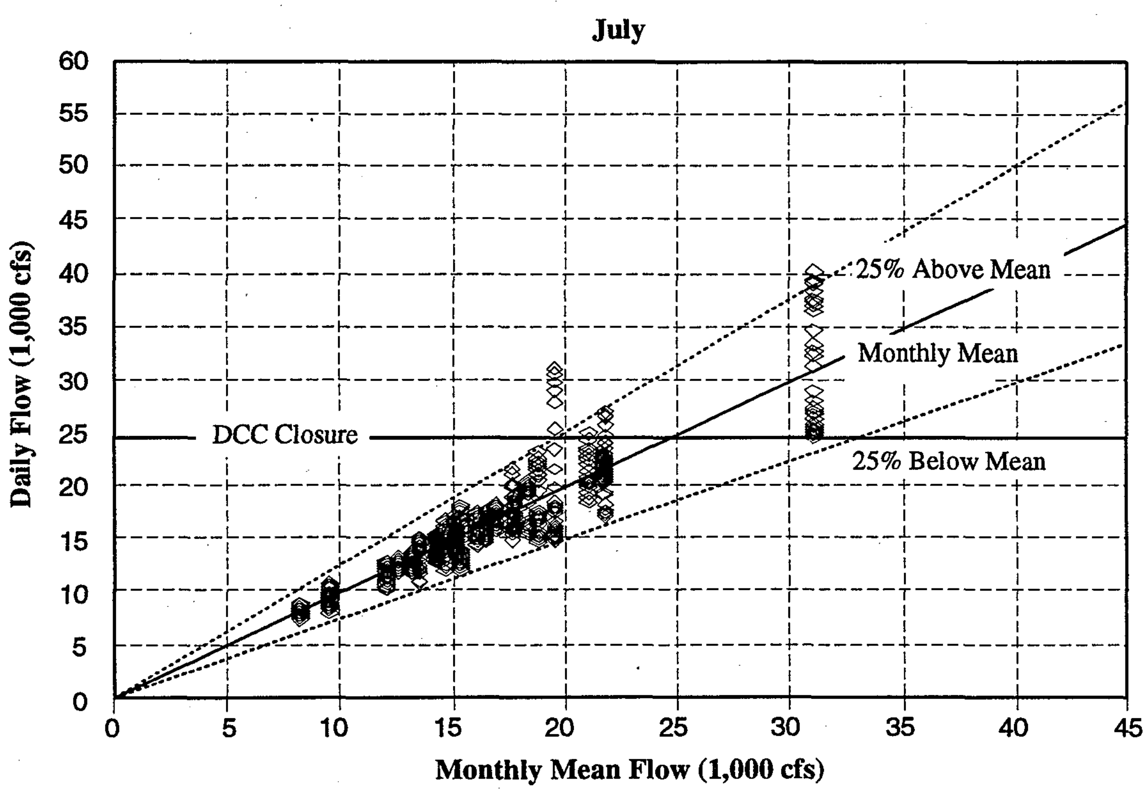


Figure A4-7.
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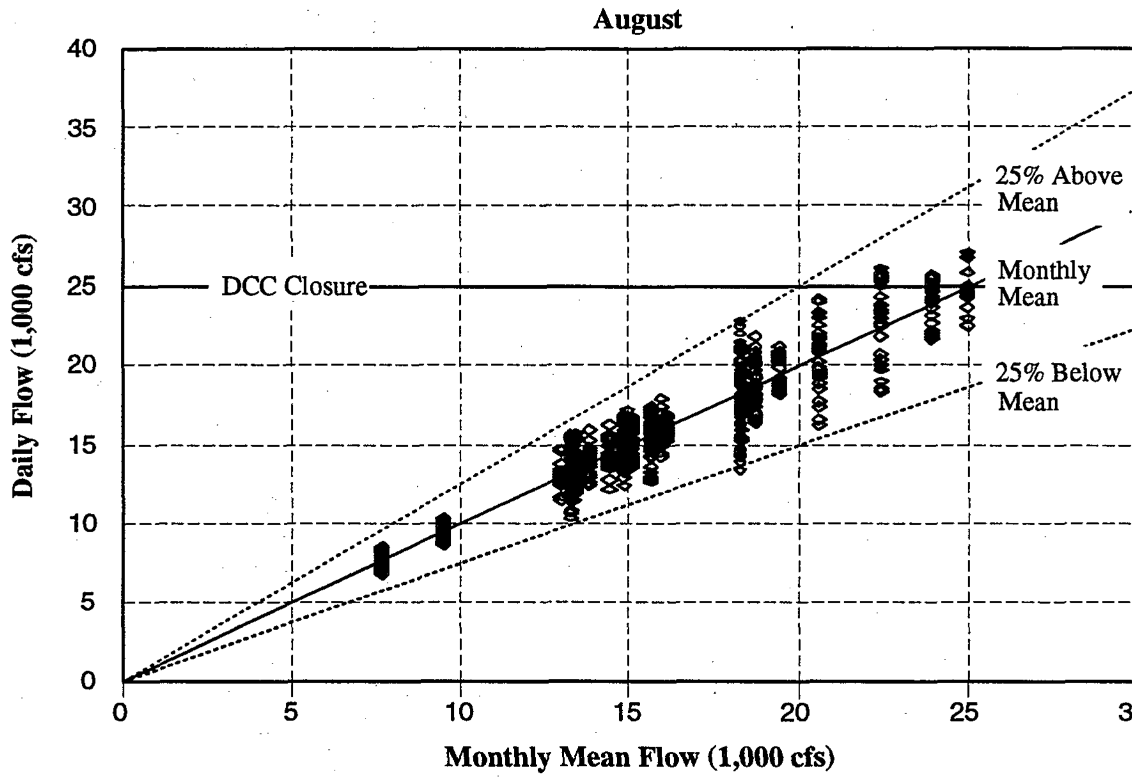
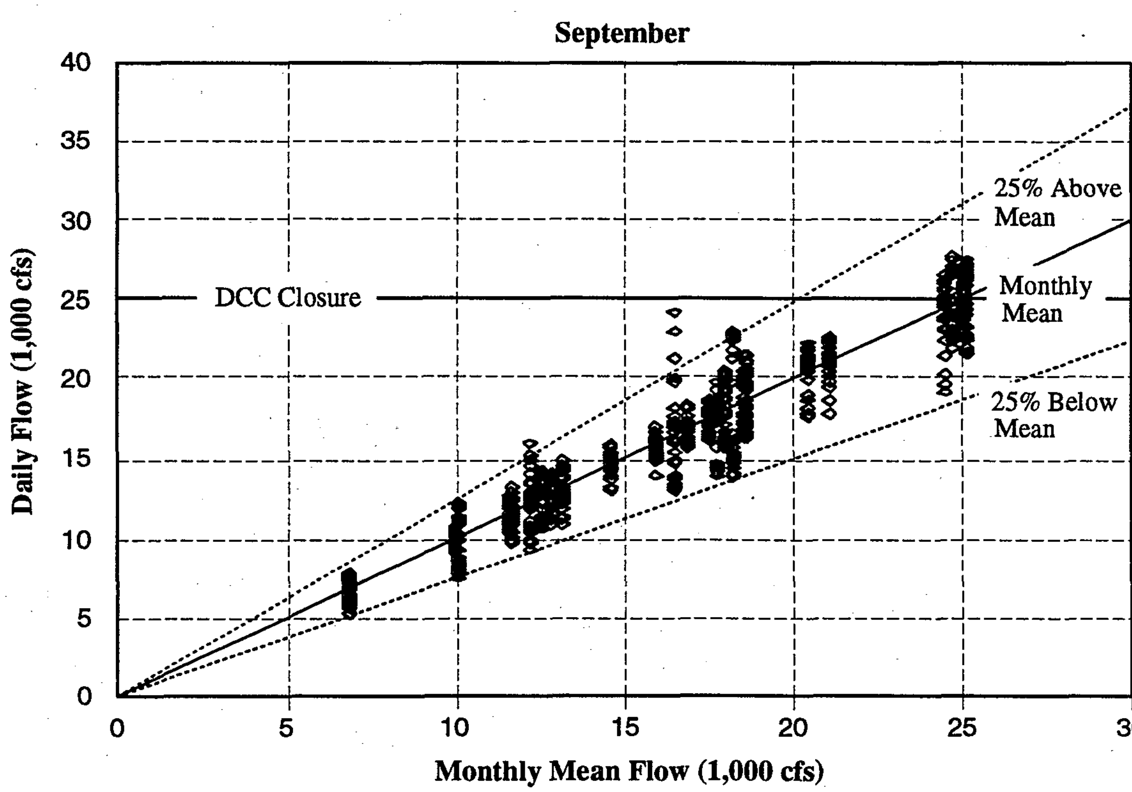
DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates





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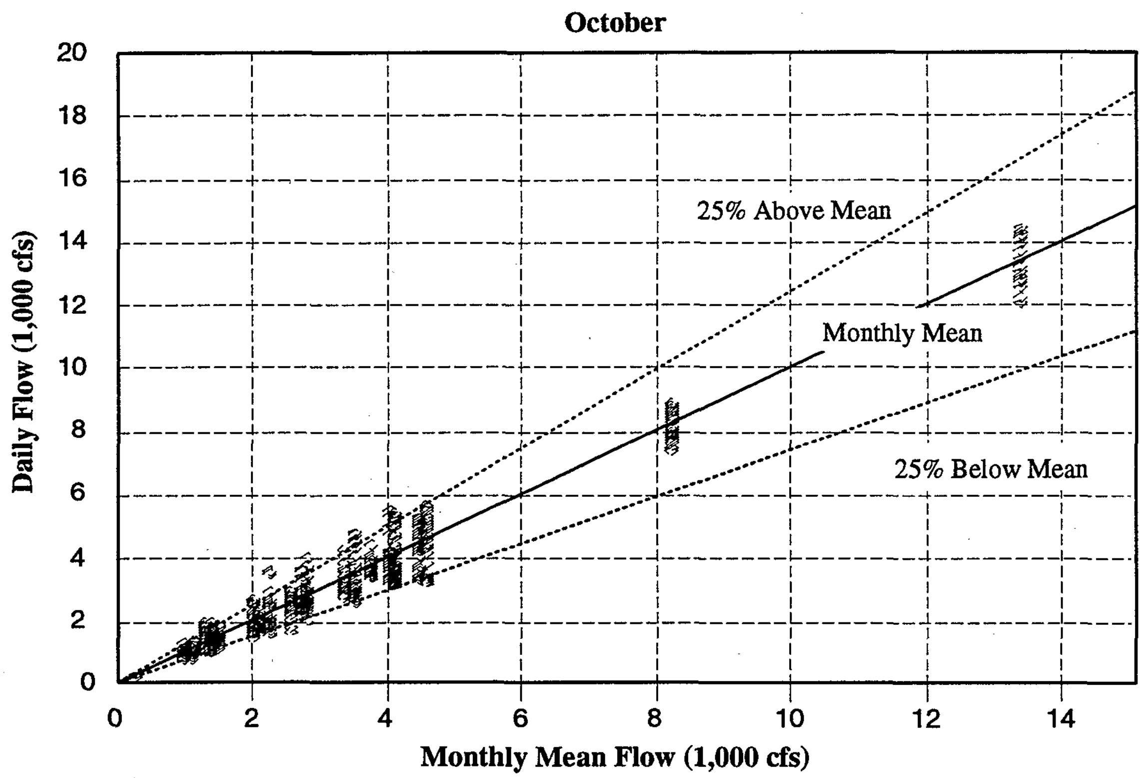


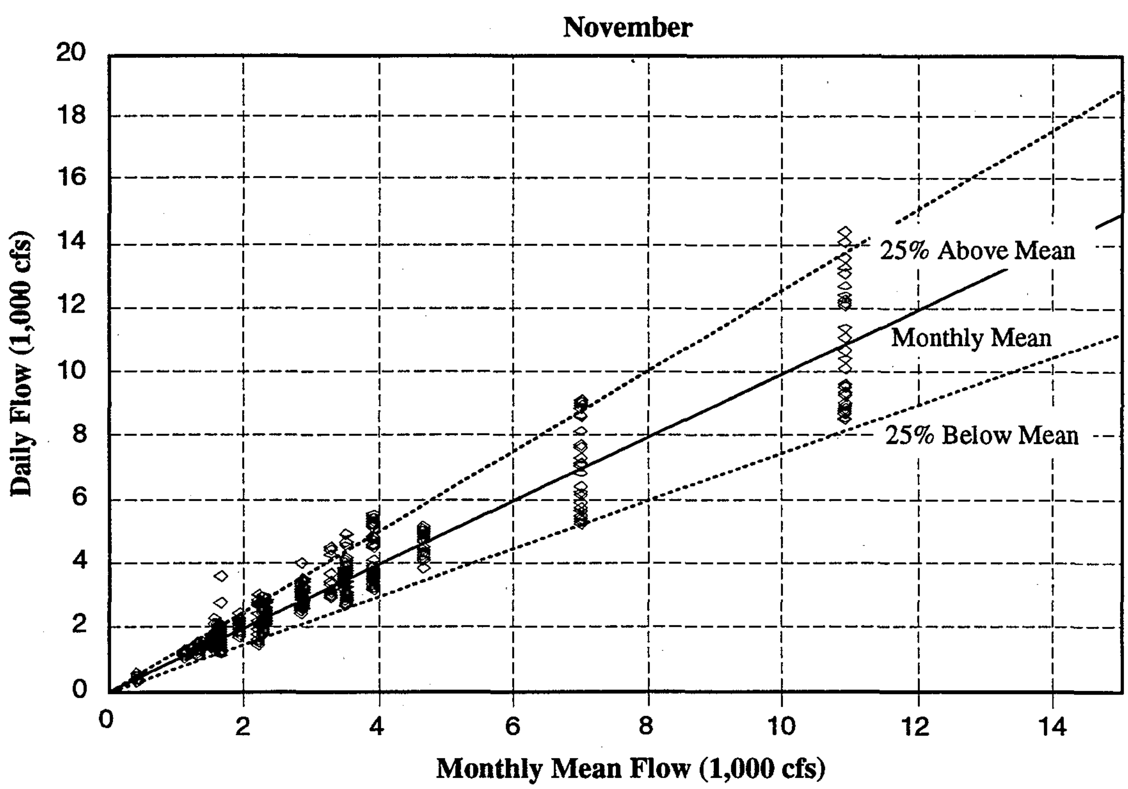
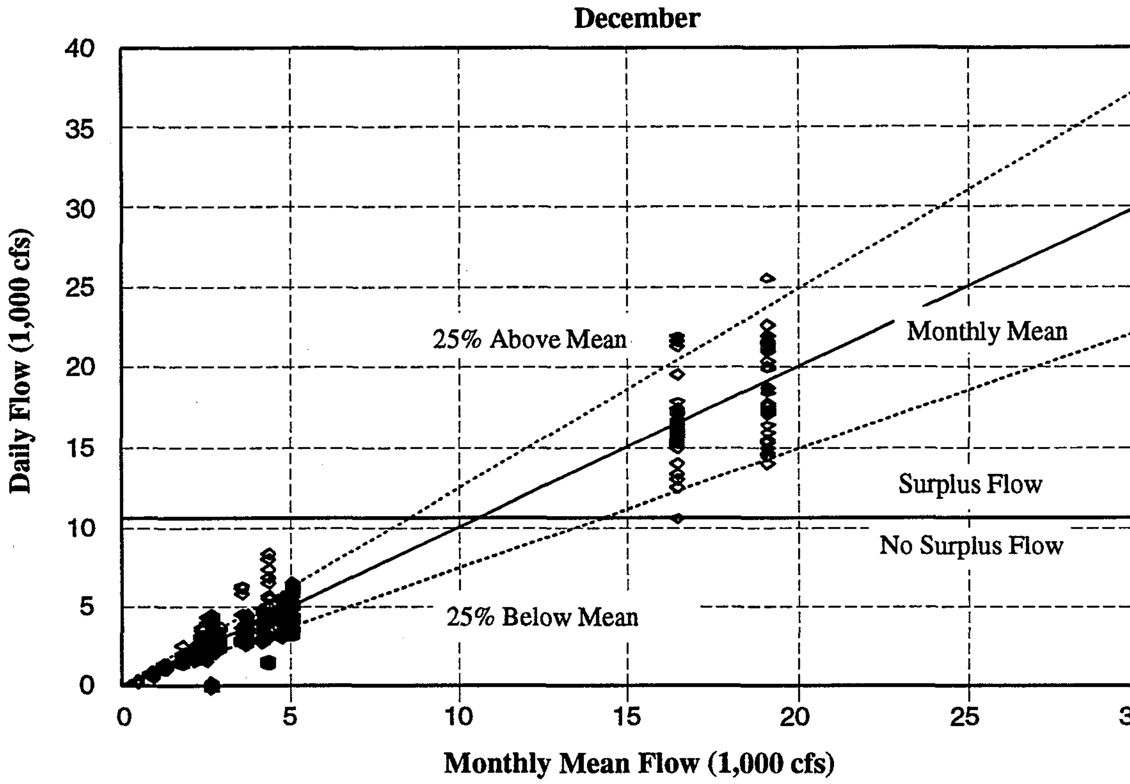


Figure A4-8.
Daily versus Monthly Mean San Joaquin River Inflow at Vernalis

DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



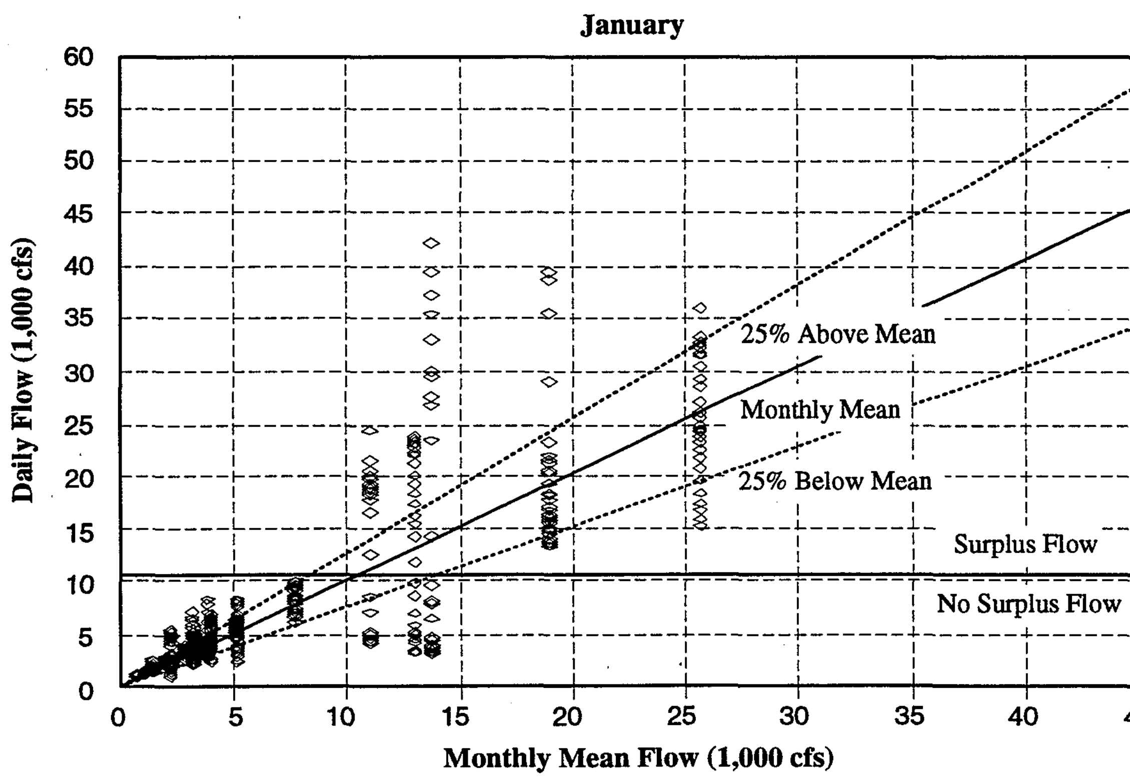


Figure A4-8.
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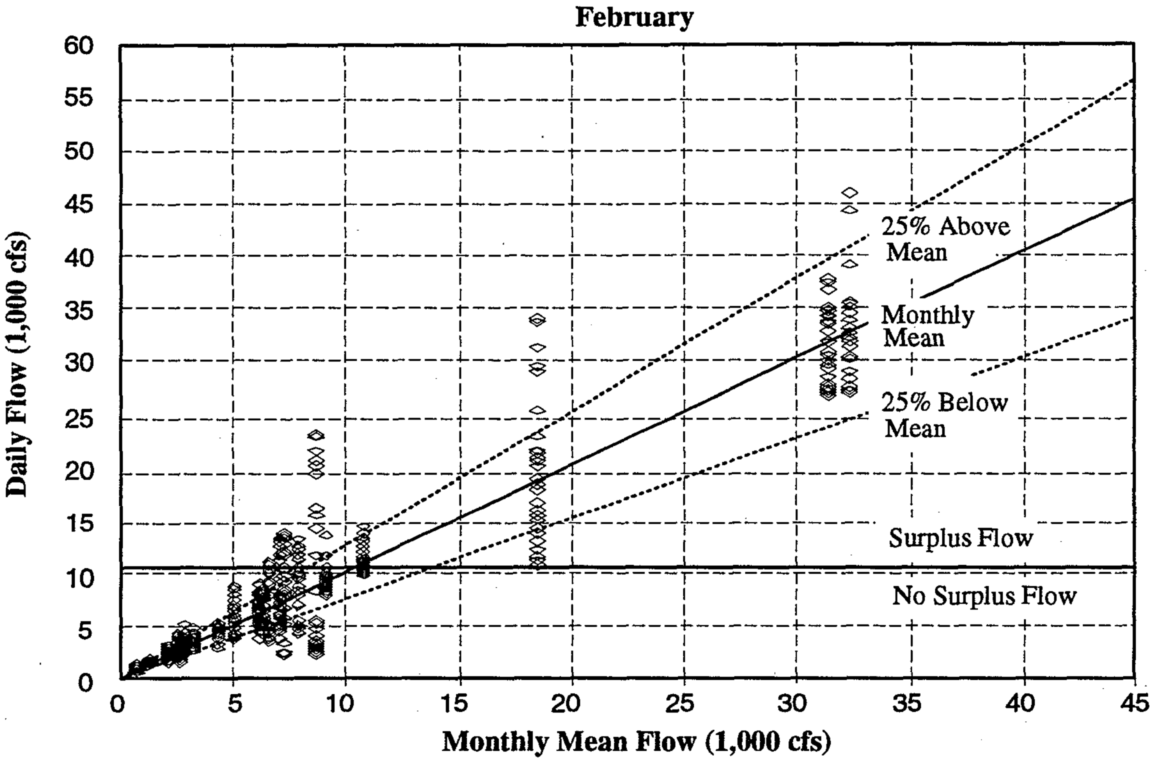
DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



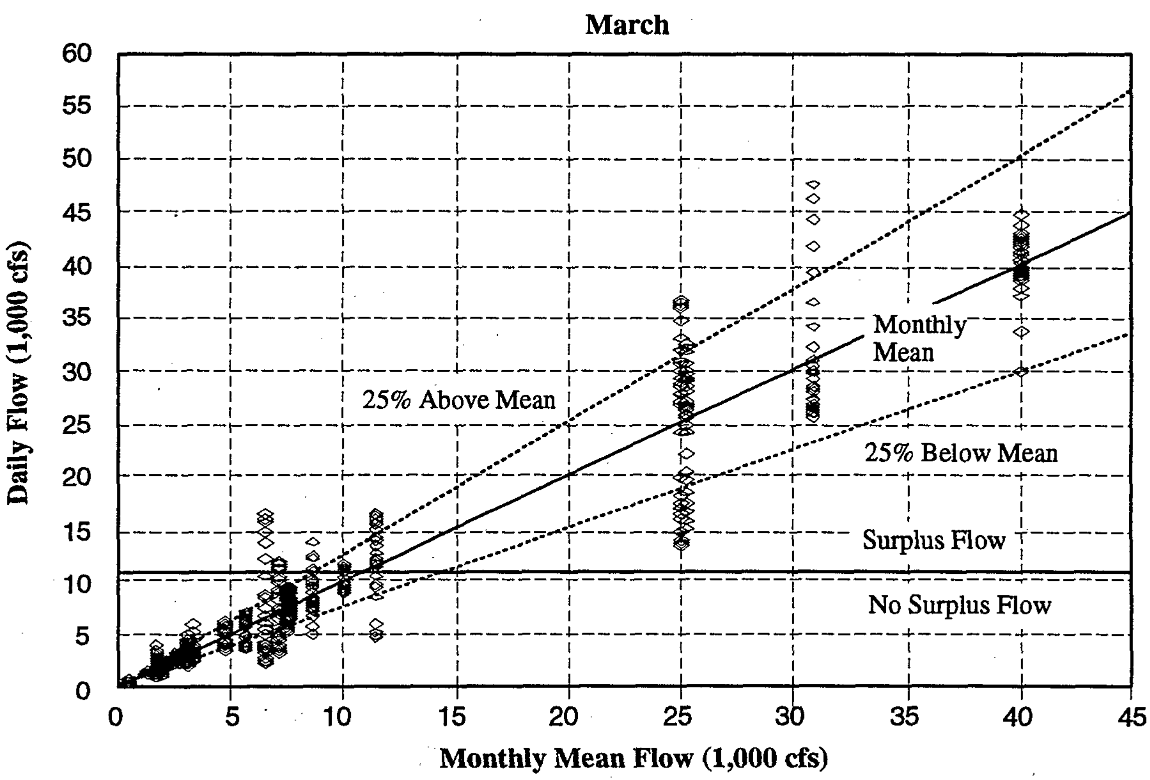


Figure A4-8.
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DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates

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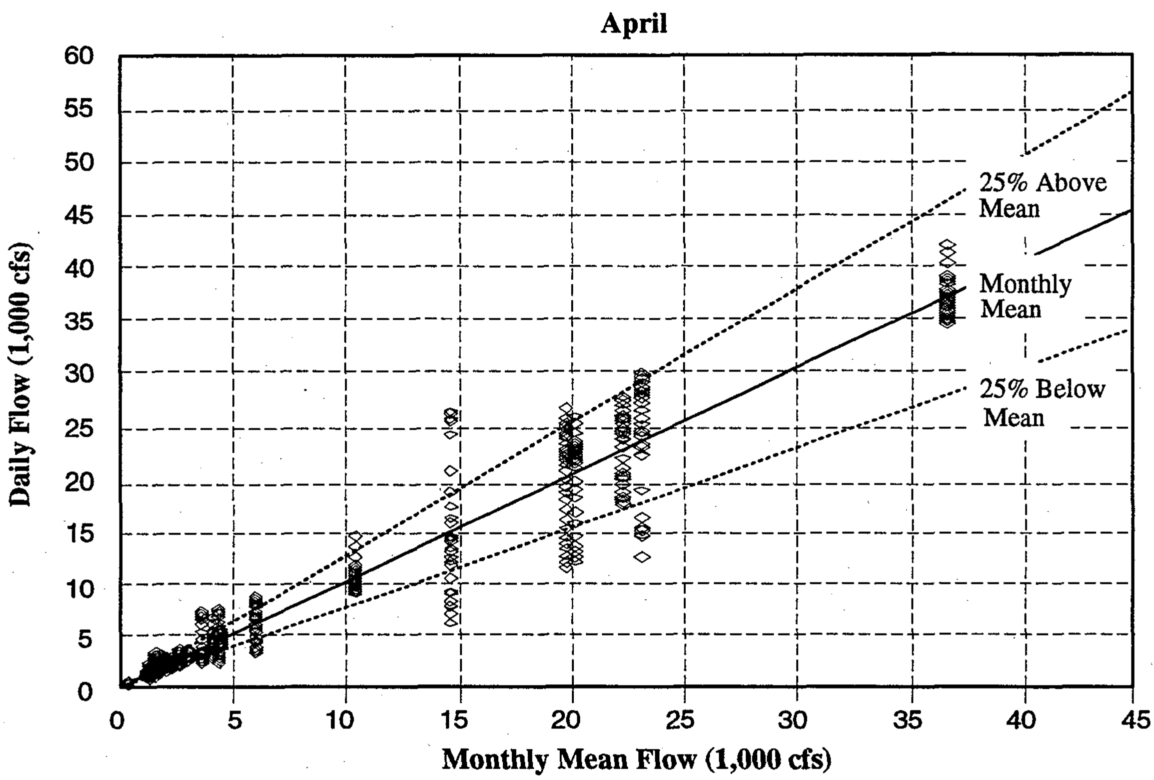

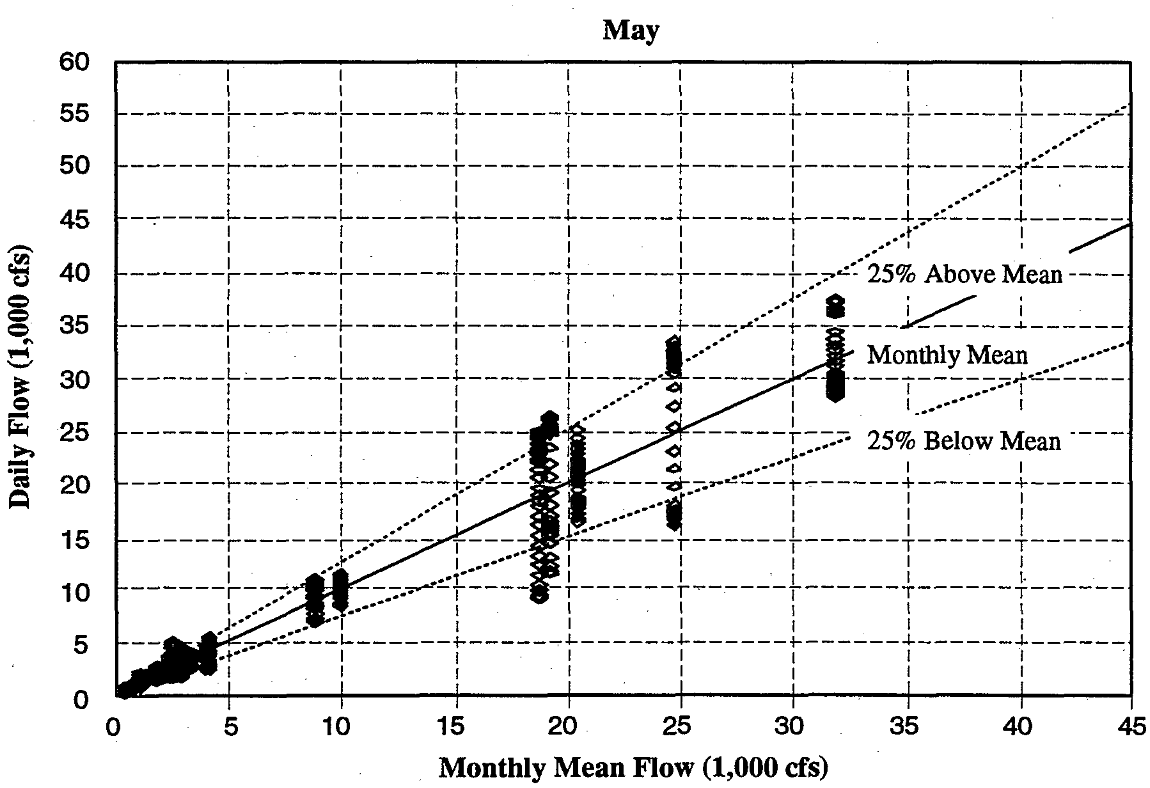

Figure A4-8.
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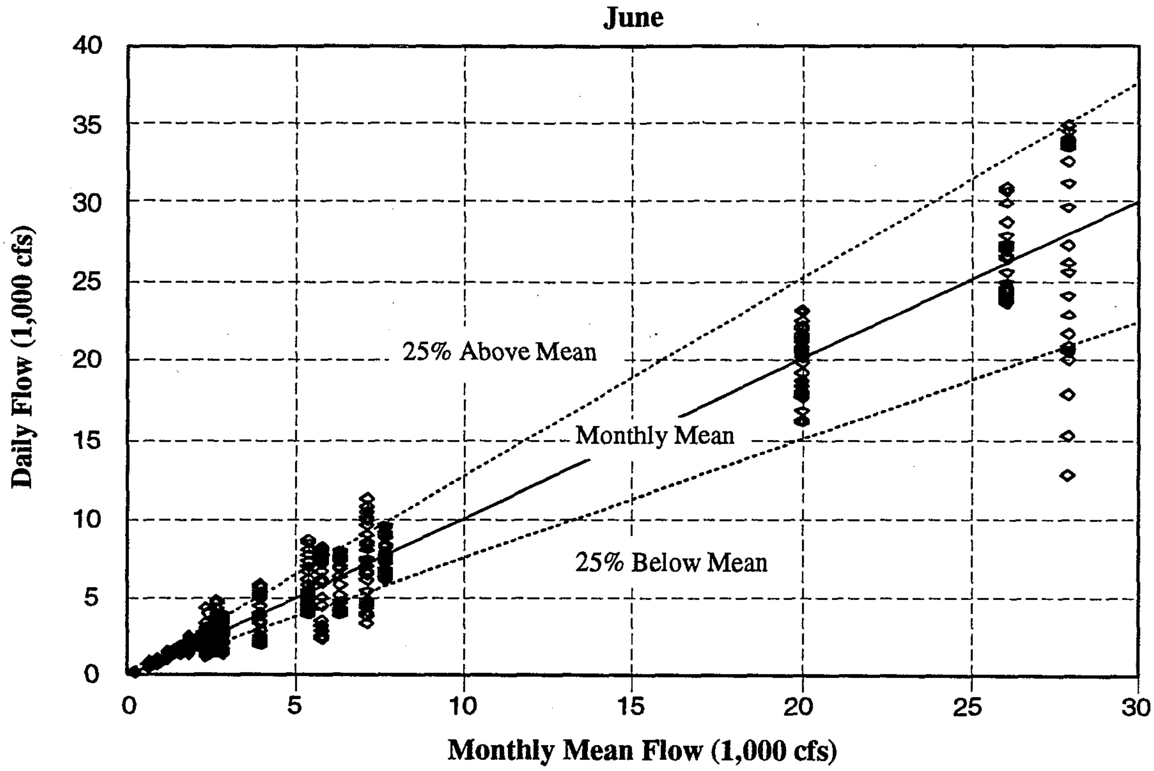
DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



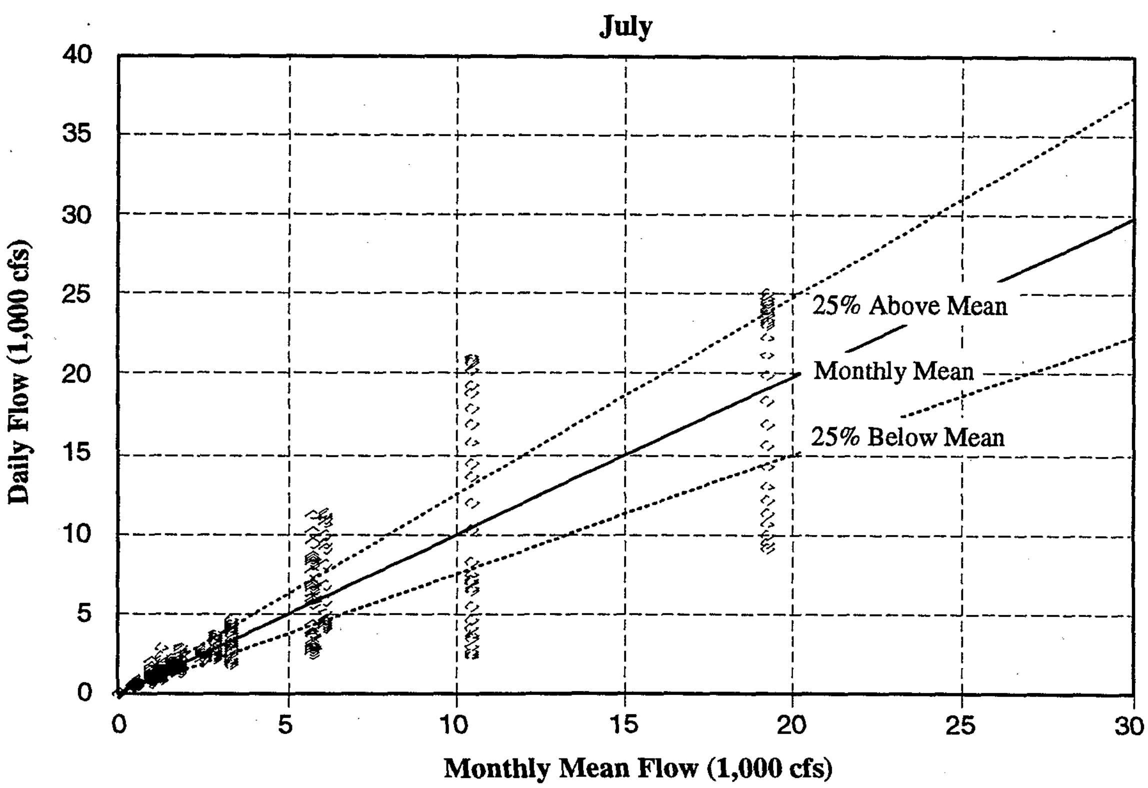


Figure A4-8.
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DELTA WETLANDS
PROJECT EIR/EIS
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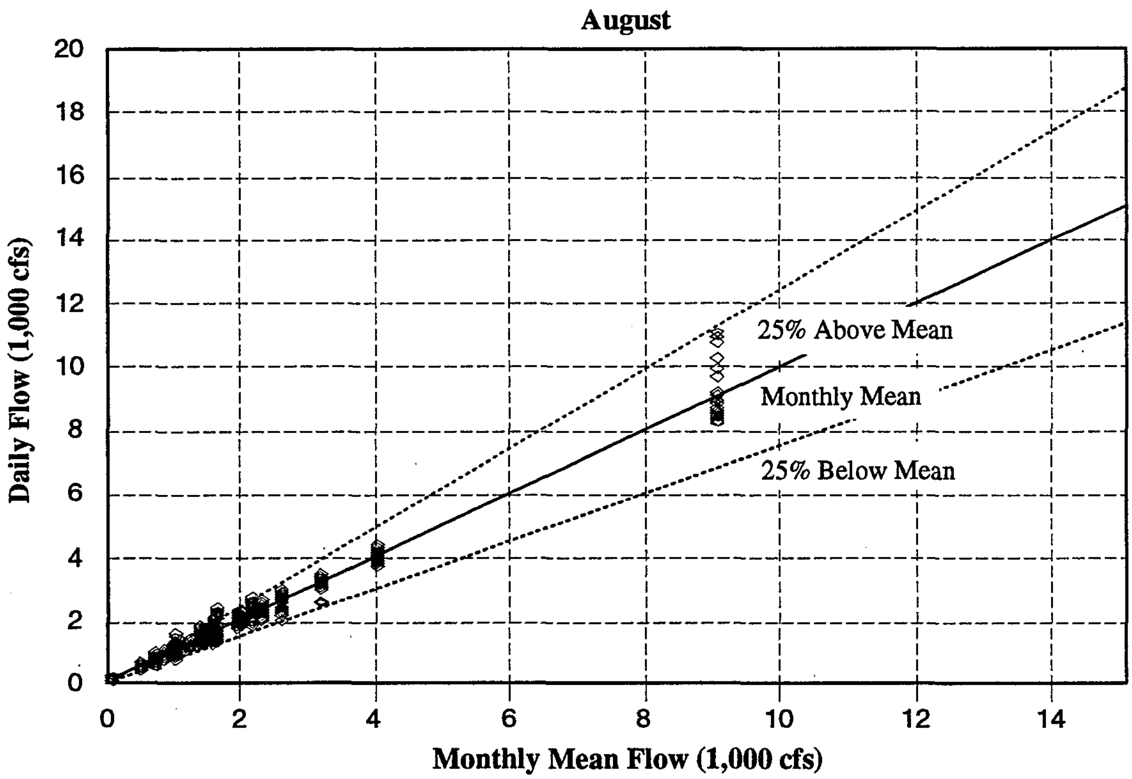

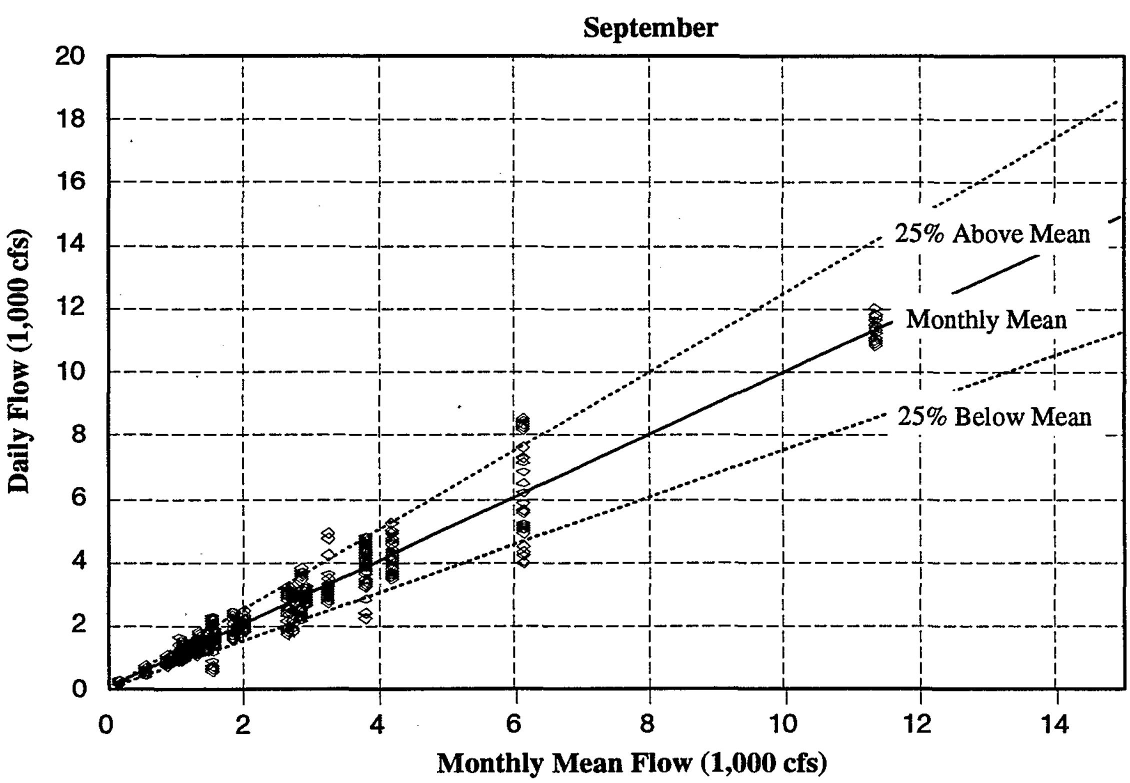

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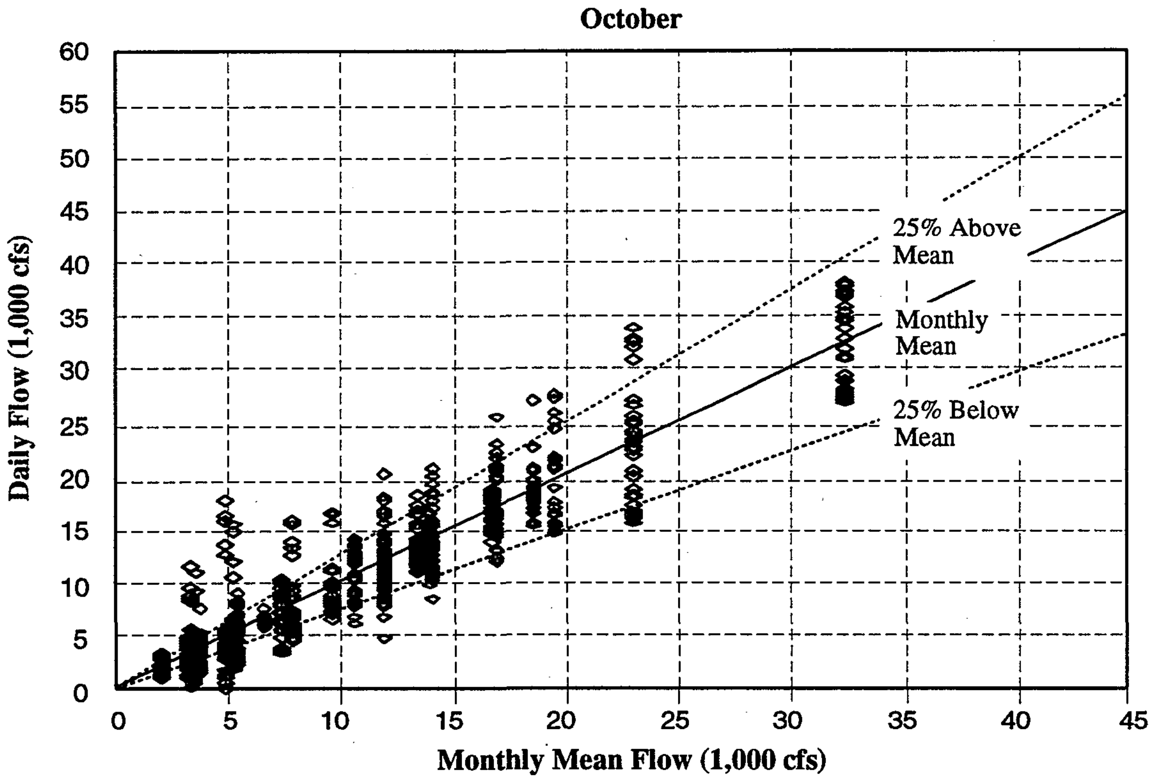


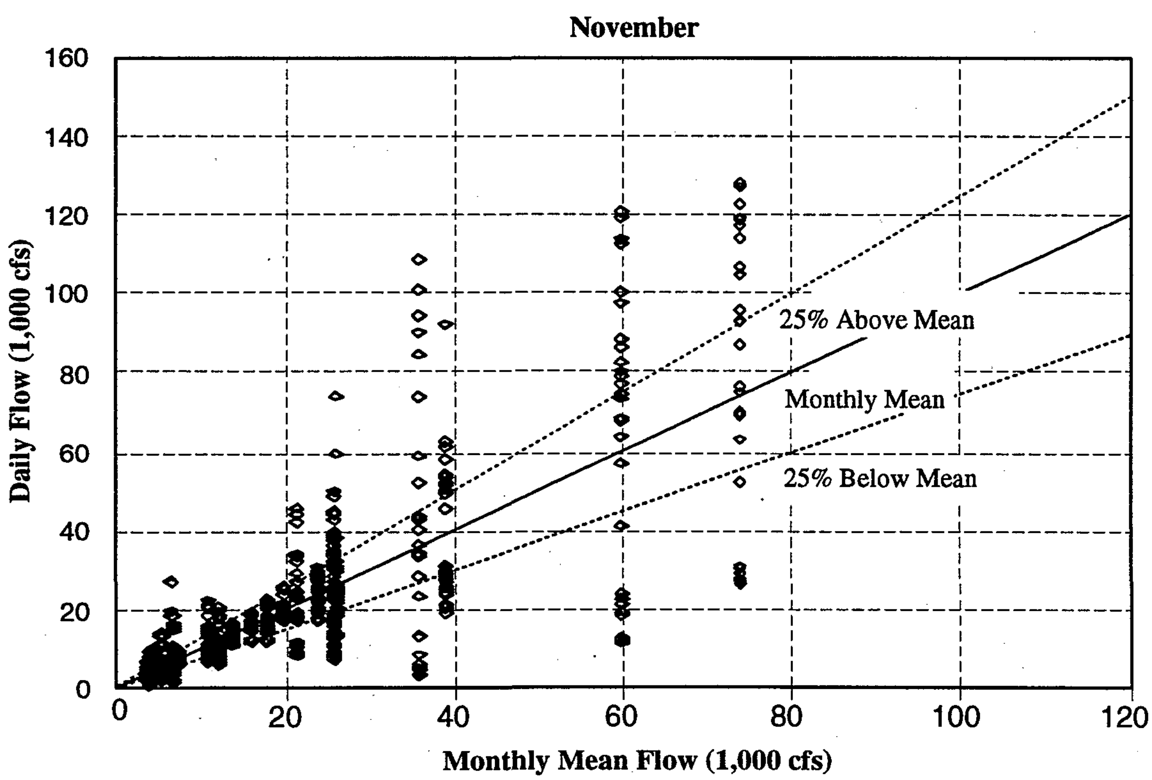
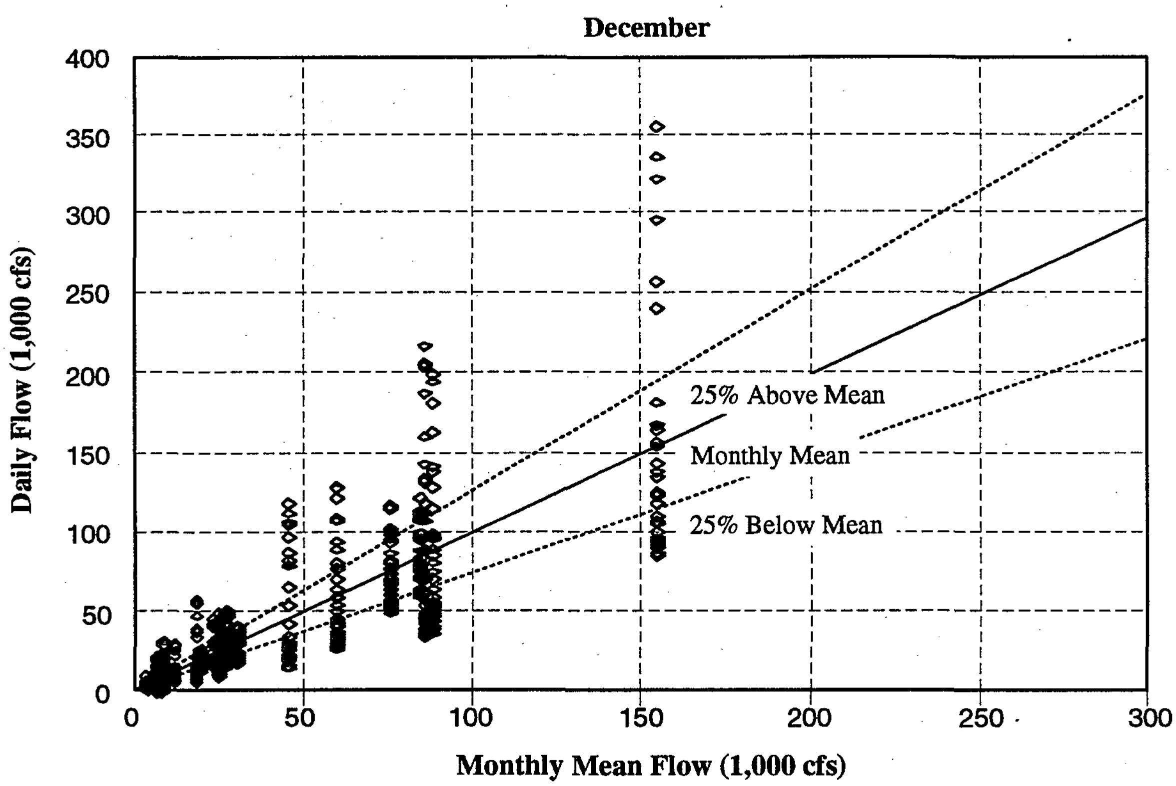


Figure A4-9.
Daily versus Mean Monthly Delta Outflow

DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



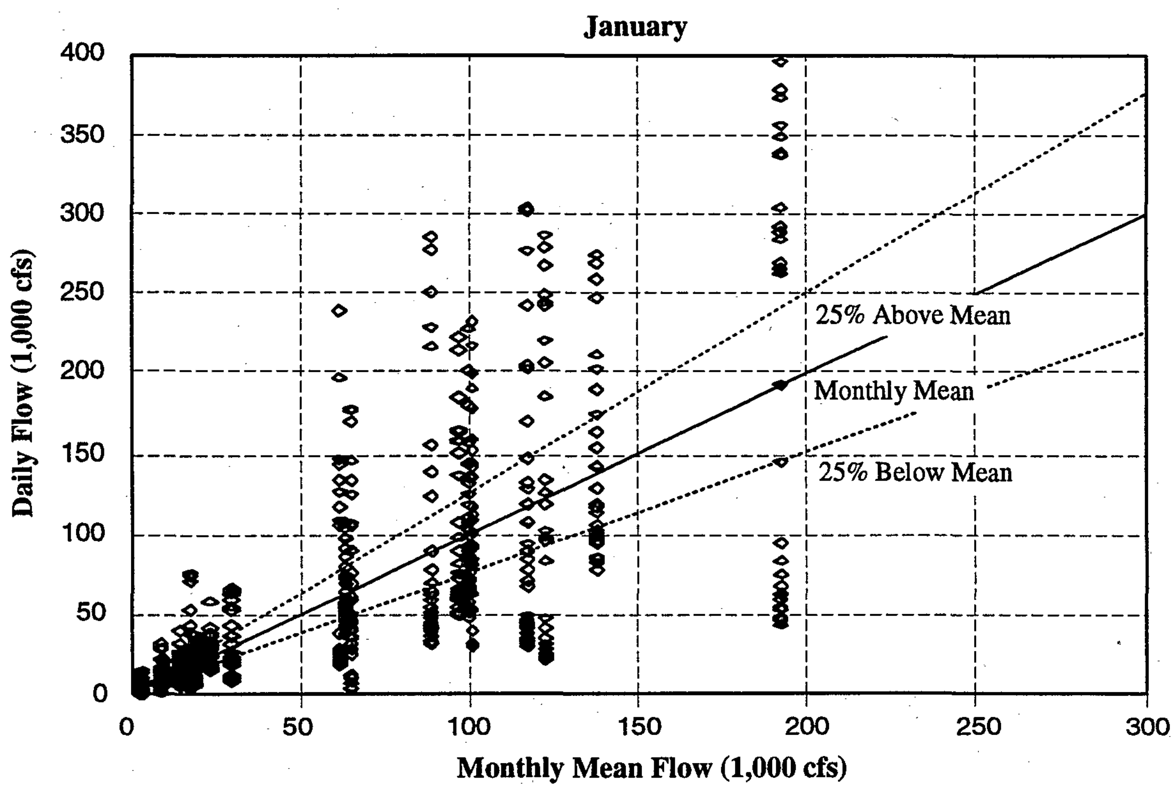


Figure A4-9.
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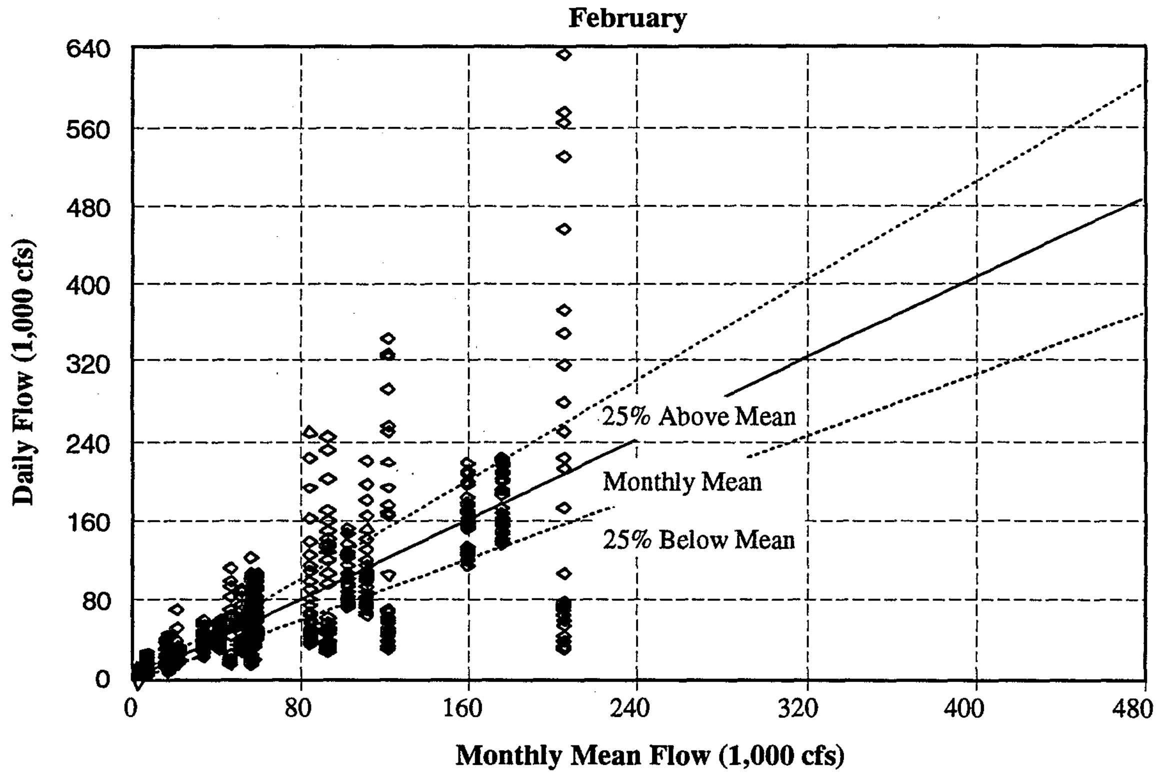
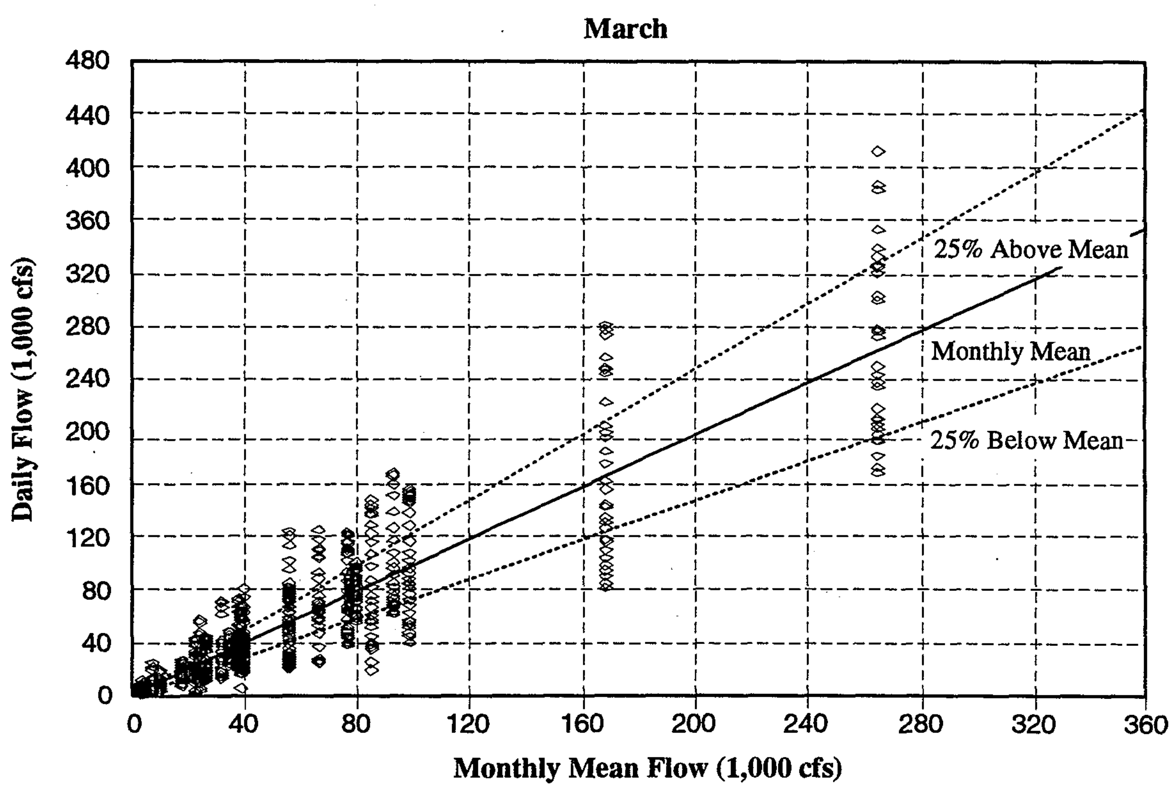
DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates





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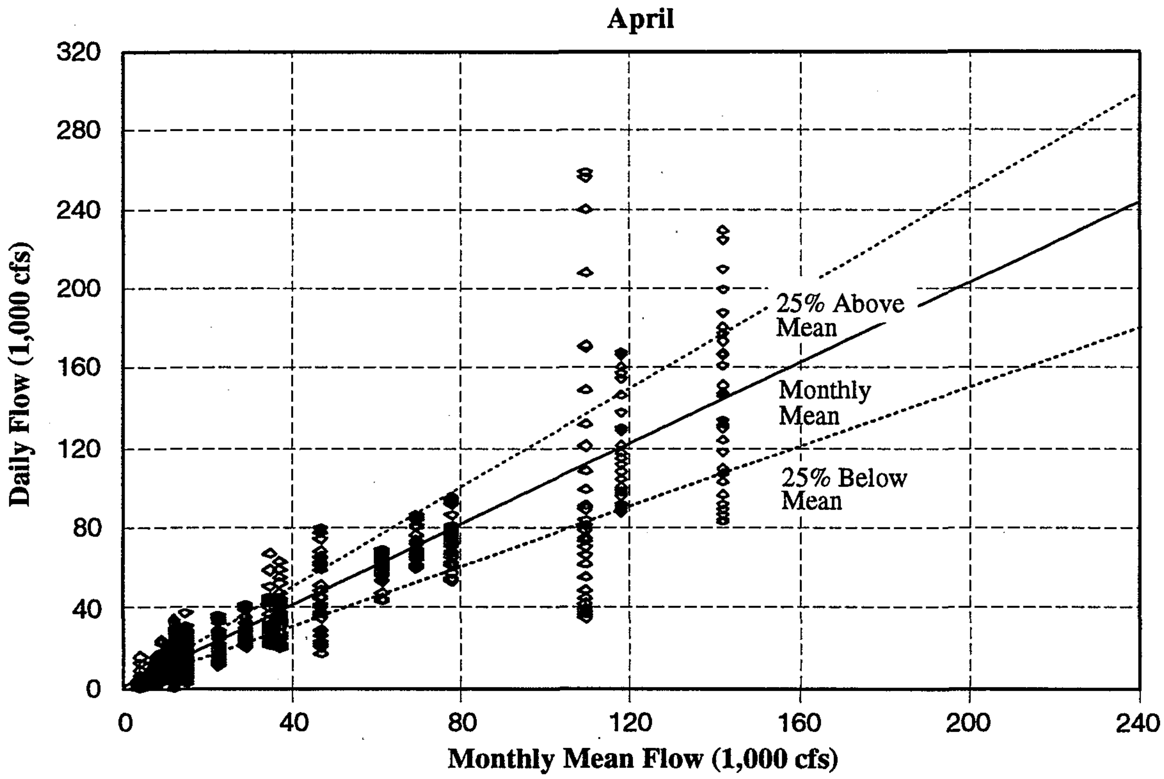

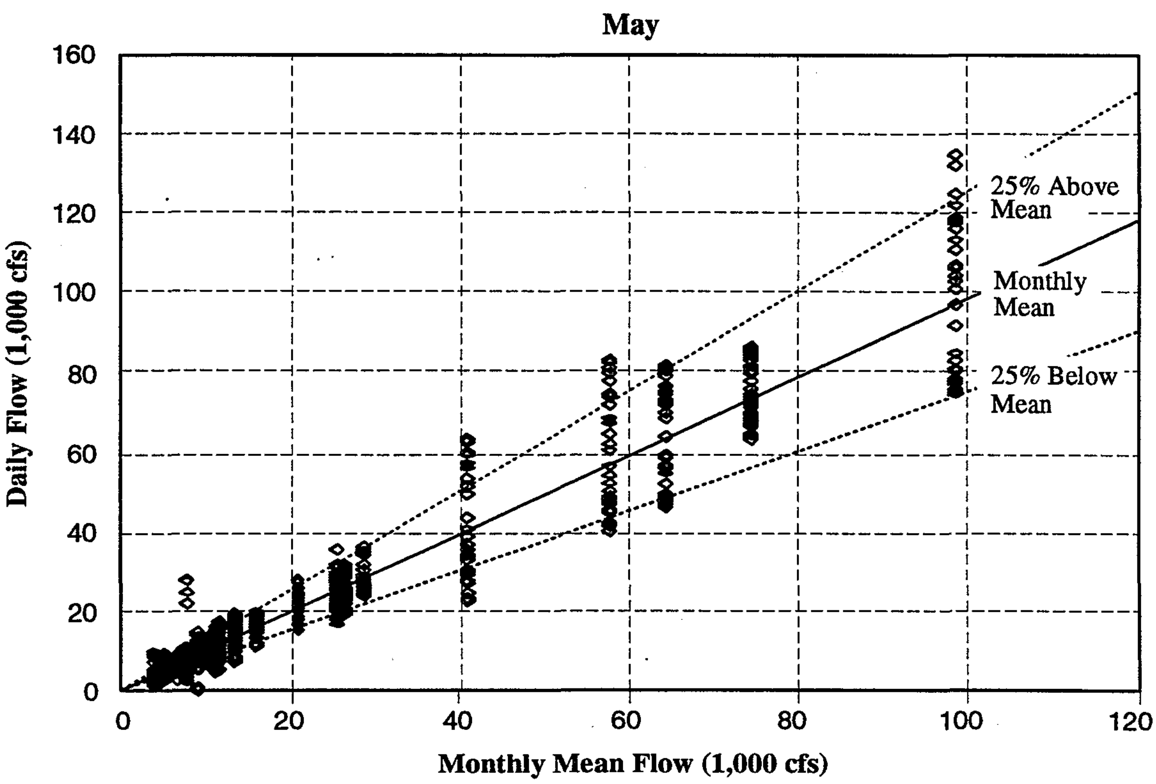

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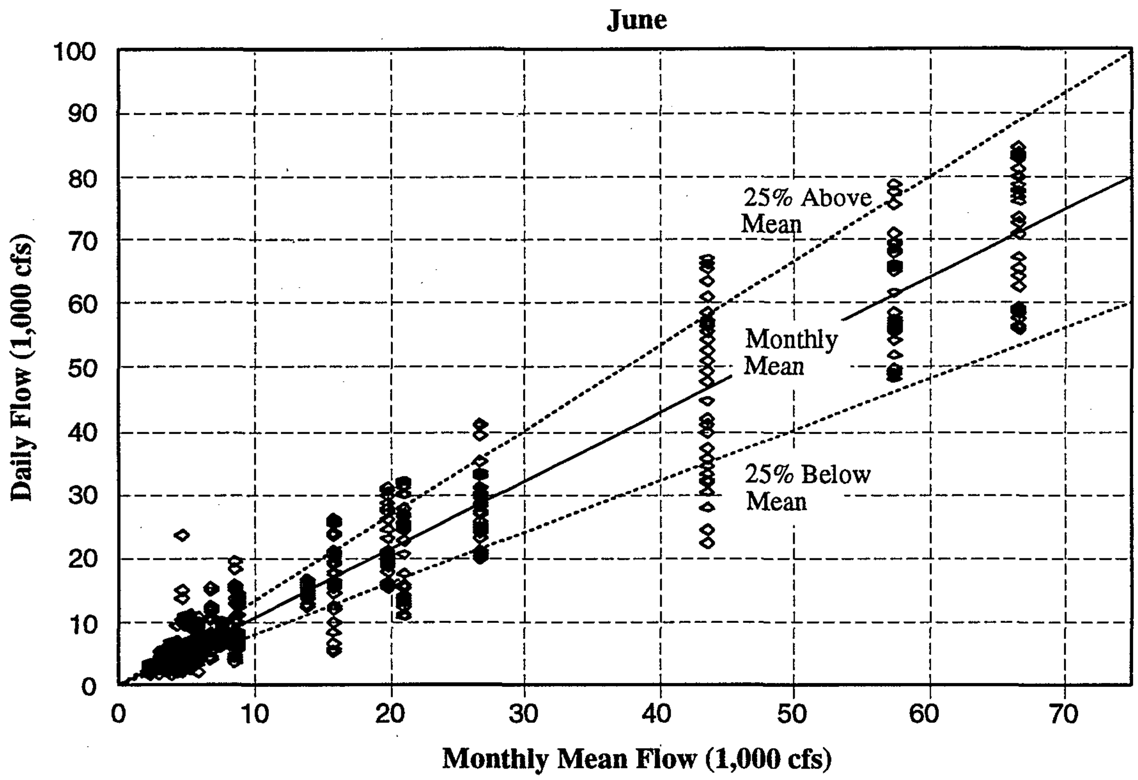

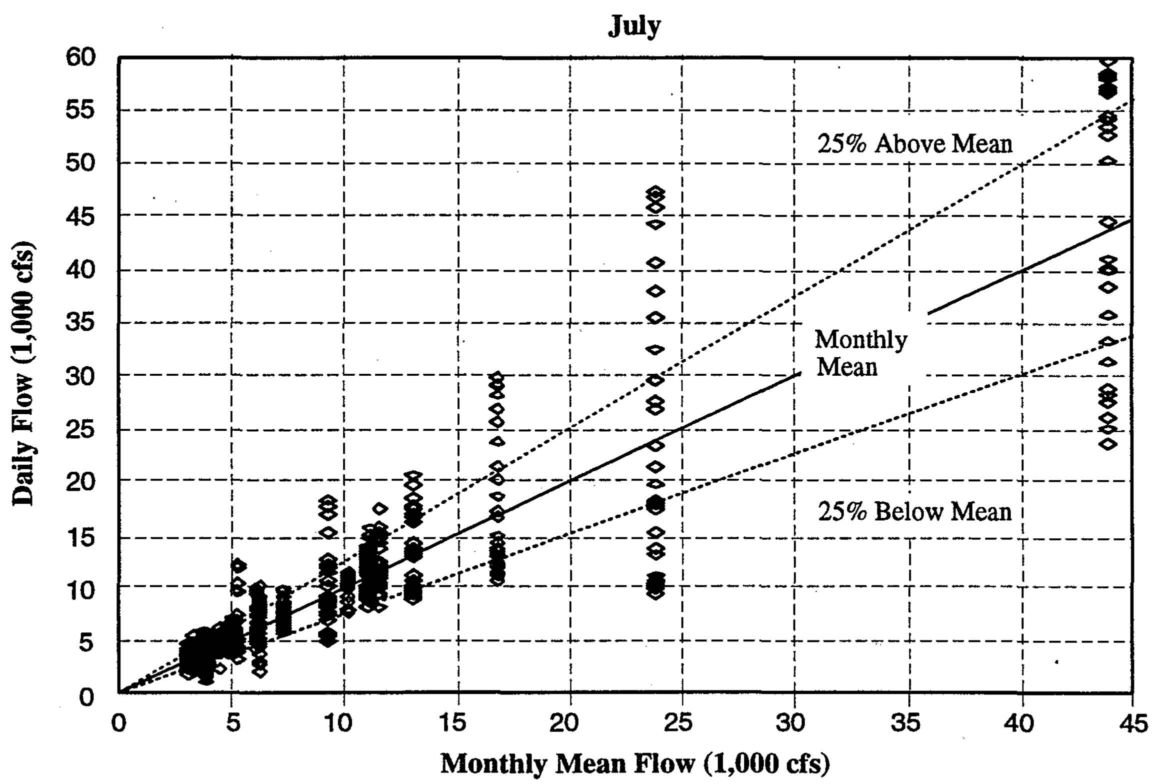

Figure A4-9.
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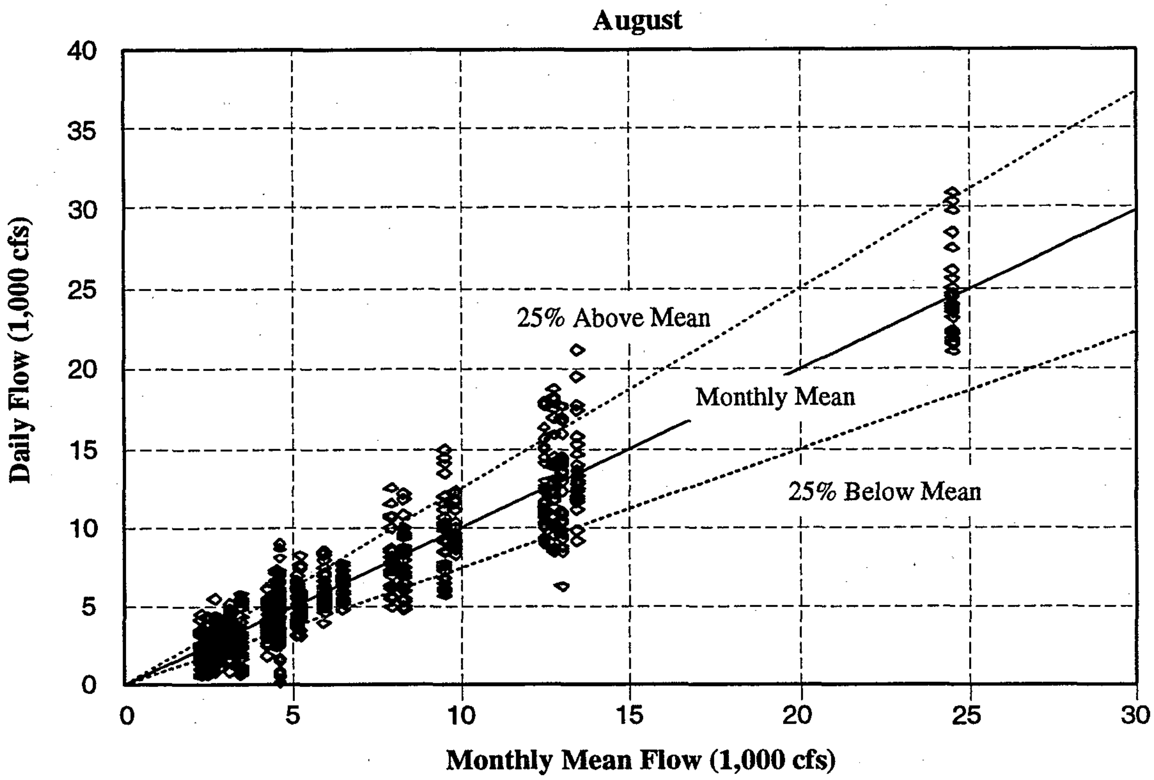
DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



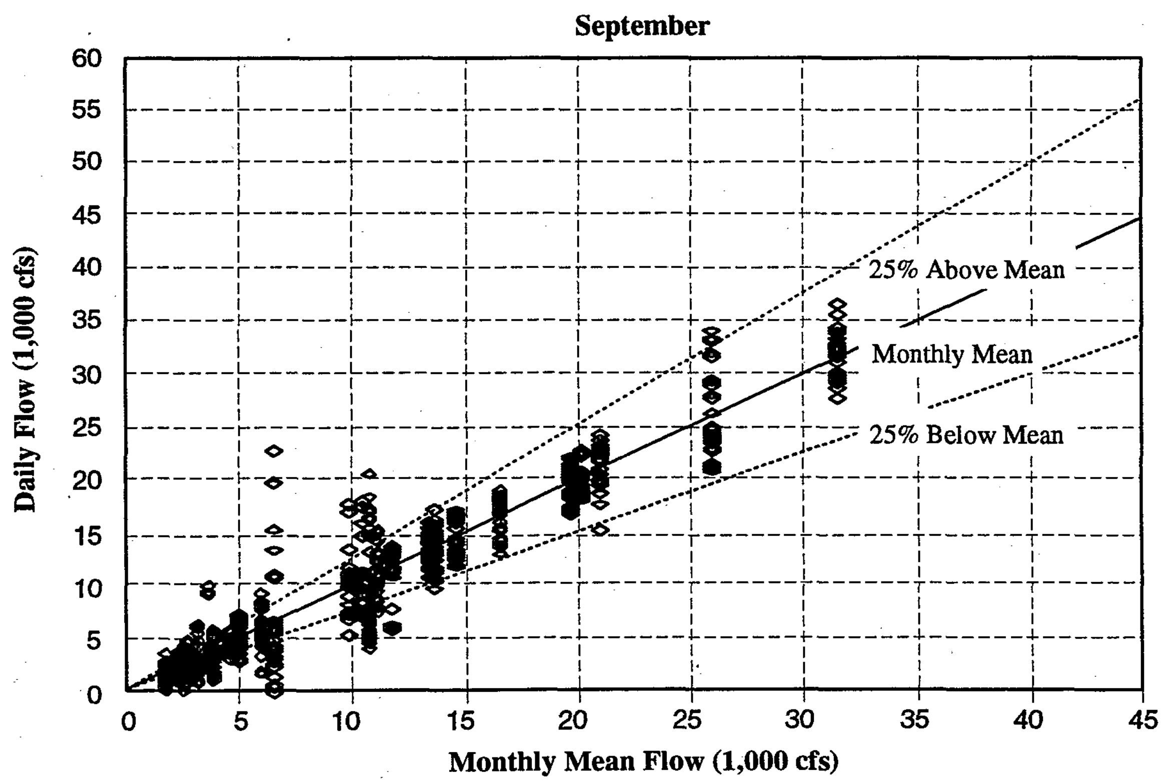


Figure A4-9.
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DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates

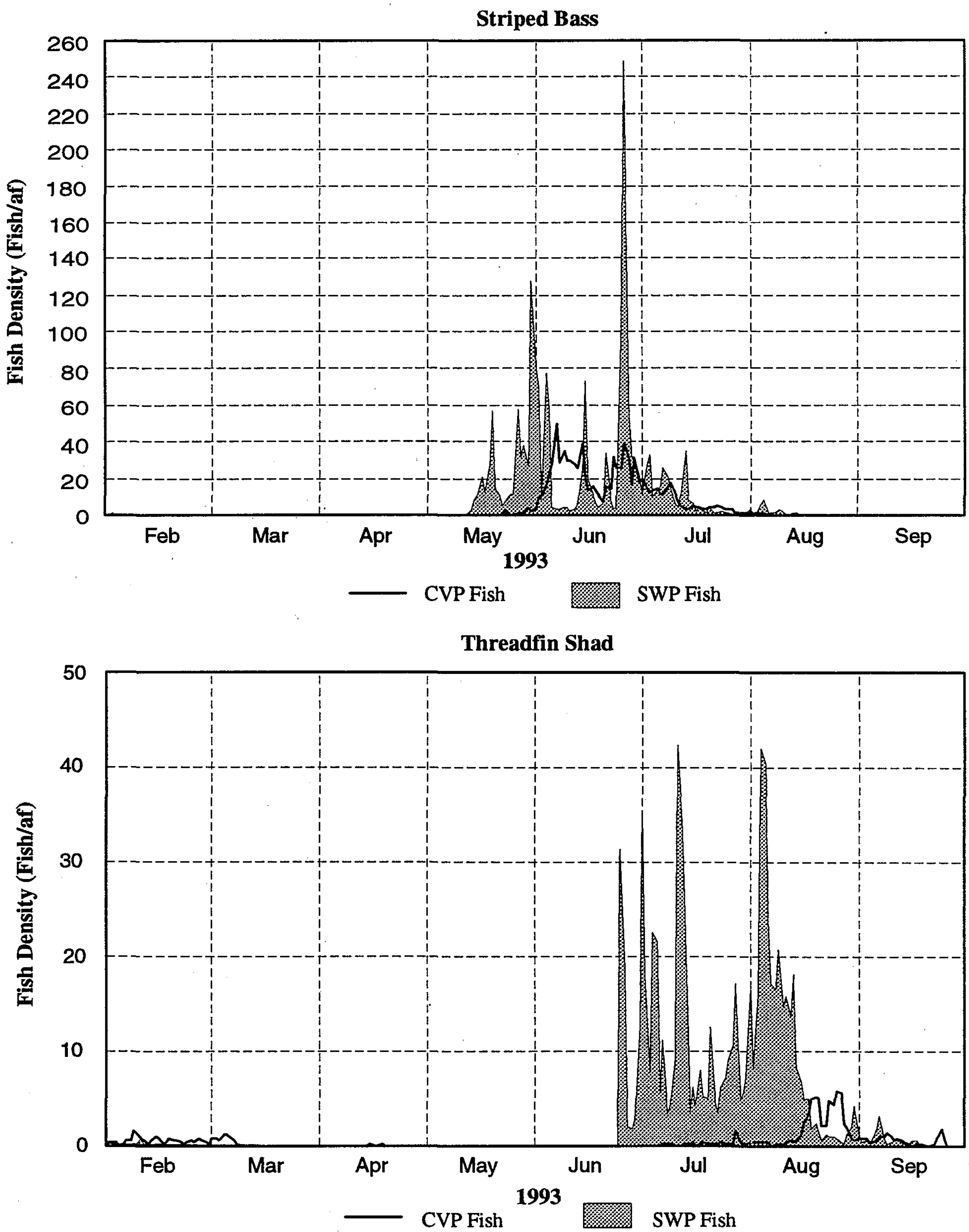
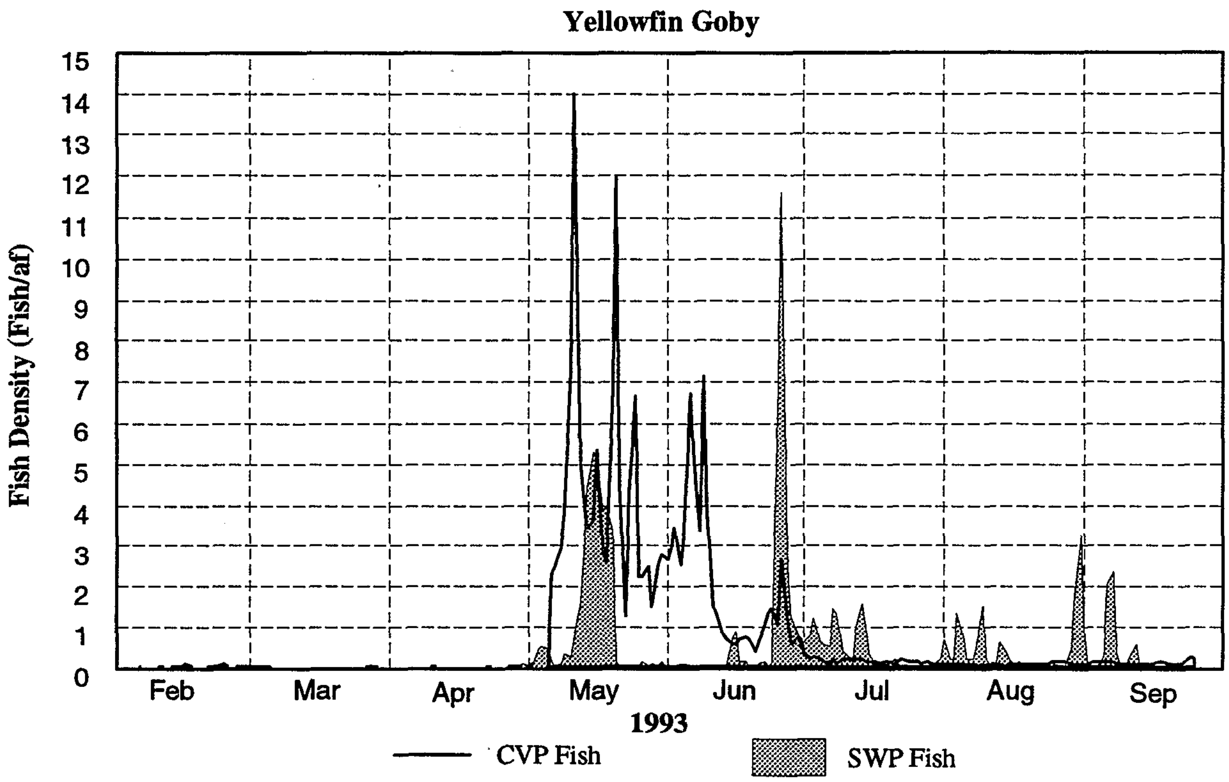
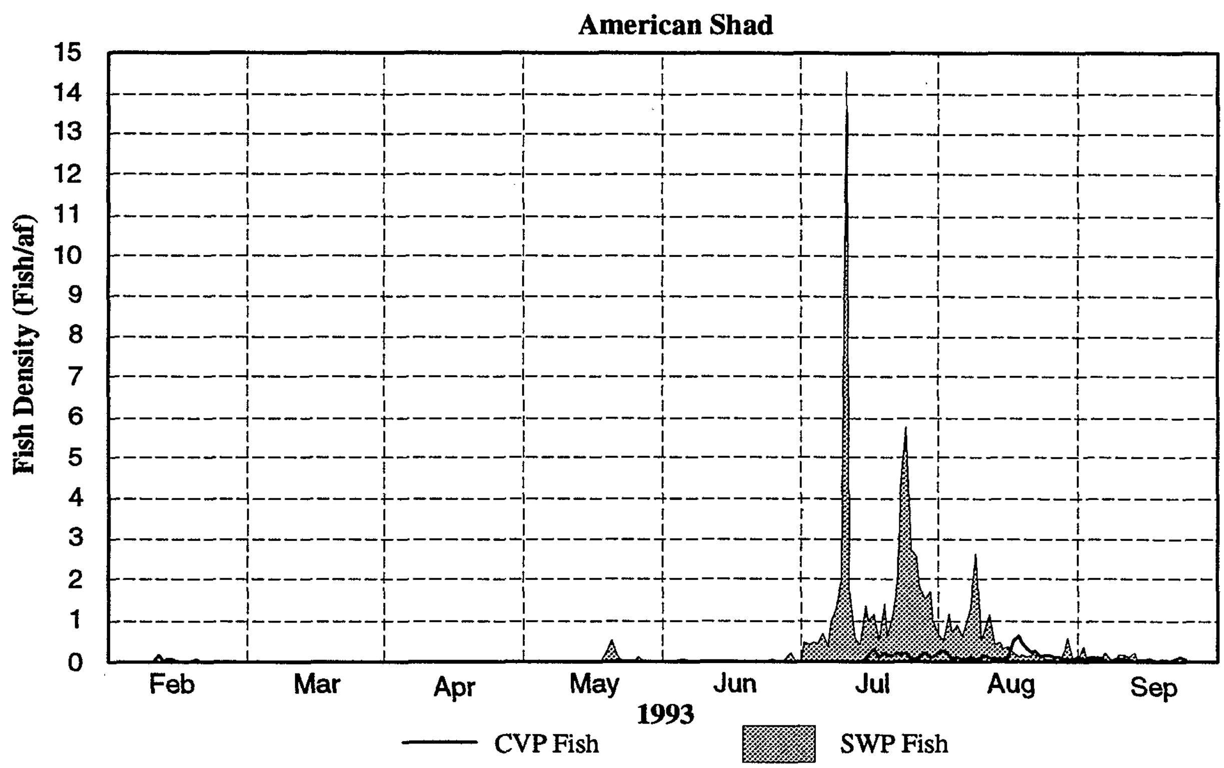


Figure A4-10.
Daily Estimates of Fish Density Obtained from SWP Banks and CVP Tracy Salvage Records for February-September 1993

DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates





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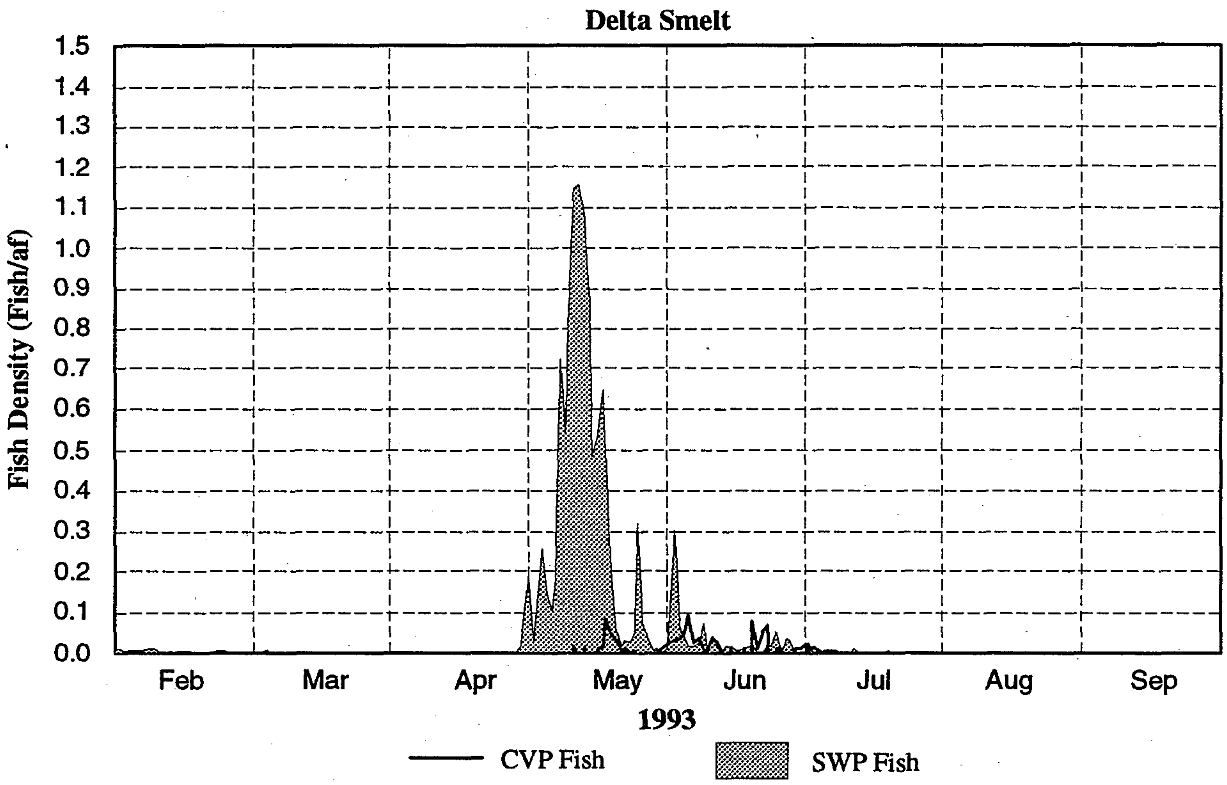

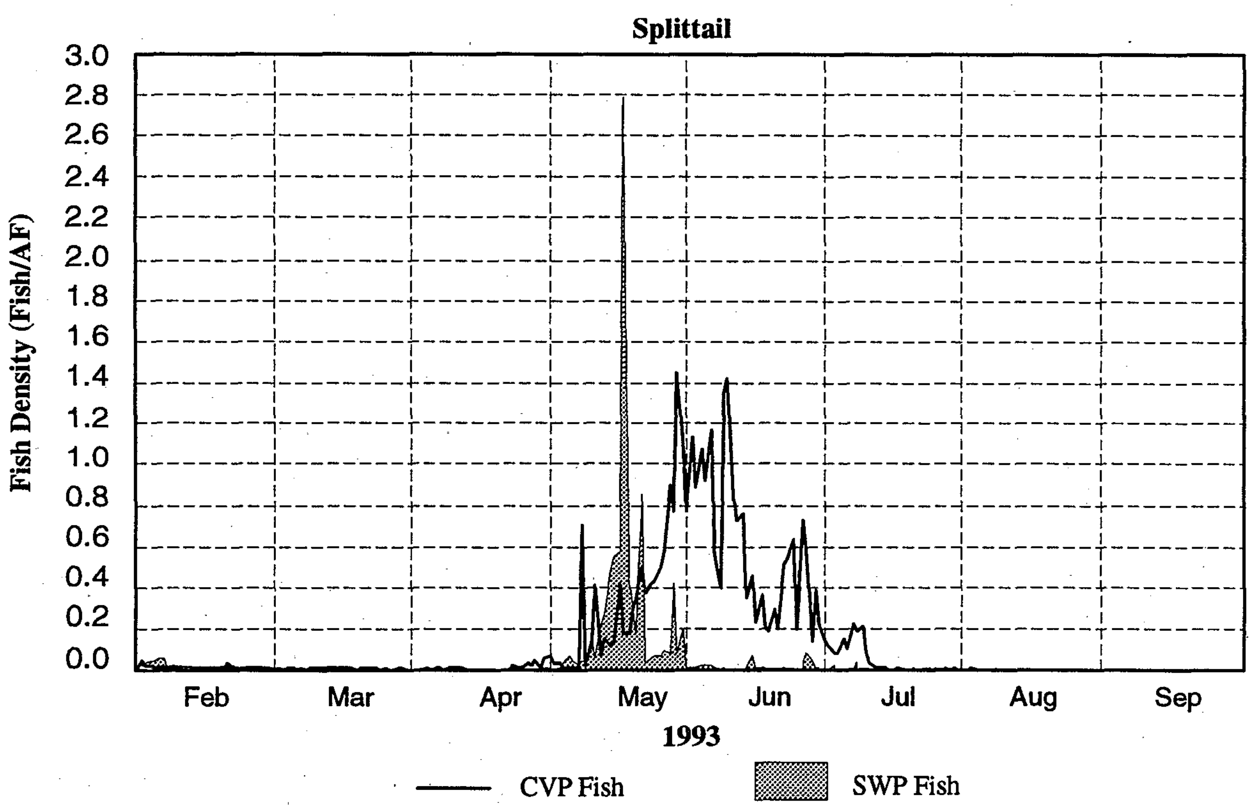

Figure A4-10.
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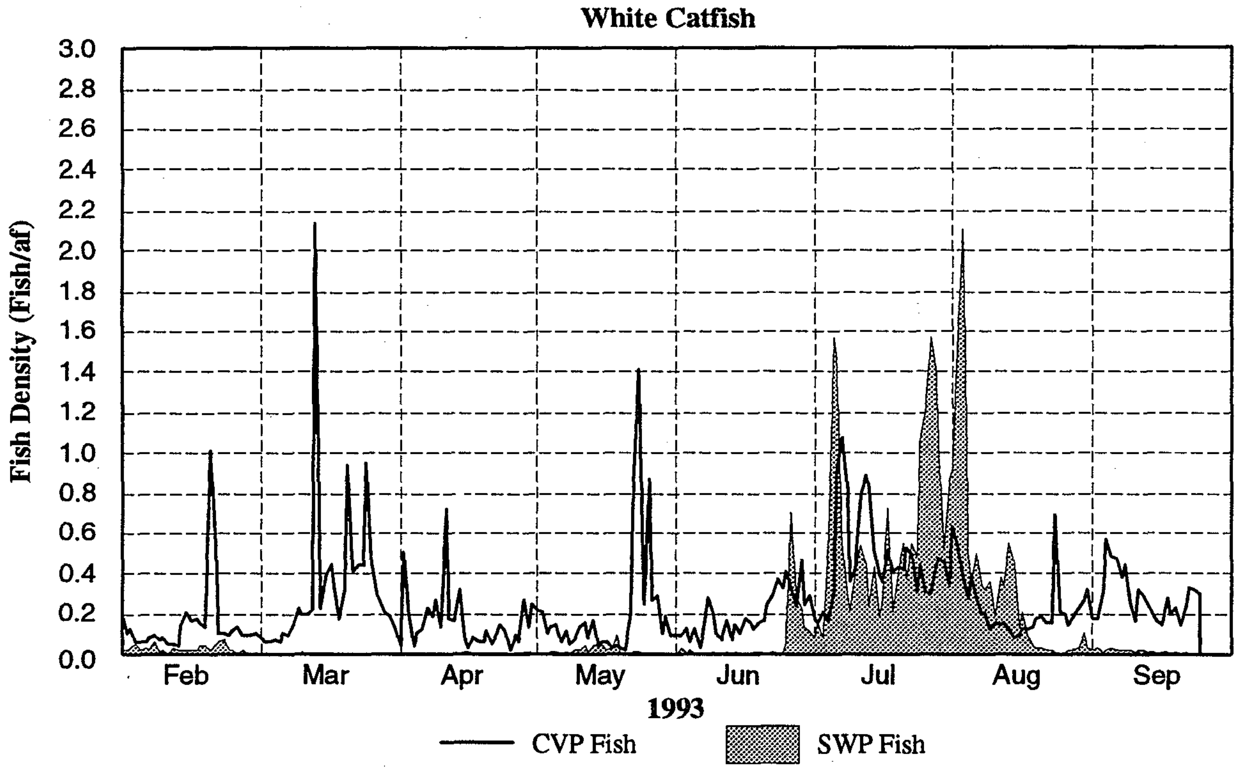
DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



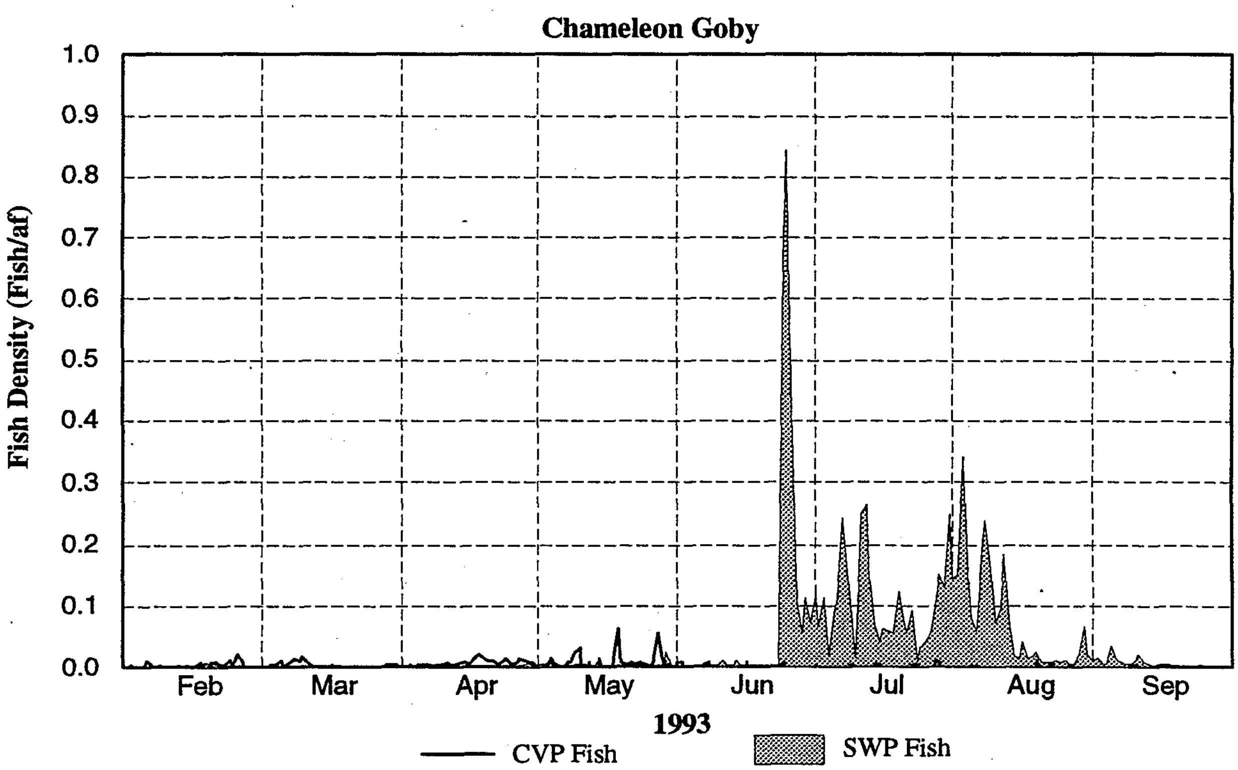


Figure A4-10.
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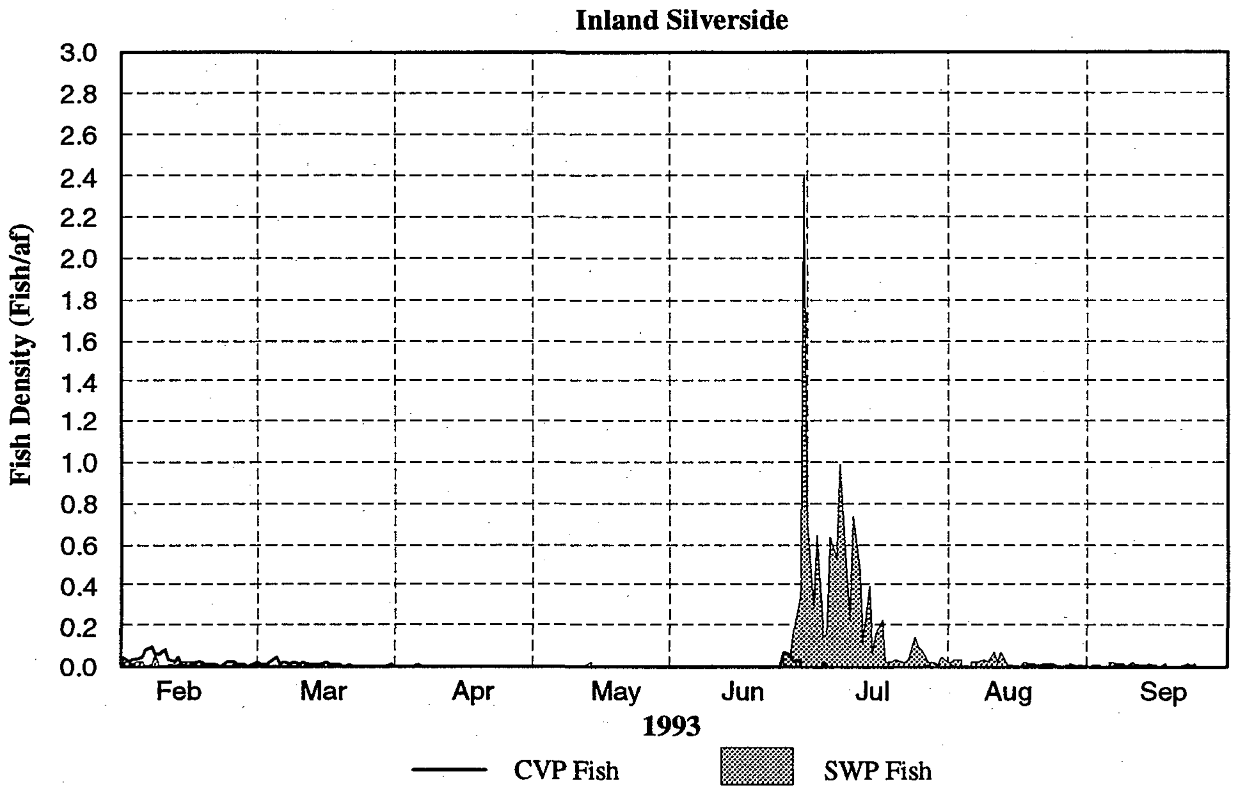
DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



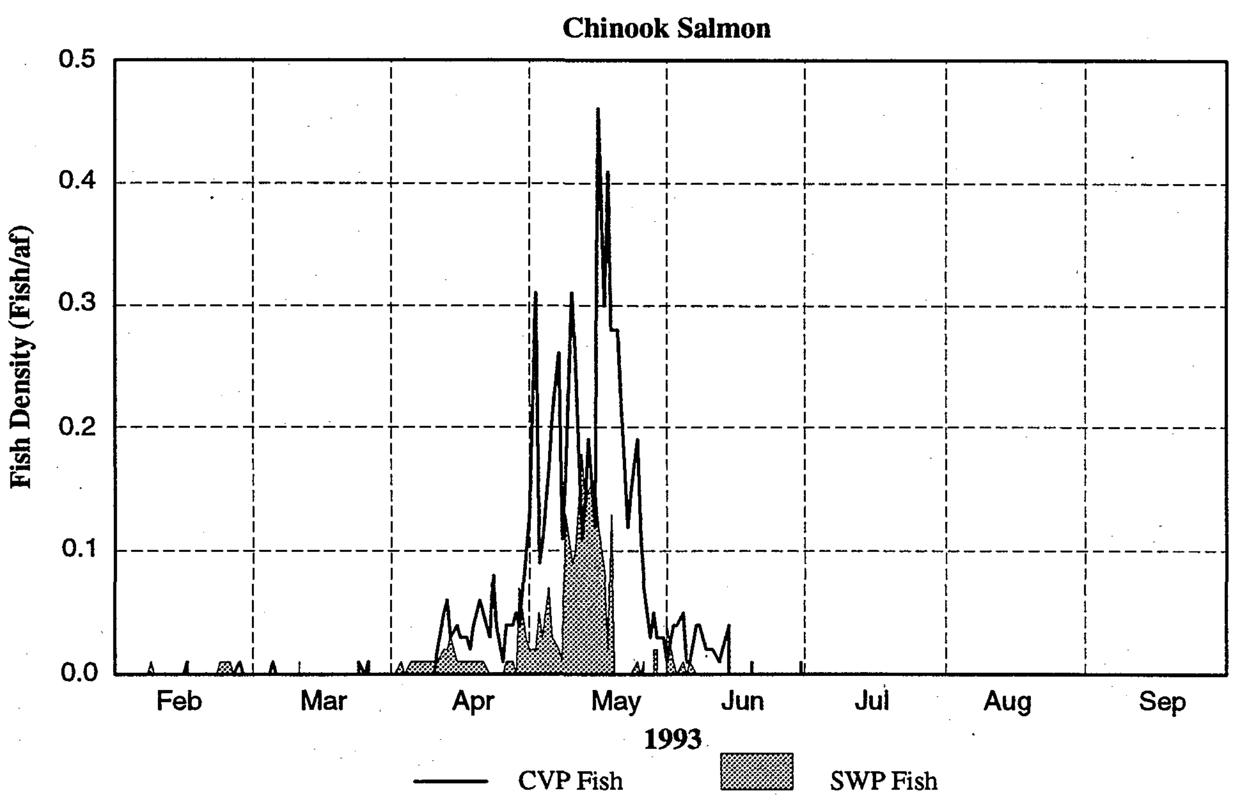


Figure A4-10.
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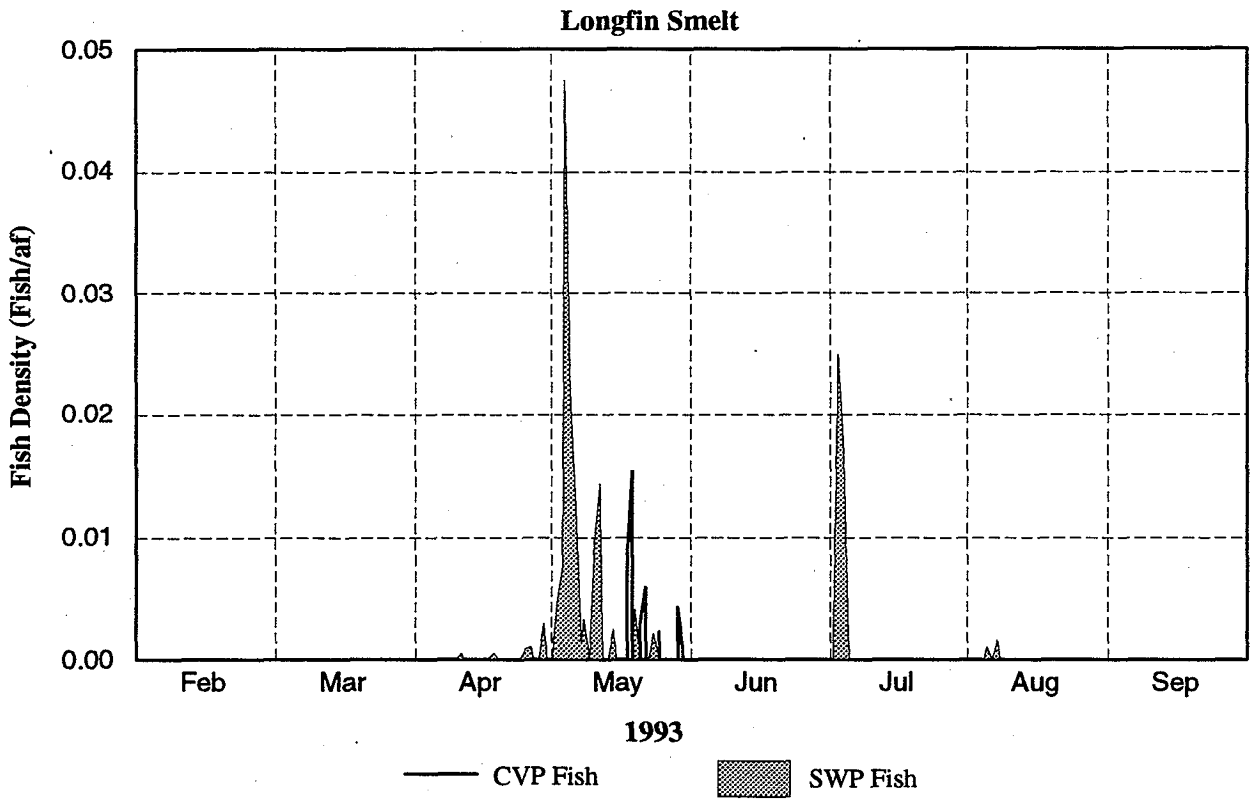
DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



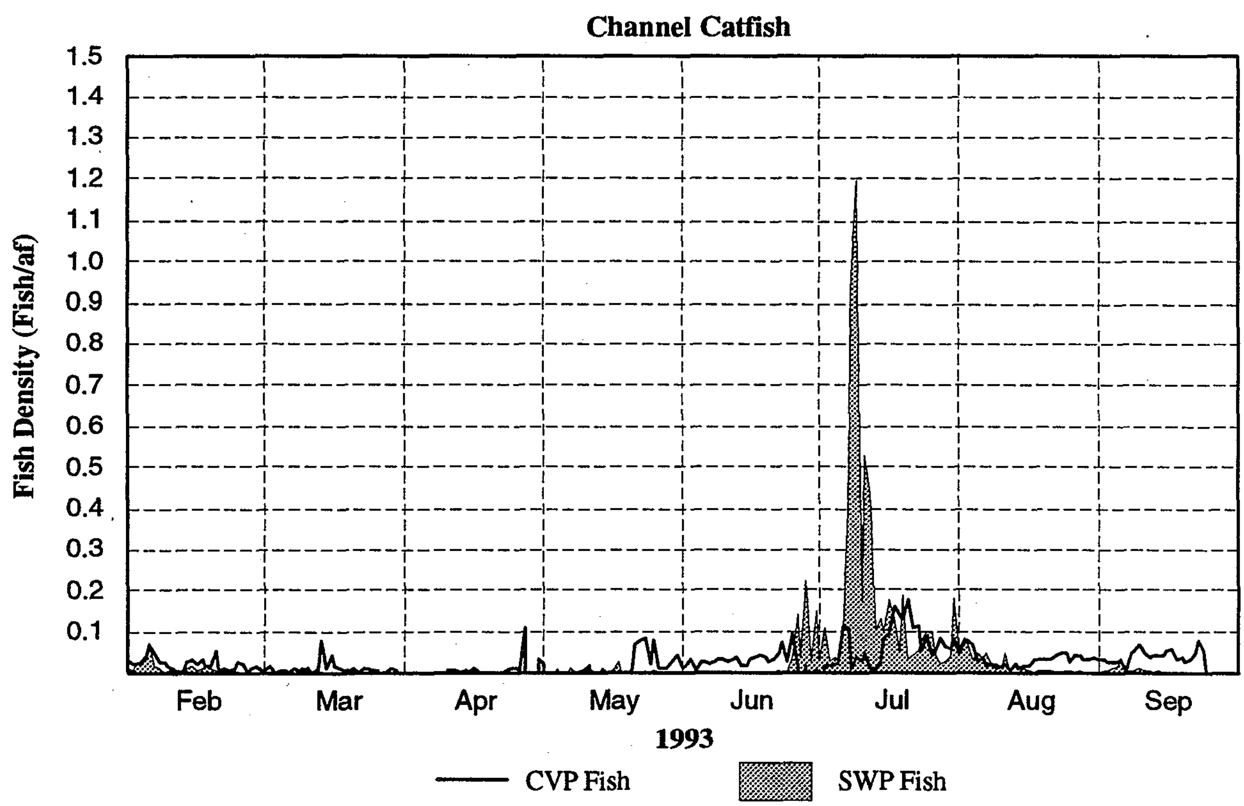


Figure A4-10.
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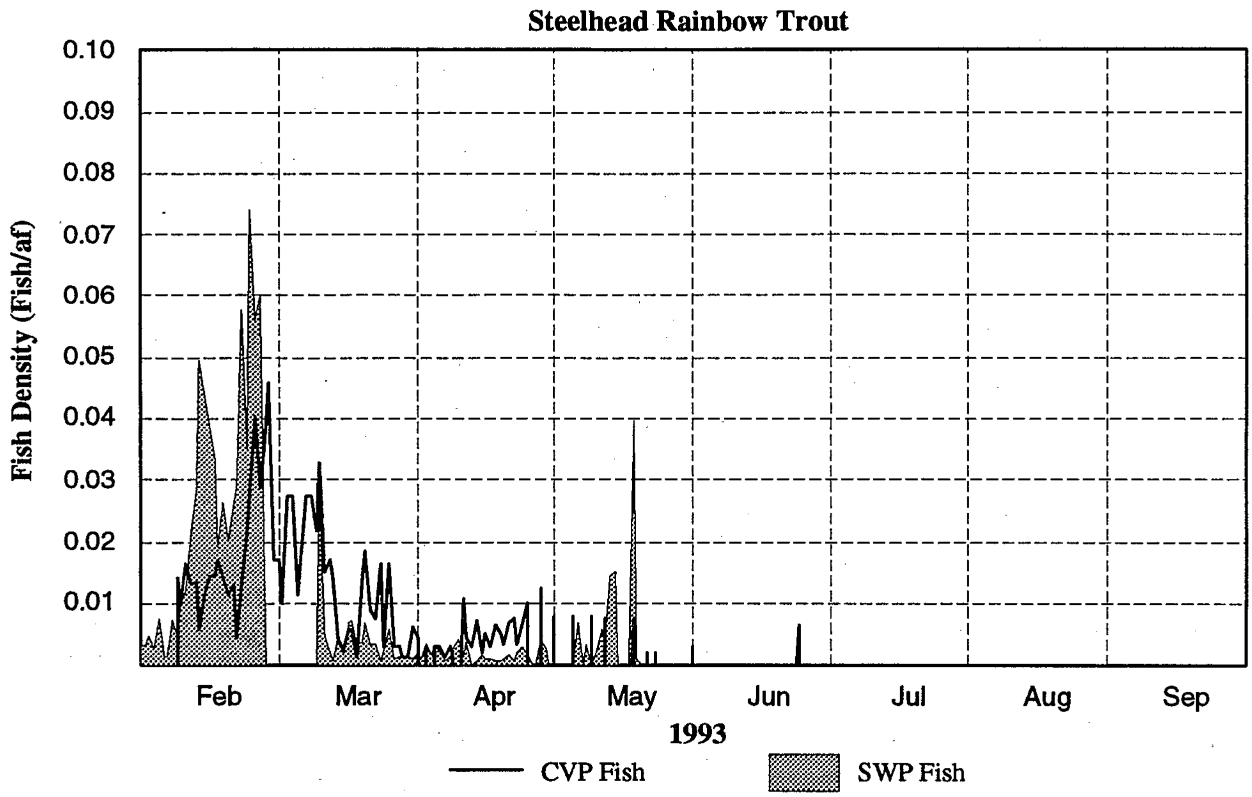
DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



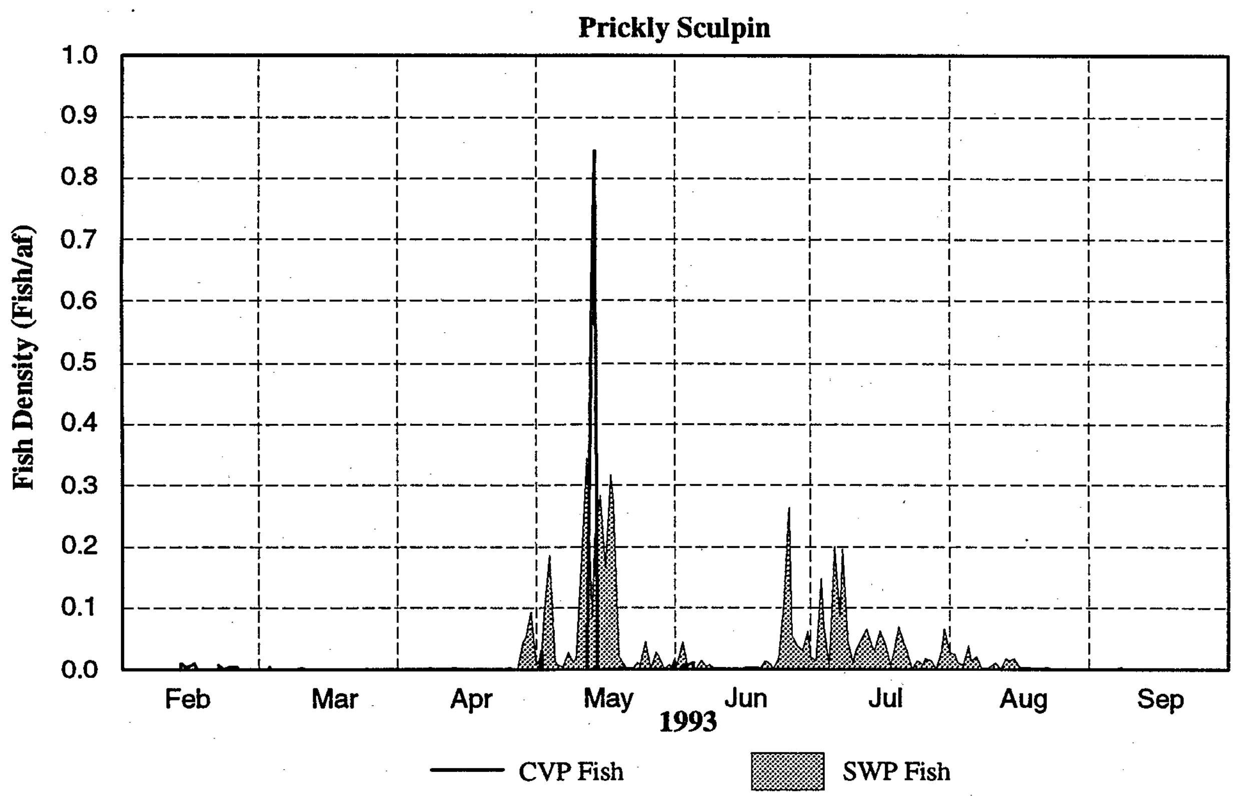


Figure A4-10.
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DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates

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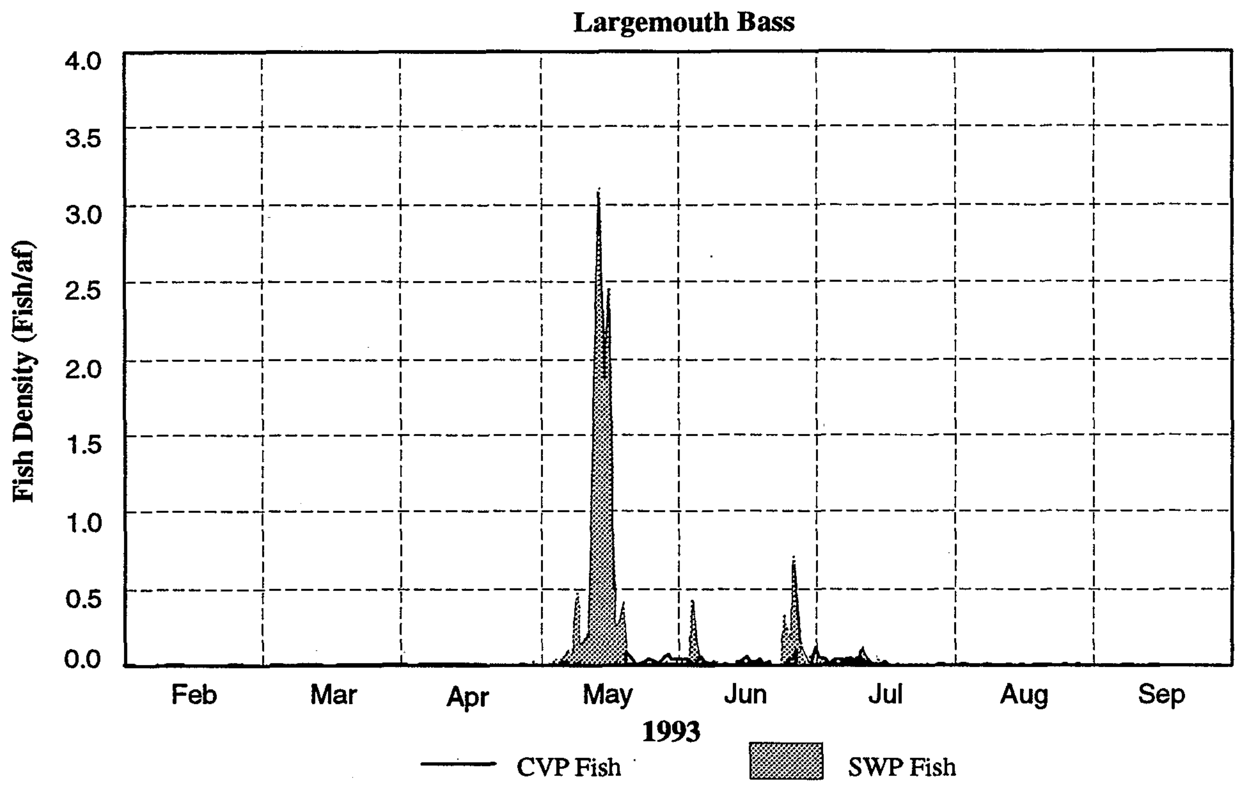

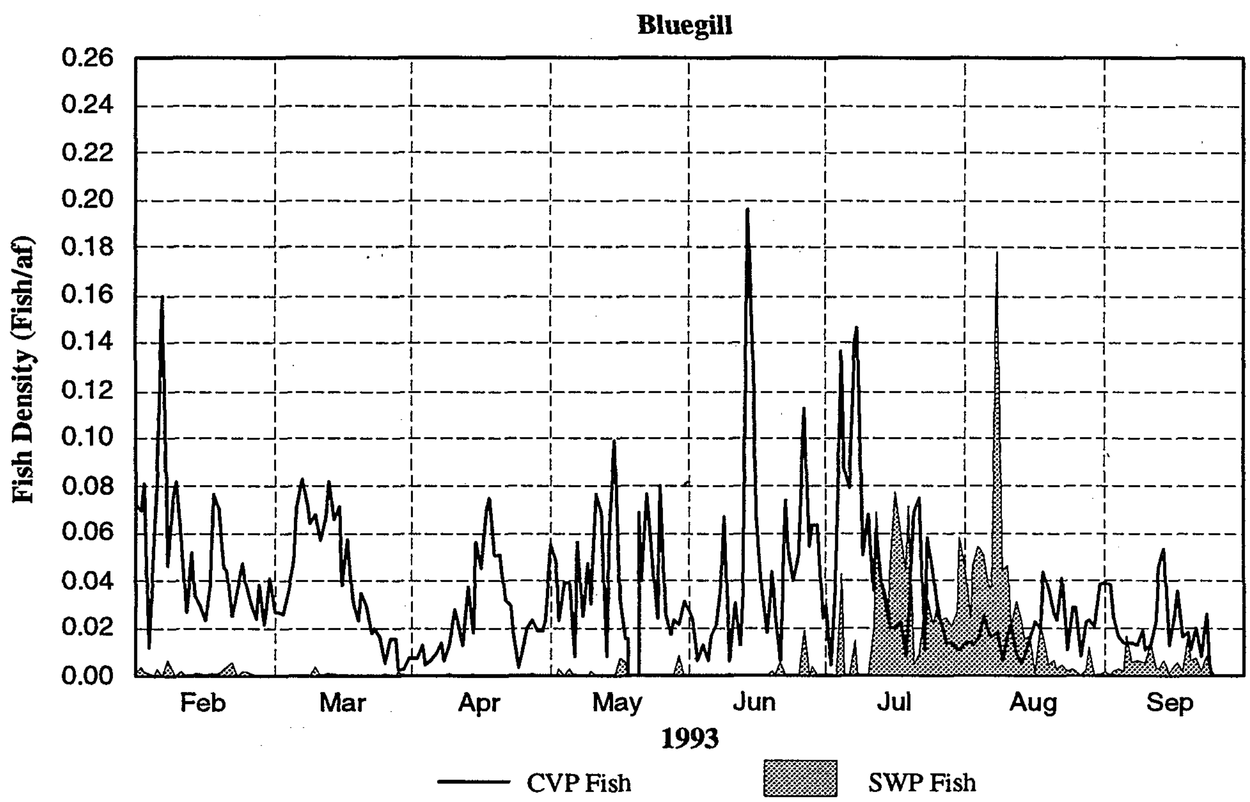

Figure A4-10.
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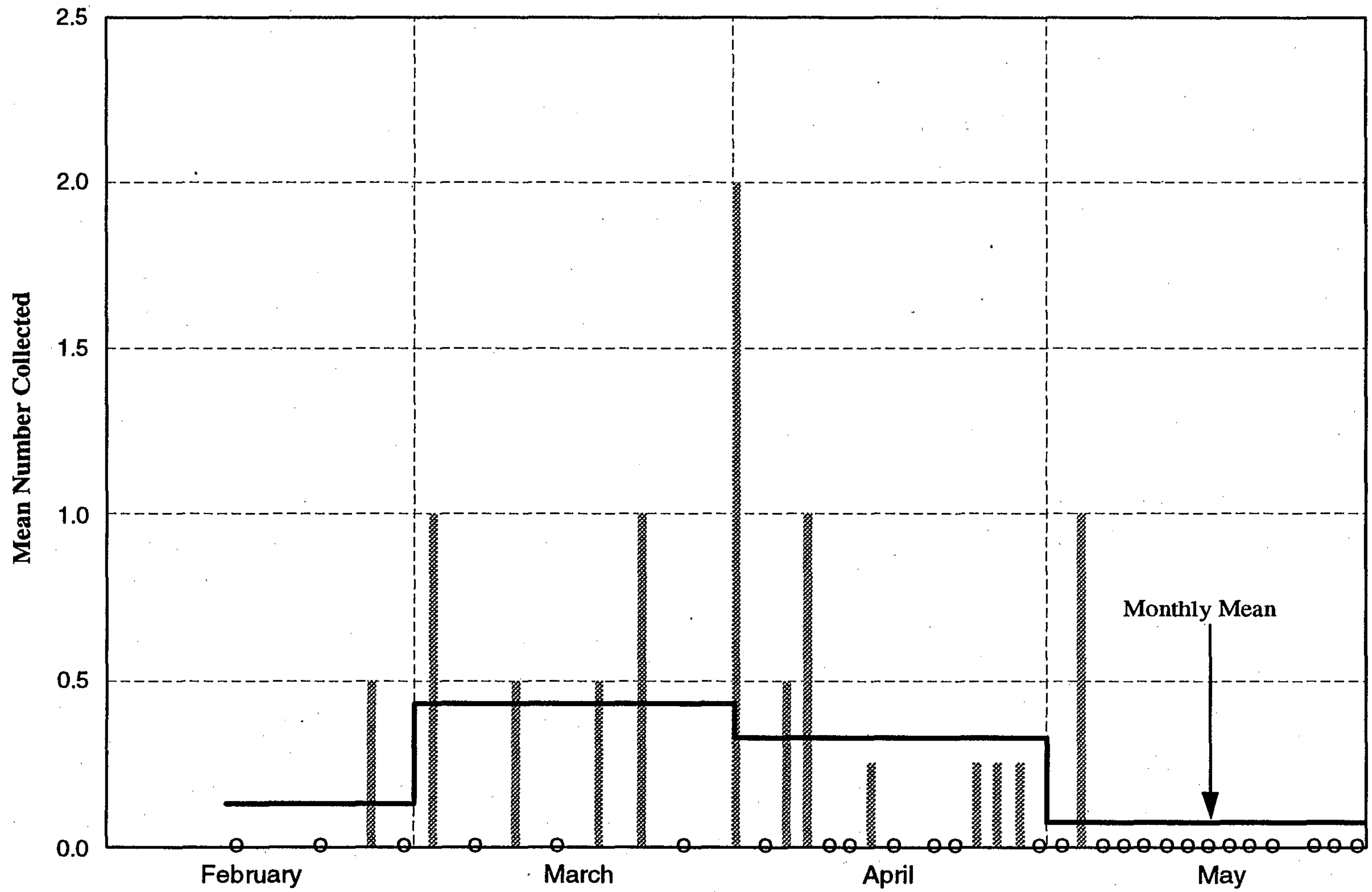
DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



Note: The o's represent sampling days on which no delta smelt larvae were caught.

Figure A4-11.
Delta Smelt Larvae at Four Sites near the DW Project Islands for February-May 1992

DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates

C-061478

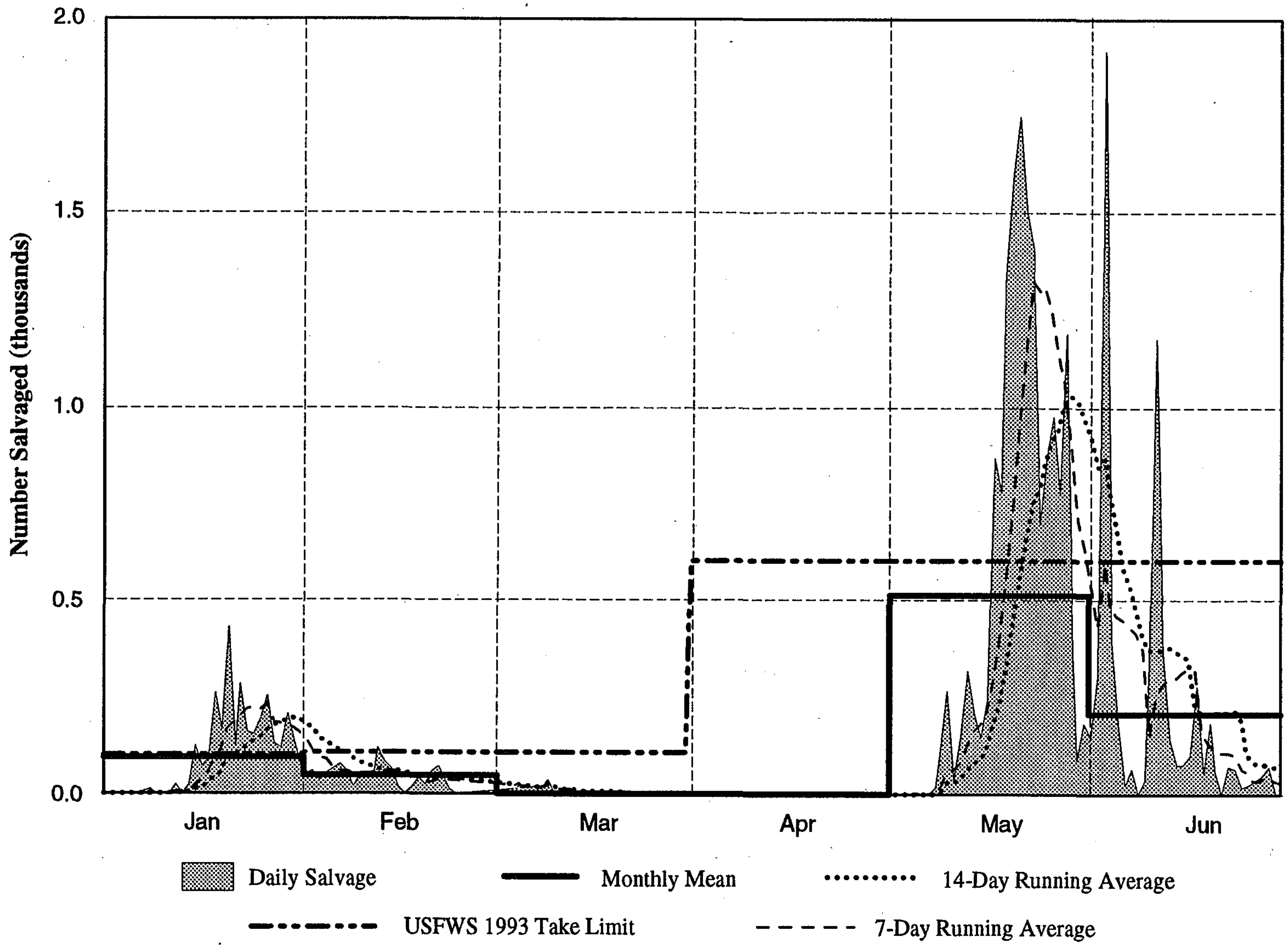
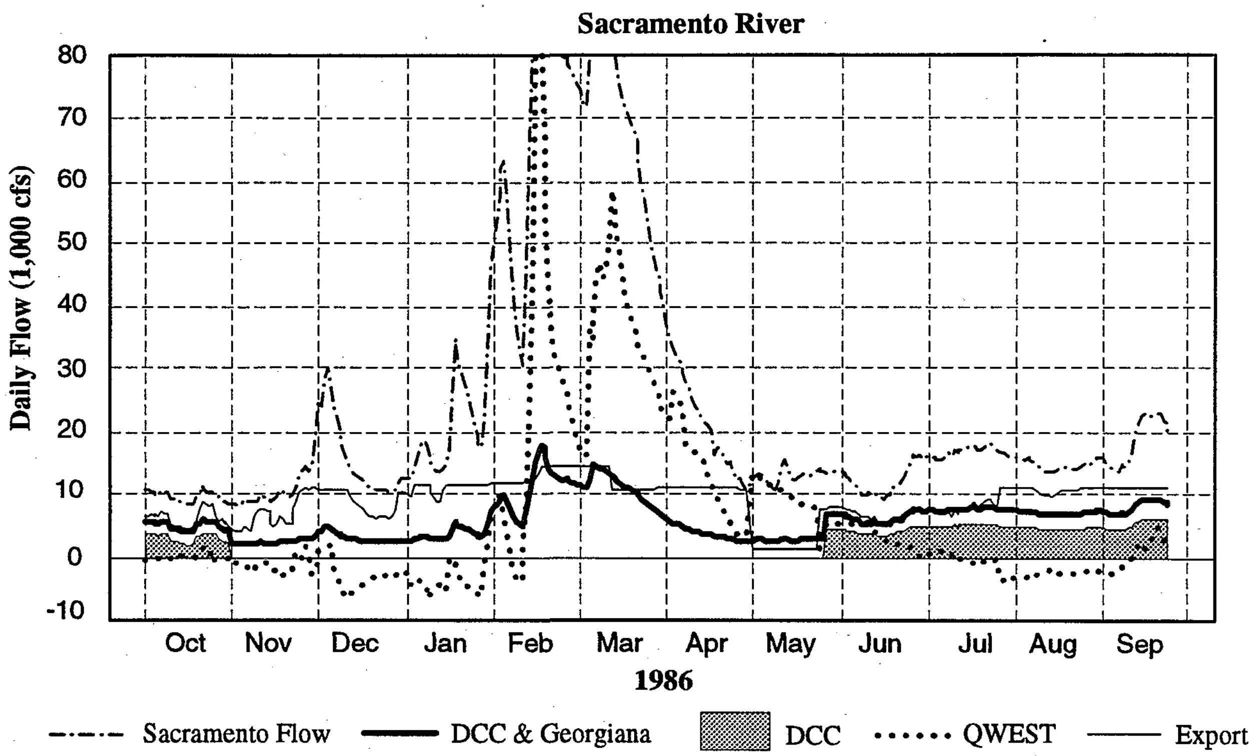


Figure A4-12.
Delta Smelt Salvaged at SWP Banks and CVP Tracy Pumping Plants during January-June 1993

DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



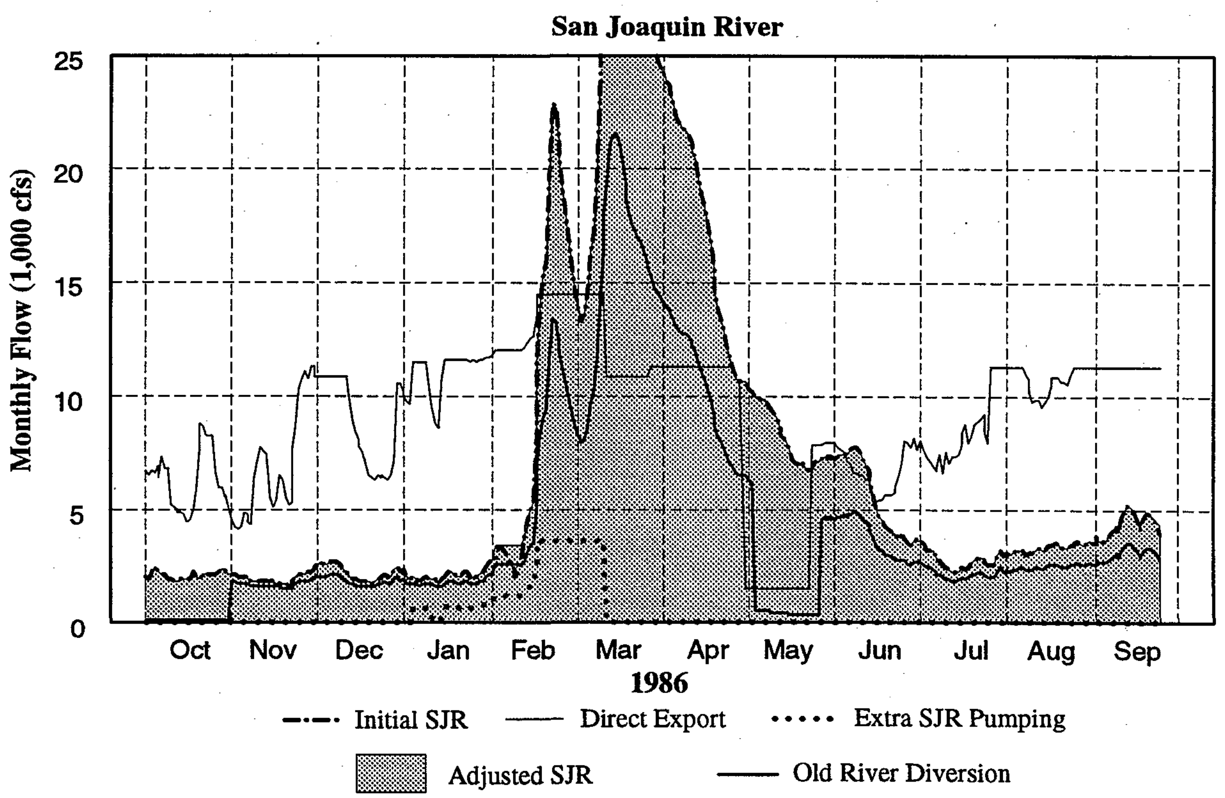
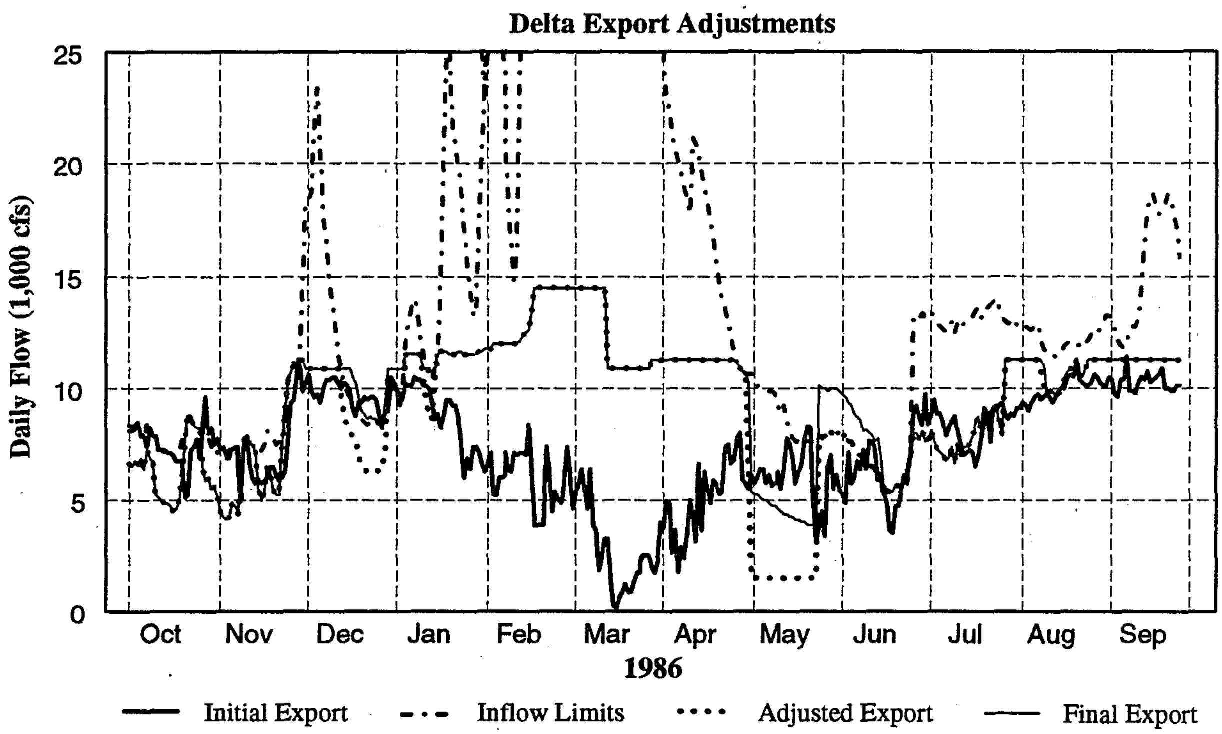


Figure A4-13A.
DailySOS Estimates of Sacramento and
San Joaquin River Adjustments and Diversions
with 1995 WQCP Objectives for 1986 Historical Inflows

DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



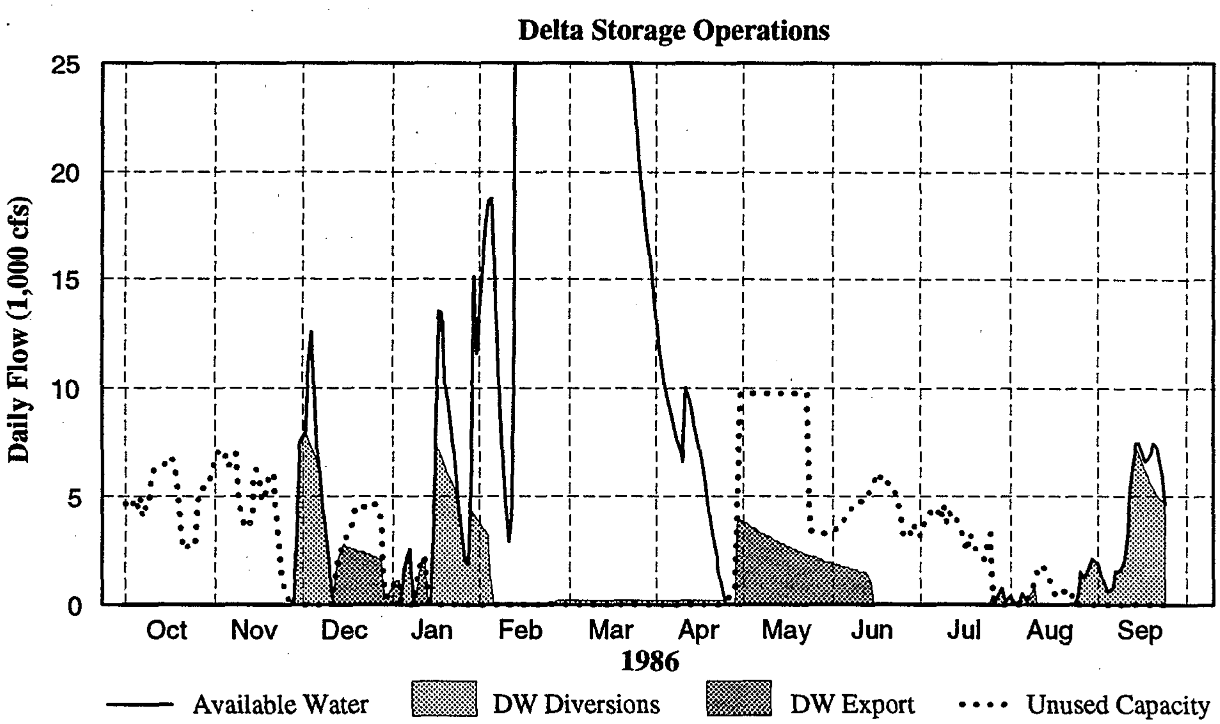
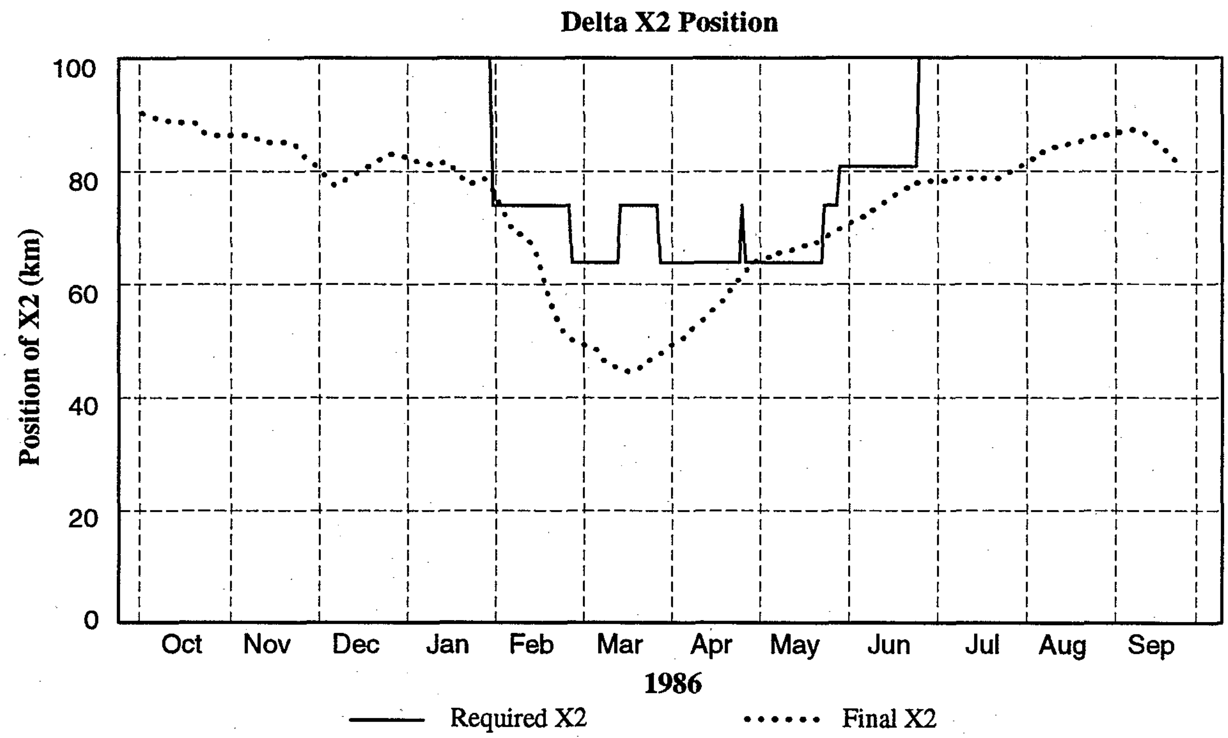


Figure A4-13B.
DailySOS Estimates of Adjustments to Historical CVP and SWP Delta Exports and DW Diversions and Exports with 1995 WQCP Objectives for 1986 Historical Inflows

DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



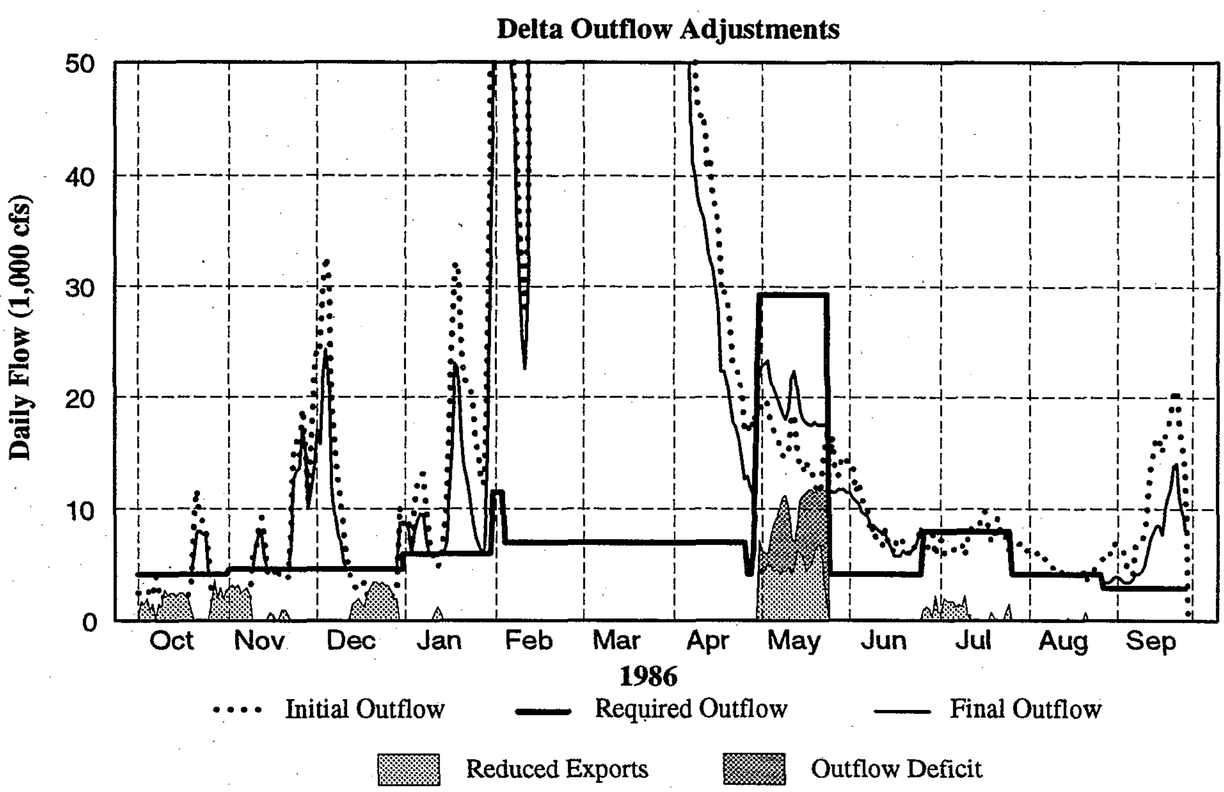
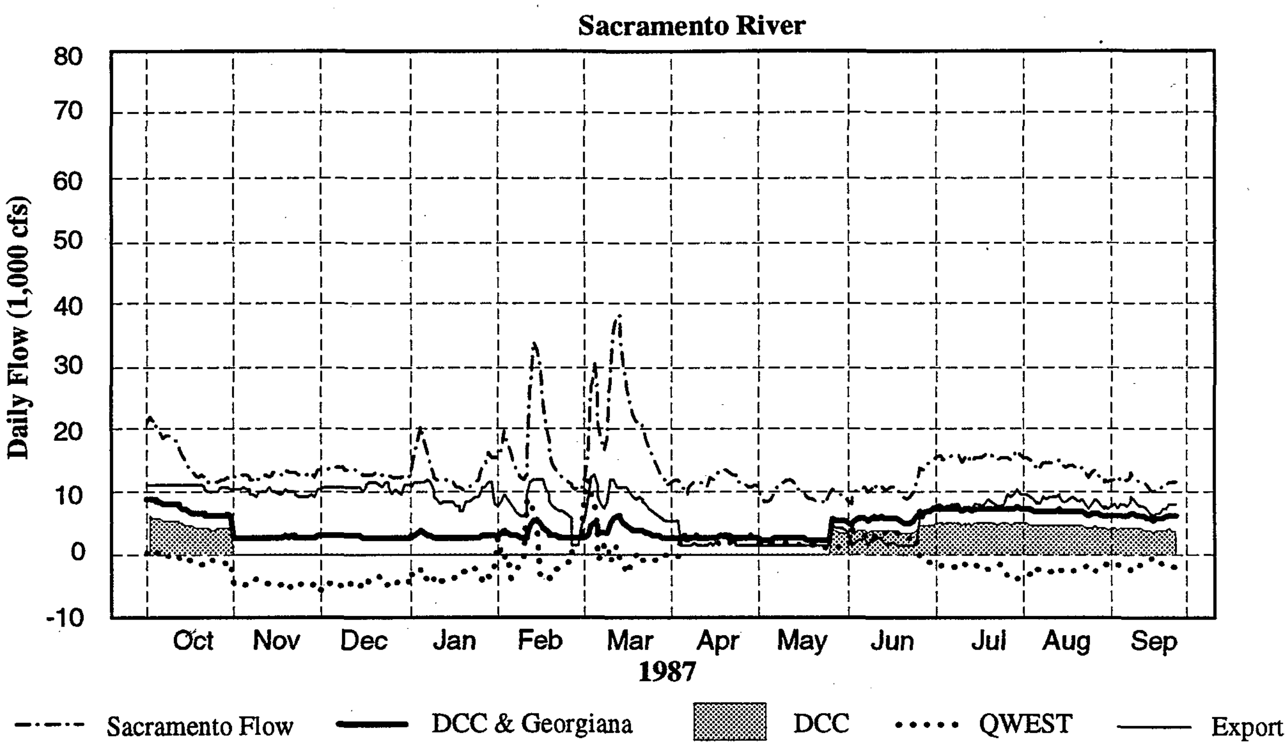


Figure A4-13C.
DailySOS Estimates of Required and Resulting X2 Location and Adjustments to Historical Outflow with 1995 WQCP Objectives for 1986 Historical Inflows

DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



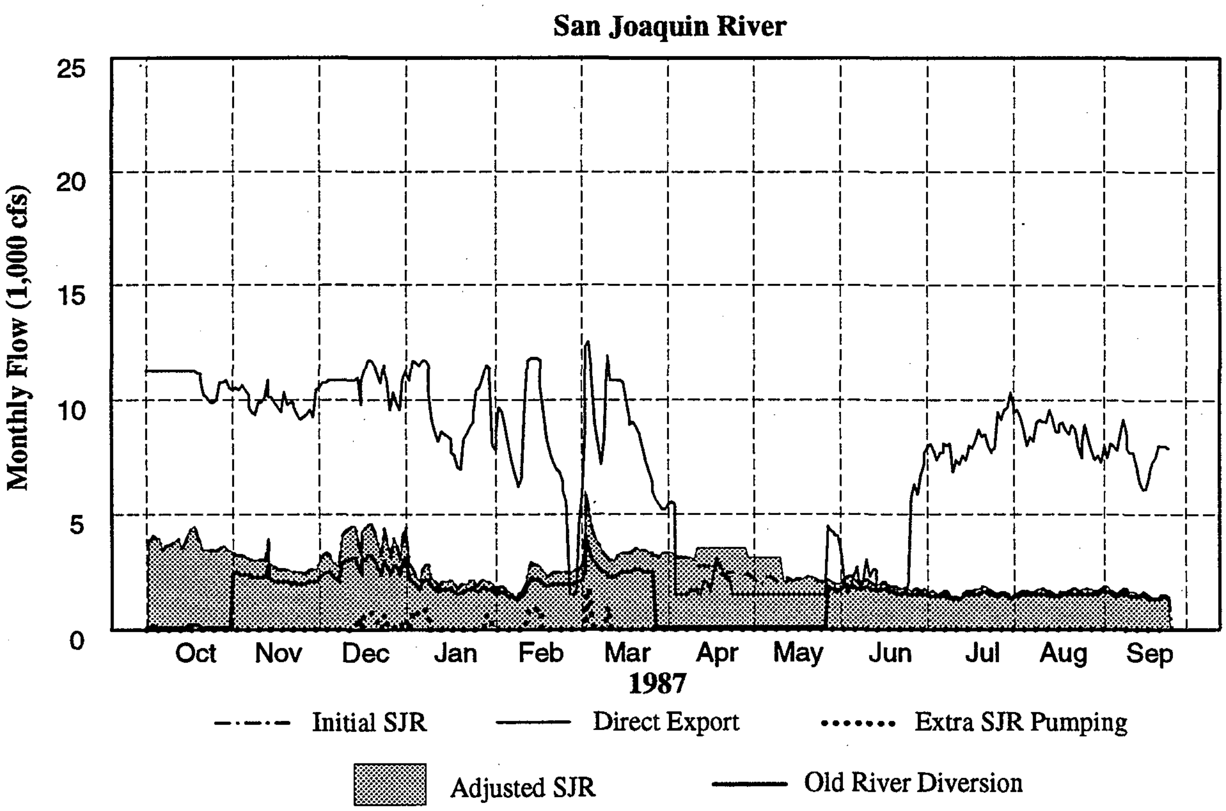


Figure A4-14A.
DailySOS Estimates of Sacramento and San Joaquin River Adjustments and Diversions with 1995 WQCP Objectives for 1987 Historical Inflows

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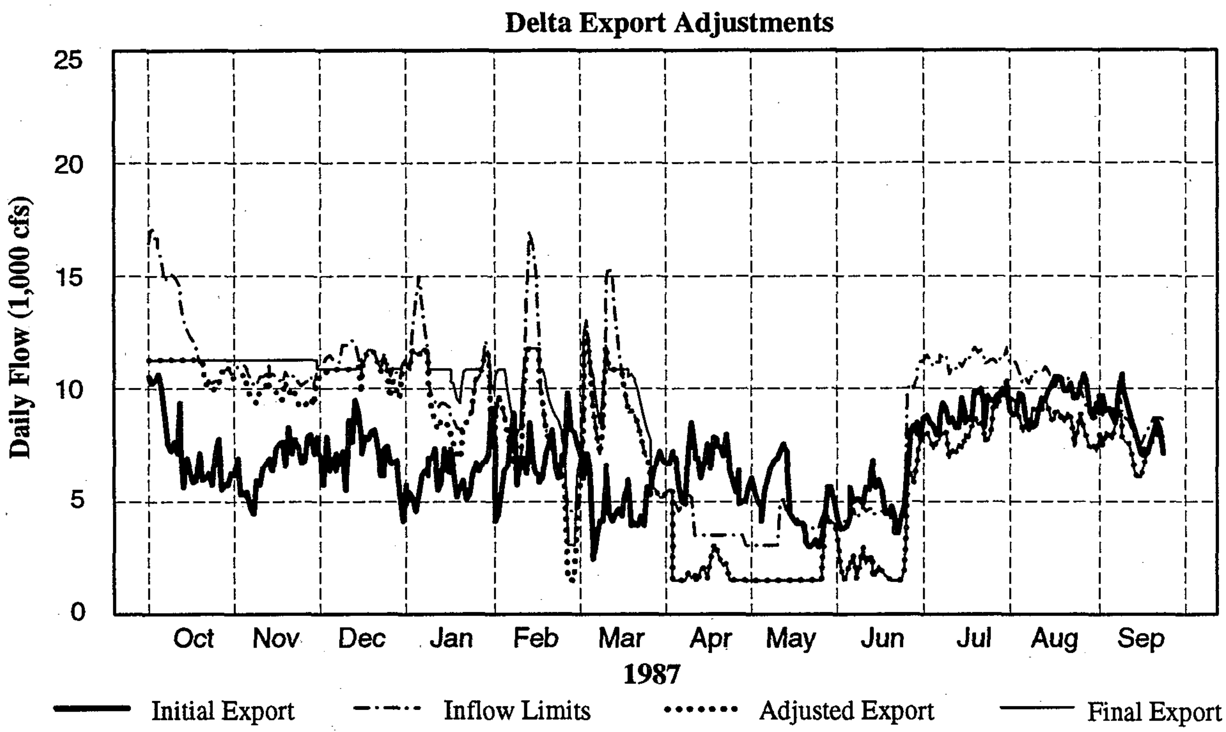

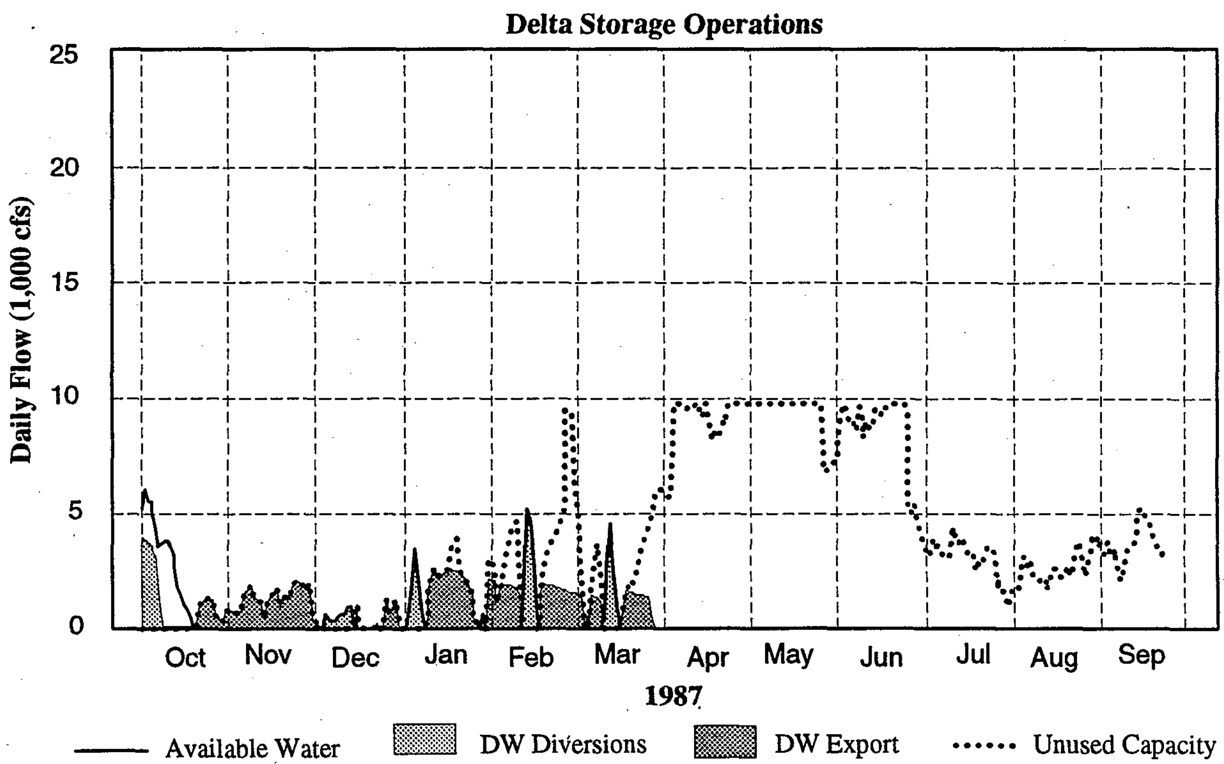

Figure A4-14B.
DailySOS Estimates of Adjustments to Historical CVP and SWP Delta Exports and DW Diversions and Exports with 1995 WQCP Objectives for 1987 Historical Inflows

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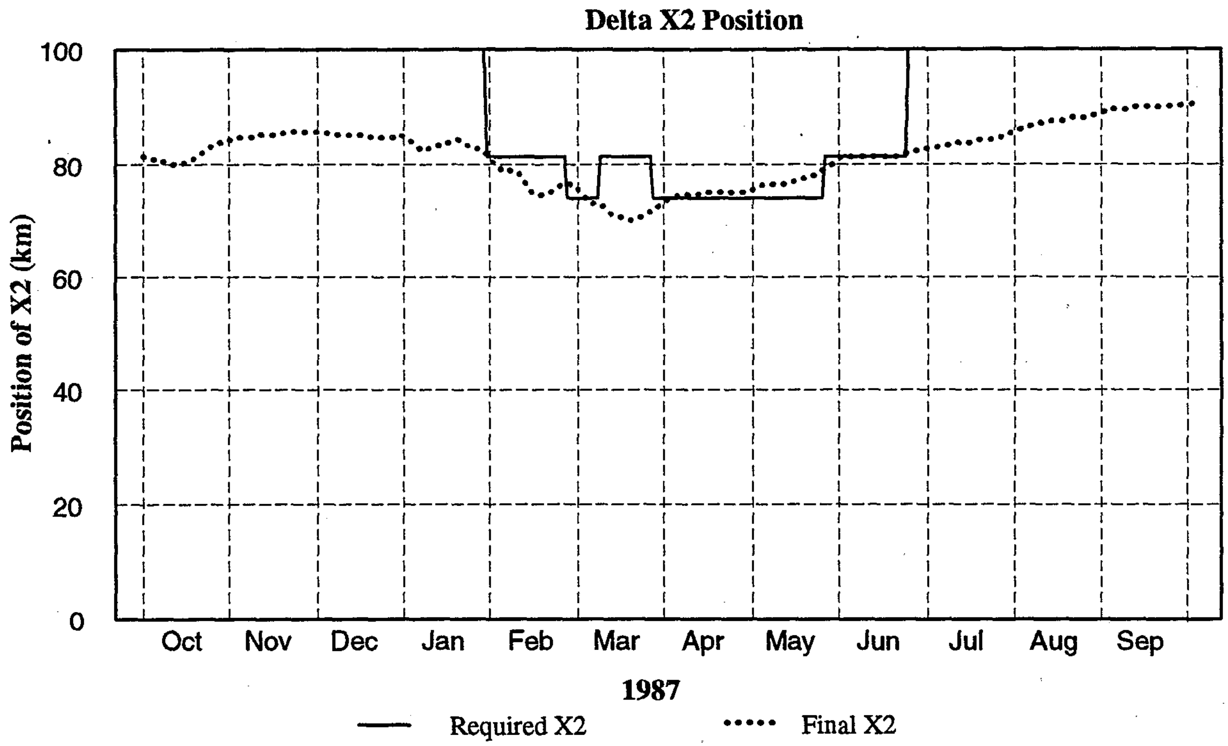

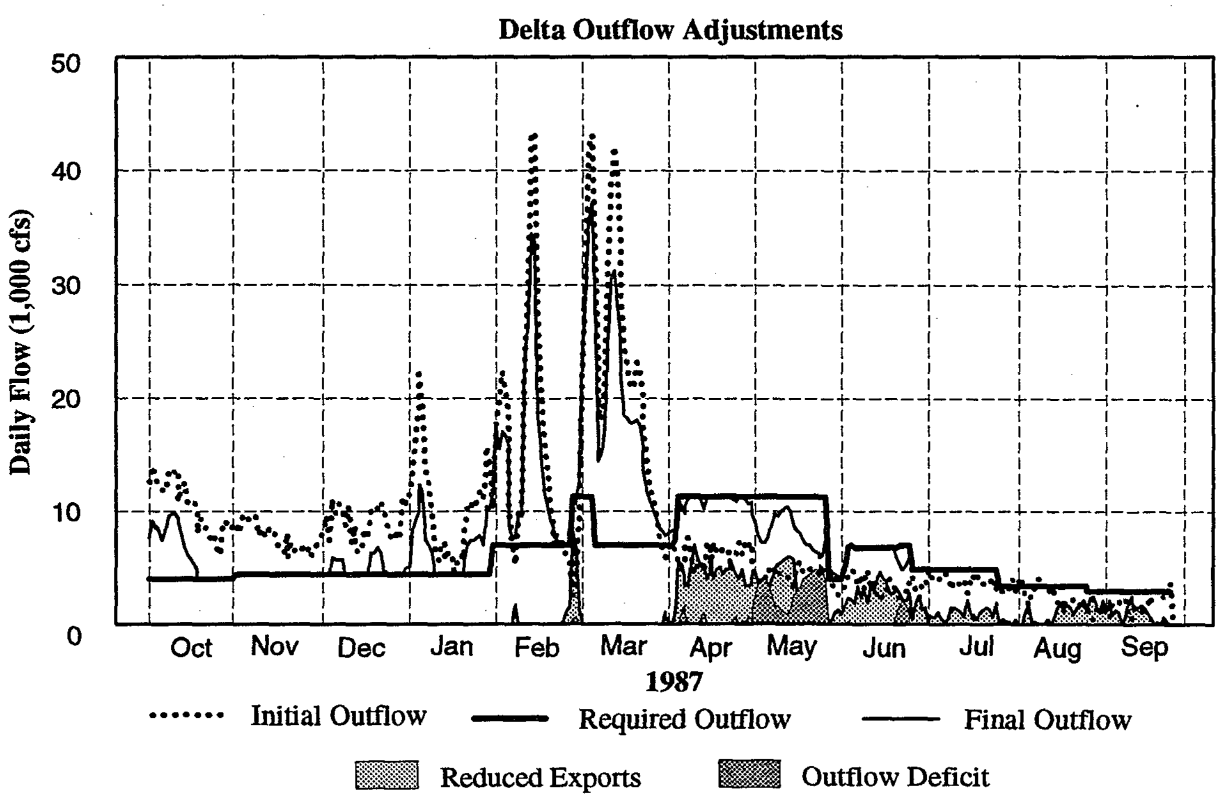

Figure A4-14C.
DailySOS Estimates of Required and Resulting X2 Location and Adjustments to Historical Outflow with 1995 WQCP Objectives for 1987 Historical Inflows

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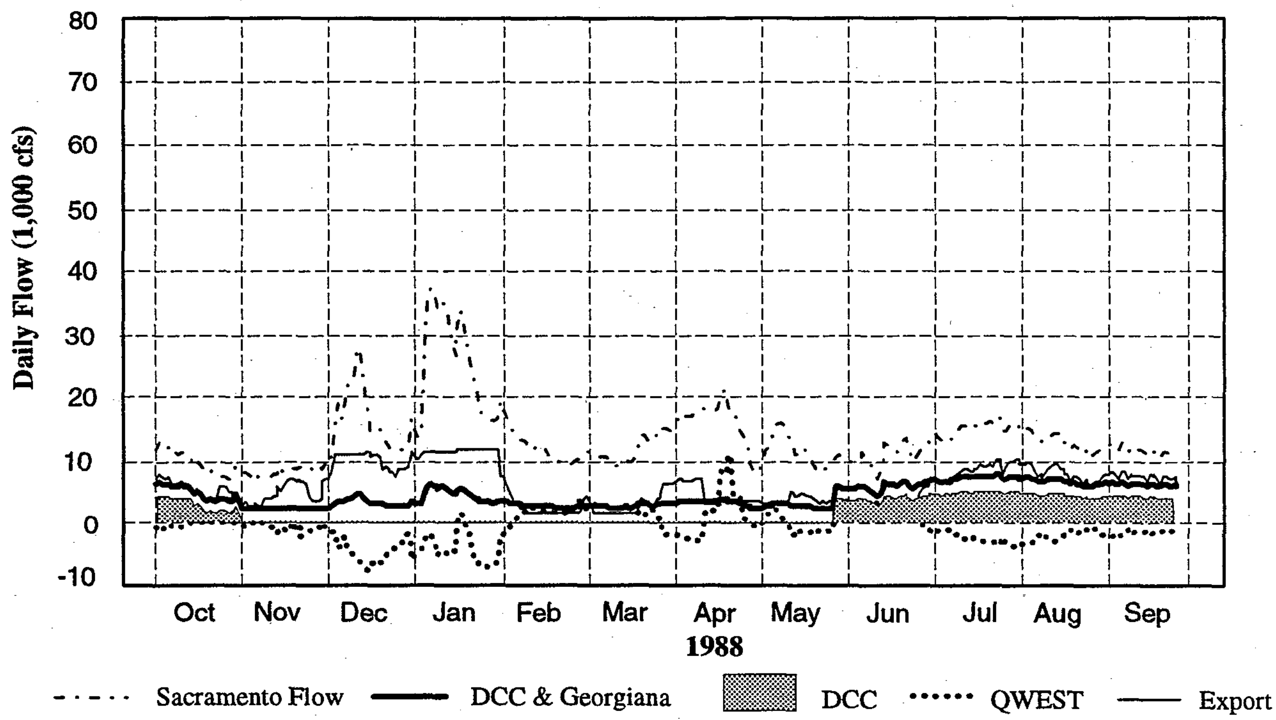
Sacramento River



San Joaquin River

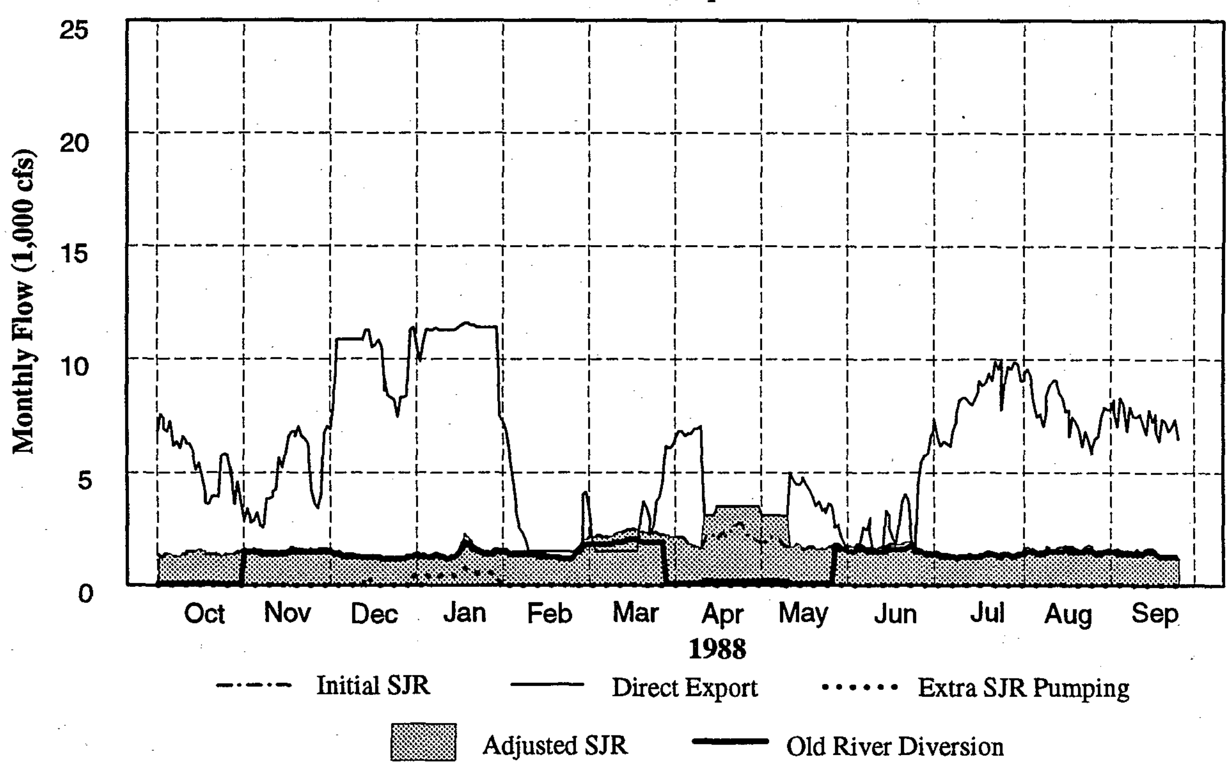


Figure A4-15A.
DailySOS Estimates of Sacramento and San Joaquin River Adjustments and Diversions with 1995 WQCP Objectives for 1988 Historical Inflows

DELTA WETLANDS
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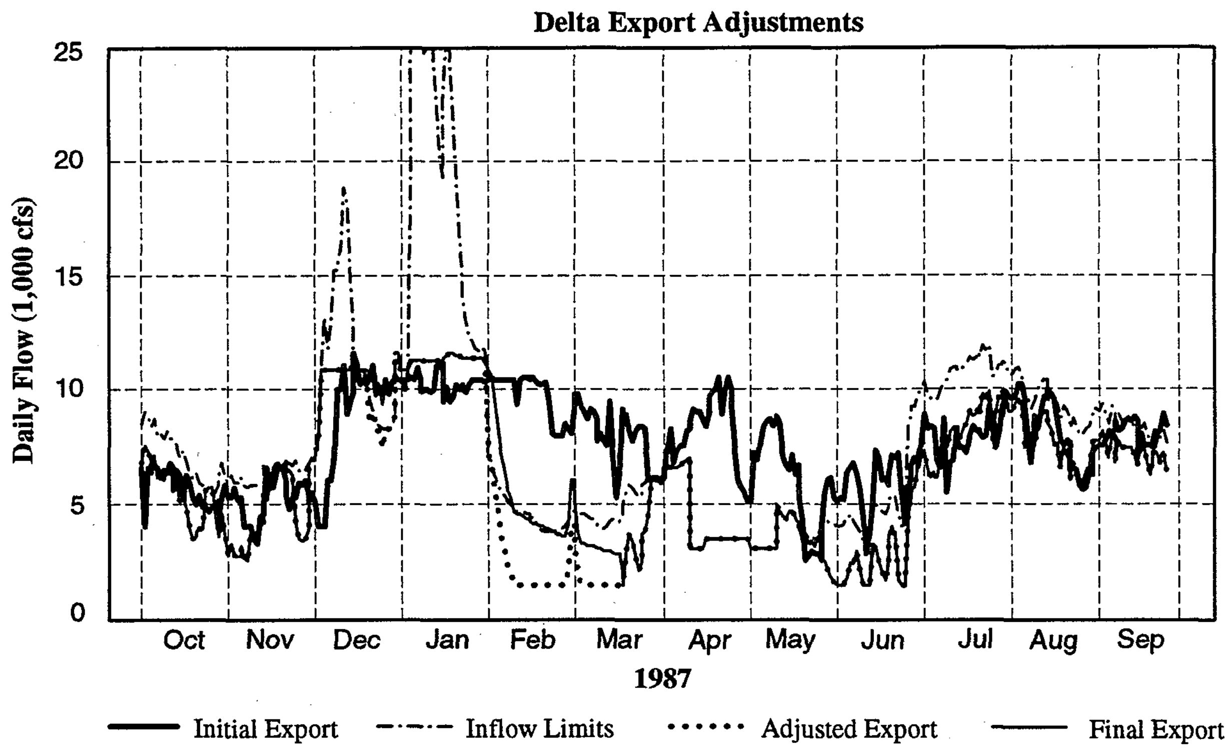

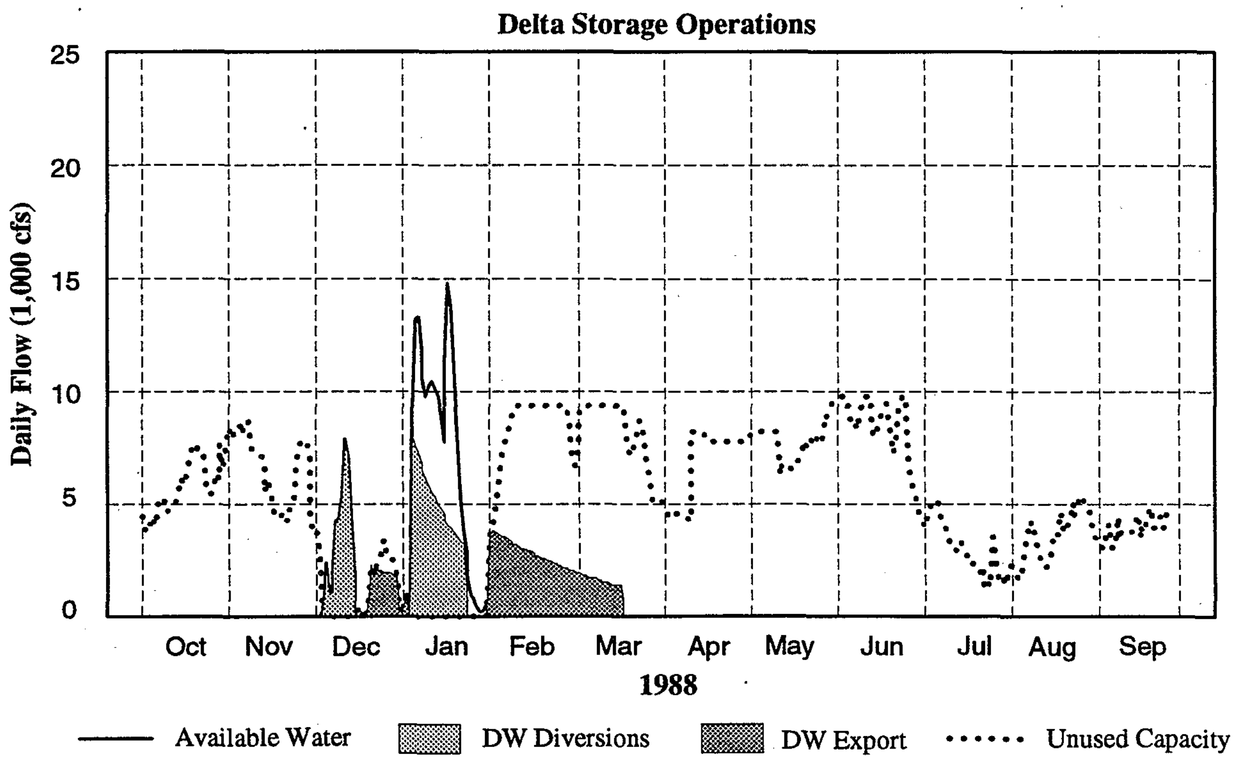

Figure A4-15B.
DailySOS Estimates of Adjustments to Historical CVP and SWP Delta Exports and DW Diversions and Exports with 1995 WQCP Objectives for 1988 Historical Inflows

DELTA WETLANDS
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Prepared by: Jones & Stokes Associates

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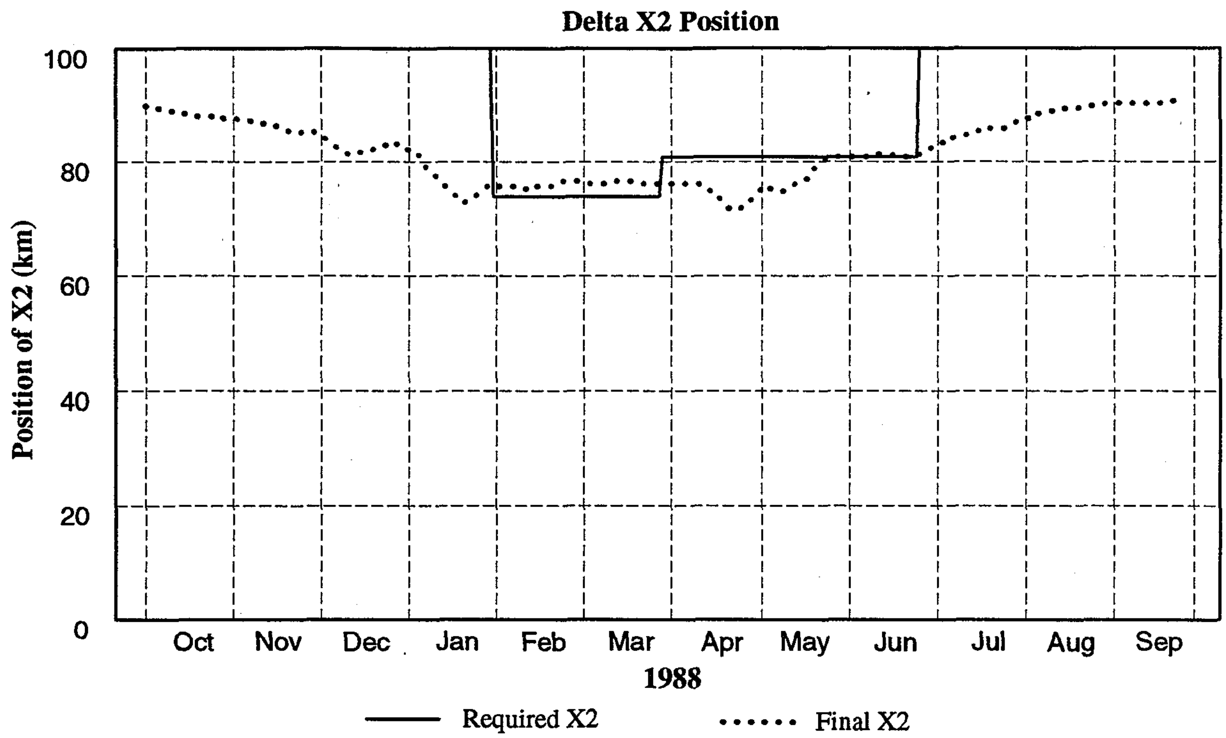

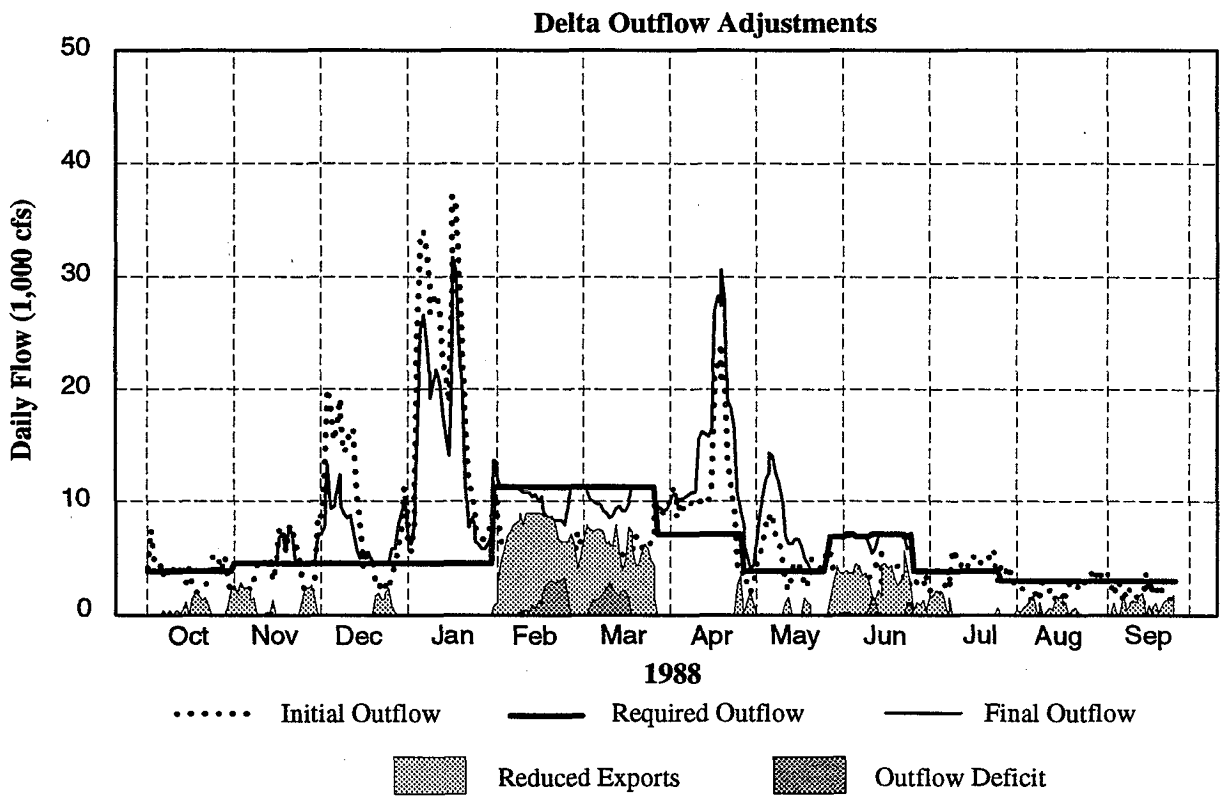

Figure A4-15C.
DailySOS Estimates of Required and Resulting X2 Location and Adjustments to Historical Outflow with 1995 WQCP Objectives for 1988 Historical Inflows

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PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates