Appendix B1. Hydrodynamic Modeling Methods and Results for the Delta Wetlands Project

C-061489

Appendix B1. Hydrodynamic Modeling Methods and Results for the Delta Wetlands Project

SUMMARY

This appendix describes the methods and results of modeling Delta hydrodynamic impacts of the Delta Wetlands (DW) project using the hydrodynamic module of the Resource Management Associates (RMA) Delta model. The RMA Delta model was used to estimate net Delta channel flows and inflow source contributions over a wide range of monthly Delta inflows, exports, and outflows to determine hydrodynamic changes that could be caused by diversions to and discharges from the DW project islands under DW project operations.

The appendix describes model calibration performed using tidal stage data and provides simulation results showing Delta tidal hydraulic patterns; relationships between inflows, exports, and assumed Delta channel gate operations; divisions of flow between several important Delta channels; and inflow source contributions at export and outflow locations. These hydrodynamic relationships were incorporated into the Delta Standards and Operations Simulation (DeltaSOS) and Delta Drainage Water Quality (DeltaDWQ) assessment models for impact assessment of the DW project alternatives.

The discussion describes the relationship between DW project operations and several hydrodynamic variables and identifies those variables that could be affected by DW project operations: Delta and local net channel flows and inflow source contributions. Results of simulations to determine effects of DW operations on net channel flows and source contributions are presented for each DW project alternative and the No-Project Alternative.

INTRODUCTION

Background

Analysis of Delta water resource impacts of the DW project is based on hydrodynamic modeling performed by RMA using its link-node hydrodynamic model of the Delta. RMA performed the modeling under the direction of the lead agencies and provided results to Jones & Stokes Associates (JSA) for use in conducting impact analyses for hydrodynamics, water quality, and fisheries, which are discussed in Chapters 3B, 3C, and 3F, respectively, of this environmental impact report/environmental impact statement (EIR/EIS). The RMA Delta model, developed jointly with California Department of Water Resources (DWR), represents the hydrodynamic responses of the Delta to different hydrologic and operational conditions.

Previous hydrodynamic modeling performed by RMA was used by JSA in preparing the 1990 draft EIR/EIS on the DW project. That previous modeling focused on 5 study years (1964, 1972, 1975, 1976, and 1978), representing each of the hydrologic year types classified under D-1485 criteria. A detailed description of the RMA model and its use for the 1990 draft EIR/EIS is provided in Smith and Durbin (1989) and summarized in this appendix.

For preparation of this revised draft EIR/EIS on the DW project, RMA performed new hydrodynamic modeling of Delta conditions based on monthly average historical Delta hydrology for the 25-year period of water years 1967-1991. Appendix A1, "Delta Monthly Water Budgets for Operations Modeling of the Delta Wetlands Project", describes the historical hydrologic inputs for the RMA model.

Purpose of This Appendix

The general goal of the hydrodynamic modeling described in this appendix was to simulate Delta net channel flows and inflow source contributions over a wide range of historical monthly Delta inflows, exports, and outflows to determine hydrodynamic changes that would be caused by additional diversions to and discharges from the DW project islands.

Following are the major sections of this appendix and the purpose of each:

- "RMA Delta Hydrodynamic Model Formulation" describes the hydrodynamic modeling methodology used by RMA.
- "RMA Delta Model Tidal Flow Calibration" discusses the calibration of the RMA Delta hydraulic simulations with available Delta tide gage records.
- "Simulated Delta Tidal Hydraulic Patterns" describes typical Delta tidal hydrodynamics, which are the computational basis for simulating and evaluating hydrodynamic effects of the DW project.
- "Simulations of Monthly Average Net Delta Channel Flows Using Historical Delta Inflows and Exports" presents results of simulations of historical Delta net channel flows.
- "Variables for Measuring Hydrodynamic Effects of DW Operations" defines the hydrodynamic relationships used by JSA to describe hydrodynamic effects of the DW project.
- "Maximum Hydrodynamic Effects on Local Channel Flows, Velocities, and Stages" and "Simulated Effects of DW Operations on Delta Channel Flows and Source Contributions" present detailed results of the hydrodynamic impact assessment of the DW project alternatives.

RMA DELTA HYDRODYNAMIC MODEL FORMULATION

The RMA Delta model represents the Delta as a network of nodes (volume elements) and links (channels). Nodes are discrete volume units characterized by surface area, depth, side slope, and volume as a function of water depth (stage). A node generally represents half the volume of the channels to which it is connected, so the channel volume is represented in the two nodes connected to the channel. The channels (links) connecting the nodes are each characterized by length, cross-sectional area, hydraulic radius (related to depth), and friction factor (Manning's "n" value) as a function of water depth. Water is modeled to flow from one node to another through one or more links representing the significant channels between nodes. The RMA Delta model is formulated with approximately 375 nodes and 465 links (Figure B1-1).

The RMA Delta model combines a link-node hydrodynamic module and a mass-balance water quality module. The hydrodynamic module is a branched one-dimensional formulation, which simulates average flow and velocity in each channel (model link) and average stage (water surface elevation) at each volume element (model node). Tidal flows simulated with the hydrodynamic module are used to estimate net channel flows and tidal mixing between model nodes, both of which are used to simulate mixed concentrations of water quality variables at model nodes in the mass-balance water quality module. The water quality module is described in Appendix B2, "Salt Transport Modeling Methods and Results for the Delta Wetlands Project".

The RMA hydrodynamic module operates on a 1.5-minute time step and estimates stages, flows, and velocities in the Delta channels for a repeating average tide. The primary inputs to the RMA hydrodynamic model are Delta inflows, exports, Delta channel diversions and drainage discharges, and the repeating average tidal boundary conditions at the downstream end of Suisun Bay near Benicia. Delta agricultural diversions and drainage discharges are treated as sinks or sources at appropriate nodes.

Time Step of Inputs and Calculations

Impact assessments of DW operations are based on DWRSIM simulations of monthly average SWP and CVP reservoir operations and Delta exports, which are used in the DeltaSOS assessment model. The RMA simulations of monthly average flows were used to provide an accurate characterization of hydrodynamic conditions (tidal and net channel flows) for a full range of possible Delta inflows and exports.

The RMA model was used to simulate 1967-1991 historical Delta conditions using monthly average inflows and exports. All historical hydrologic data and simulations use water years (October-September). The range of hydrologic conditions that occurred during this 25-year period is similar to the full range of conditions represented by the 1922-1991 hydrologic record. The historical Delta inflows and exports for 1967-1991 are similar to those that would be expected under the No-Project Alternative because most of the existing SWP and CVP facilities and reservoirs and diversion facilities on Delta tributaries were operational during this period (conditions for the No-Project Alternative differ from historical conditions because the No-Project Alternative would operate under 1995 WQCP requirements and export demands).

Monthly Delta inflows and exports and estimates of agricultural diversions and drainage were derived from DAYFLOW, as described in Appendix A1. Daily variations in river inflows, Delta exports, or Delta Cross Channel (DCC) gate operations for flood control or fishery management are not simulated in monthly simulations. Although hydrologic conditions can be specified and used in the RMA model at a daily time step, monthly simulations are considered adequate for impact assessment of the DW project because year-to-year and seasonal changes in Delta hydrology and potential DW operations are adequately represented by monthly simulations (see Appendix A4, "Possible Effects of Daily Delta Conditions on Delta Wetlands Project Operations and Impact Assessments").

The tidal boundary condition used in the RMA model is the 19-year average tidal pattern measured at Benicia, typically used in Delta hydrodynamic studies. Long-term average tide data were used in place of actual tide data for all RMA simulations of operations of the DW project alternatives (Smith and Durbin 1989). An extreme tide was used for simulating maximum DW diversions and maximum DW discharge conditions (see "Maximum Hydrodynamic Effects on Local Channel Flows, Velocities, and Stages", below). Although averaging tide measurements smooths the differences between extreme tides throughout the year, it is justified because the hydrologic inputs are monthly averages. The hydrodynamic model repeats this average tide for each set of monthly inputs. Because the tidal cycle is 25 hours long, net channel flows are averages for the 25-hour tidal period in units of cubic feet per second (cfs). Figure B1-2 illustrates typical variations in tidal fluctuations at Antioch during a half lunar cycle of 14 days.

The RMA model calculations of tidal hydraulics were made at a 1.5-minute time step (tidal hydraulics simulated for the average Benicia tide are described in a later section of this appendix). Hydrodynamic results are summarized as average ebb tide flows, average flood tide flows, and net (positive or negative) channel flows for each set of hydrologic inputs (net flow = ebb tide flow - flood tide flow). The sign convention of the RMA link-node model is based on the assumption that positive flow is from a lower number node to a higher number node. Most node numbers increase from upstream to downstream so that positive channel flows correspond to river flow and ebb tide flow. Flood tide flows for these nodes are negative. Positive and negative flows are added and the result is divided by the approximately 25-hour tidal period to give the average net channel flow for each model link. Because the hydrologic inputs to the RMA model for the DW impact assessment were monthly averages, the model outputs for net channel flows are also monthly averages.

Hydrologic Inputs

The RMA hydrodynamic model inputs are specified in a hydrologic input file with monthly values for water years 1967 to 1991 for each required input variable. Values for river inflows, Delta exports, and combined DW project diversions and discharges were obtained from DeltaSOS model results for each DW project simulation case. The RMA input file spreadsheet disaggregates the total DW project diversions and discharges into monthly average flows for each of the four DW project islands. Agricultural diversions and drainage flow estimates for Delta uplands and Delta lowlands, as well as channel evaporation estimates, were obtained from results of simulations using the DeltaDWQ model (described in Appendix C4, "DeltaDWQ: Delta Drainage Water Quality Model").

The RMA Delta model allocates Delta inflows, exports, agricultural diversions and drainage flows, and proposed DW project diversions and discharges to the appropriate model nodes. The total drainage and diversion volume for the Delta is allocated among the Delta islands in proportion to each island's acreage as a percentage of total Delta acreage. The total drainage and diversion volume for an individual island is also allocated between the nodes surrounding the island in proportion to the relative sizes of siphons and pumps at each node. RMA has further divided the drainage and diversion fractions to correspond to Delta uplands and lowlands. DeltaDWQ produces separate estimates for water budget terms for these two regions of the Delta (see Figure C4-12 in Appendix C4).

Simulated Delta Facilities

The simulation results produced by the RMA Delta model depend on assumed Delta channel configurations and geometry, the DCC gate operation pattern, and the tidal operation pattern of the Clifton Court intake and the Suisun Marsh salinity control gate.

The analysis described in this appendix used existing channel geometry without any of DWR's proposed modifications in north Delta or south Delta channels. Existing

CCWD, CVP, and SWP pumping capacities, as simulated by the DeltaSOS model (described in Appendix A2), were assumed in the RMA model.

The RMA input file specified the operation of the various Delta channel control gates. Monthly operation (open or closed) of the DCC, the Suisun Marsh salinity control gate, and the temporary barrier at the head of Old River were specified. The partial barriers that are being installed and operated by DWR in the south Delta were not simulated.

RMA DELTA MODEL TIDAL FLOW CALIBRATION

Hydrodynamic calibration of the RMA model has been previously demonstrated for selected years (Smith and Durbin 1989). Direct hydrodynamic calibration of the RMA model with channel flows and velocities has not been possible because flows and velocities have not been measured routinely in the Delta channels (some stations are now operational). Calibration is therefore based on the match between observed and simulated water surface fluctuations at several tidal stage recording stations located throughout the Delta.

Conservation of mass requires that flow past a location depends directly on tidal phase and amplitude. Therefore, agreement between measured and computed stage is a good indication that the model is properly simulating the tidal movement of water in Delta channels. As the figures described below demonstrate, the Delta channel tidal stage patterns simulated by the RMA hydrodynamic model generally match tidal stage data.

The following are example comparisons of observed and simulated stage at important Delta locations. Two methods are used to compare simulated and observed tidal stage: time-series plots of tidal stage and scatter plots of observed and simulated stage. Inaccurate gage datums caused by levee subsidence may result in observed stage being consistently high; thus, simulated stage may be consistently lower than observed stage. Errors in modeled tidal phase or the magnitude of tidal fluctuations will cause the difference between the observed and simulated stage to fluctuate.

Figure B1-2 shows observed and simulated stage for the San Joaquin River at Antioch for the period of July 6-19, 1979. Average Delta hydrology during this periods was as follows: Sacramento River inflow of about 16,000 cfs, San Joaquin and eastside stream inflow of about 1,700 cfs, Delta exports of about 9,300 cfs, channel depletion of about 4,400 cfs, and Delta outflow of about 4,000 cfs. Both the time-series and scatter plots indicate agreement between simulated and observed stage at Antioch. The time-series plot shows that the model correctly accounts for the 2.5-hour tidal lag between the Benicia tidal boundary and Antioch, thus correctly representing conveyance factors and friction terms in the channels over that distance. The correspondence of simulated and observed stage at Antioch suggests that the tidal flow split between the Sacramento River and San Joaquin River channels is accurately simulated by the RMA model.

Figure B1-3 shows observed and simulated stage for the Sacramento River at Walnut Grove for the period of July 6-19, 1979. Both the time-series and scatter plots indicate agreement between simulated and observed stage at Walnut Grove. The time-series plot shows that the model correctly accounts for the 4-hour tidal lag between the Benicia tidal boundary and Walnut Grove. Simulated low tides are several inches lower than measured low tides, but the simulated magnitudes and timing of the tides are very close to those observed. The stage correspondence at Walnut Grove suggests that tidal flows in the Sacramento River, and therefore in the DCC and Georgiana Slough, are accurately simulated by the RMA model.

Figure B1-4 shows observed and simulated stage for Old River at Rock Slough for the period of July 6-19, 1979. Both the time-series and scatter plots indicate close agreement between simulated and observed stage at Rock Slough. The time-series plot shows that the model correctly accounts for the 4.5-hour tidal lag between the Benicia tidal boundary and Rock Slough. Low tides are lower than measured by a few inches, but the simulated magnitudes and timing of the tides are very close to the observed stage. The stage correspondence at Rock Slough suggests that tidal flows in Old River near two of the islands for the proposed DW project, Holland Tract and Bacon Island, are accurately simulated by the RMA model.

Tidal stage calibrations at several other Delta locations are shown in Smith and Durbin (1989). The tidal calibration results suggest that the RMA Delta model can be used with confidence to simulate the possible effects of the proposed DW project on Delta channel stage, velocity, and flow. Appendix B2 presents further confirmation of the RMA model calibration by comparing observed and simulated salinity (electrical conductivity [EC]) patterns for 1968-1991. Simulation of the historical EC data provides indirect evidence that the hydrodynamic simulations are accurate because the tidal flows govern the upstream mixing of EC from the downstream boundary.

The U.S. Geological Survey (USGS) and DWR have installed ultrasonic velocity meters (UVMs) in the Sacramento River at Freeport, Montezuma Slough at the Suisun Marsh salinity control gate, Old River at Bacon Island, and Middle River at Bacon Island and plan to install more of these velocity and flow measuring devices. Obtaining tidal flow measurements in Delta channels will provide an opportunity to adjust hydraulic model coefficients and further increase the hydrodynamic model accuracy.

SIMULATED DELTA TIDAL HYDRAULIC PATTERNS

The RMA Delta model computes hydrodynamic effects based on simulations of tidal flows in Delta channels induced by the average tide at the downstream Delta boundary and based on the inflows and exports specified at model boundary nodes. Because the same average tide is used for all specified inflows and exports, Delta tidal flows induced by the average tide, without any inflows or exports, can be described once for all hydraulic simulations. The purposes of this section are to:

- document typical Delta tidal hydraulics, which are the computational basis for simulating and evaluating hydrodynamic effects of the DW project;
- demonstrate the influence of tidal flows on transport and mixing exchange in the Delta channels, which govern the movement of salt and other water quality variables and may govern the movement and survival of various fish life stages in the Delta; and
- describe the averaging of the tidal flows to calculate the tidally averaged net channel flows and tidal mixing flows (part of tidal flow involved in mixing), which are used in the RMA Delta water quality mass-balance model computations.

Channel Geometry

Hydraulic simulations require accurate geometry data for the Delta channels. Surface area is important in determining the upstream tidal flow for a given change in stage at a node. Cross-sectional areas and lengths of channels (with corresponding friction factor) determine divisions of flow when tidal flows can move into more than one channel. Volume determines the change in stage corresponding to a tidal inflow or outflow at a node. Table B1-1 summarizes these important hydraulic geometry data for major Delta channel segments.

As the flood tide flow moves into Delta channels, stage increases and water is stored in the channels. This dynamic storage in a channel reduces the total flow in an upstream direction and attenuates the flood tide wave. The amount of storage is a function of the channel surface area and the change in stage. As the tide reverses to ebb, the temporary channel storage empties and creates the ebb tide flow out of the Delta.

Typical tidal hydrodynamic simulations do not include the effects of the spring-neap tidal cycle on the mean tidal stage of the Delta. There is a daily variation in the average tidal stage over the spring-neap cycle, with a variation of approximately 1 foot within the 28-day lunar cycle; the mean stage during spring tides (one large and one small tidal fluctuation) tends to be higher, and the mean stage during neap tides (two moderate tidal fluctuations) tends to be lower. This variation in mean stage produces a component of Delta outflow (positive or negative) due to this tidal filling and emptying cycle of the Delta that is not included in the RMA simulations that used long-term typical tidal fluctuations at Benicia.

Simulated Tidal Hydraulics

Table B1-2 presents simulated tidal flows, tidal velocities, channel cross-sectional area, and tidal excursions for selected Delta channel locations. The average flood tide flow is typically calculated from the tidal simulation results as the 12.5-hour average of all flood tide flows during the tidal cycle. The actual tidal cycle may contain two periods of flood tide flow corresponding to the two periods of rising water surface elevations (stages) between low tide and high tide. An equivalent flow moves in the opposite direction during the ebb flow portions of the tidal cycle. The magnitude of the simulated tidal flow determines the strength of simulated tidal effects in a Delta channel.

Average flood tide velocity is the average simulated velocity during the 12.5 hours of simulated floodflows in a channel. The average channel cross-sectional area can be approximated as the average flow divided by the average simulated velocity. The channel area of some channels may increase considerably between low tide and high tide.

Tidal excursion is the average distance that a passive object would move between high tide (upstream) and low tide (downstream). The daily tidal excursion is the range of the cumulative tidal movement, calculated from the simulated average tidal velocities as the estimated position of imaginary objects (particles) released at the beginning of the tidal cycle and followed as they move upstream on flood tide flows and then downstream on ebb tide flows. During tidal flows there is a considerable "spreading" of water in Delta channels because water in the central portion of the channel has a greater velocity than water near the sides and bottom. This tidal spreading is what causes tidal mixing of salt and other materials released into Delta channels.

Tidal Hydraulics in Suisun Bay

Figure B1-5 shows the simulated tidal hydraulics in Suisun Bay. The average tide at Benicia at the west end of Suisun Bay begins with the high-high tide of 3.0 feet (mean sea level [msl] datum); the low-low tide of -2.8 feet occurs at about hour 8. The low-high tide of 2.2 feet occurs at hour 14; the high-low tide of -0.2 feet occurs at hour 19. The RMA model therefore simulates average tide in Suisun Bay with a 5.8-foot range over the tidal cycle. The change in tidal stage controls the movement of water into and out of Suisun Bay and the Delta.

The simulated tidal stages at Chipps Island at the east end of Suisun Bay are very similar to those for the boundary tide specified at Benicia, except that the low-low tide stage at Chipps Island is only -2.1 feet, not as low as at Benicia. The tidal stage pattern for Chipps Island lags behind the Benicia pattern by about 1-1.5 hours.

The change in tidal velocity lags behind the change in tidal stage. This is because the tidal change in the slope of the water surface elevation drives the tidal velocity and flow in the estuary channels. At Benicia, for example, the simulated stage is decreasing from high tide during the first 7.5 hours of the tidal cycle. The simulated velocity and flow at Benicia are in the upstream (negative) direction for the first 2.5 hours, and then are in the downstream direction with a peak downstream flow at hour 6.5, about 1 hour before low tide. The peak flood tide flow and velocity (upstream direction) occurs at hour 13.5, approximately 1 hour before the high tide simulated at hour 14.5. Therefore, high tides are generally associated with maximum upstream flow and velocity, while low tides are associated with maximum downstream flow and velocity, but peak flows precede the high and low tides. The delay between peak flows and peak stages varies with location within the estuary.

Simulated tidal velocities at Benicia and Chipps Island are similar, with a lag of about 1 hour between these two locations. The peak tidal velocities are about 3 feet per second (fps), with an average velocity of about 1.8 fps. Although the pattern of tidal velocities depends on the specified tide, these tidal velocities provide a general indication of the magnitude of the tidal exchange within Suisun Bay.

Simulated tidal flows at Benicia are quite large, with a peak ebb tide flow of about 575,000 cfs (positive downstream flow) and a peak flood tide flow of about 500,000 cfs (negative upstream flow). The average simulated flood tide flow at Benicia is 322,000 cfs (Table B1-2). Because this flood tide flow occurs during one-half of the day, the conversion factor between average flood tide flow (cfs) and daily flow volume (acre-feet/day) is about 1. Therefore, the volume of water moving upstream into Suisun Bay from the Benicia boundary during the flood tide periods of one tidal cycle is approximately 322,000 acre-feet (af). This daily flood tide volume is about 73% of the mean tide volume of Suisun Bay shown in Table B1-1 (443,000 af at mean sea level). A similar amount of water moves from Suisun Bay into San Pablo Bay during the ebb tide periods. These simulated results indicate very high exchange rates for water in Suisun Bay.

Simulated tidal flows at Chipps Island are considerably less than at Benicia, with a peak ebb flow of about 320,000 cfs and a peak flood tide flow of 310,000 cfs. The average flood tide flow is about 203,000 cfs. The reduction in flood tide flow at Chipps Island is caused by the temporary storage of water in Suisun Bay. The surface area of Suisun Bay is approximately 25,000 acres, and about 100,000 af can be temporarily stored within a tidal range of 4 feet. In addition, a large tidal flow (approximately 20,000 cfs flood tide flow) moves into the Suisun Marsh channels.

Tidal Hydraulics in the Sacramento River

Based on specified model channel geometry (Table B1-1), the Sacramento River from Chipps Island to Sacramento is estimated to have a water volume of about 280,000 af. The Sacramento River upstream of Chipps Island encompasses about 13,000 surface acres of water with a mean depth of 21.5 feet. Simulated tidal hydraulics at four locations along the Sacramento River in the Delta are shown in Figure B1-6.

Simulated tidal stage at Collinsville has a slightly reduced range compared with tidal stage at Benicia, with a high tide of 2.8 feet and a low tide of -2.0 feet. The tidal range at Rio Vista is about the same as at Collinsville. The tidal range is reduced at Walnut Grove and Courtland, with a high tide of 2.5 feet and a low tide of -1.0 foot (Figure B1-6). The tidal lag between Benicia and Collinsville is about 2 hours, between Collinsville and Rio Vista is about 1 hour, between Rio Vista and Walnut Grove is another hour, and between Walnut Grove and Courtland is somewhat less than an hour. Therefore, the total simulated tidal lag from Benicia to Courtland is approximately 5 hours.

The simulated typical tidal hydraulic patterns at Walnut Grove (Figure B1-6) can be compared with the 14-day period of tidal stage measurements and simulation results shown in Figure B1-3. The simulated stage at Walnut Grove for the long-term average typical tide varied from -1.0 foot to 2.5 feet msl. The measured tide for the 14-day period in July 1979 varied from about 0.0 to about 3.5 feet. The measured tide fluctuations were well matched by simulated stages during the July 1979 period because the Sacramento river flow of approximately 16,000 cfs raised the average stage by about 1 foot. The simulations producing the typical tidal hydraulic results shown in Figure B1-6 assumed no river inflows, so the average stage was determined by the average tidal stage used as input at the Benicia boundary. A tidal range of about 3.5 feet at Walnut Grove was simulated both for the historical 1979 period and for the typical tidal simulation.

The magnitude of the flood tide flow decreases in the upstream direction as the flood wave is attenuated through storage in the Sacramento River and connecting Delta channels. Table B1-2 lists simulated average flood tide flows for Sacramento River and Delta channels. The average flood tide flow at Collinsville is about 100,000 cfs at an average flood tide velocity of 1.3 fps. At Rio Vista, the average flood tide flow is 46,000 cfs at an average velocity of 0.8 fps. A large portion of flood tide flow (29,000 cfs) moves up Cache Slough and the Sacramento Ship Channel, and a smaller portion continues up the Sacramento River. At Walnut Grove, average flood tide flow is 6,500 cfs at an average velocity of 0.8 fps.

Tidal Hydraulics in the San Joaquin River

Figure B1-7 shows simulated tidal hydraulics at four locations on the San Joaquin River. The San Joaquin River joins the Sacramento River near Collinsville. Because the San Joaquin River has more side channels than the Sacramento River, its tidal flow patterns are more complex. The San Joaquin River between Vernalis and the mouth near Collinsville has a total surface area of approximately 11,300 acres and volume of about 240,000 af.

Simulated tidal stage at Antioch has a range of about 4.5 feet, with a high tide of 2.7 feet and a low tide of about -1.8 feet. Tidal stage decreases only slightly as far upstream as Fourteenmile Slough near Stockton. Tidal lag, however, increases upstream on the San Joaquin River. Tidal lag between Benicia and Antioch is about 2 hours; tidal lag is another hour at Jersey Point; and at Fourteenmile Slough, the tidal lag from Benicia is about 5 hours. Tidal lag from Benicia to the head of Old River is approximately 7 hours (Figure B1-7).

Table B1-2 lists simulated average flood tide flows for the San Joaquin River and connecting channels. Simulated average flood tide flow at Antioch is 95,000 cfs at an average velocity of 1.6 fps. Upstream at Jersey Point, the average flood tide flow is 86,000 cfs at an average velocity of 1.4 fps. Approximately half the San Joaquin River flood tide flow enters the Franks Tract area through Dutch Slough and False River. The average flood tide flows in Dutch Slough and False River are about 4,800 cfs and 39,000 cfs, respectively. A small flood tide flow (3,000 cfs) reenters the San Joaquin River through the mouth of Old River.

At the mouth of the Mokelumne River, simulated average flood tide flow in the San Joaquin River is about 57,000 cfs at an average velocity of 0.9 fps. A portion of the tidal flow moves into the Mokelumne River channels through the Mokelumne River mouth and Potato Slough.

The average flood tide flow above the mouth of Middle River mouth and Columbia Cut is about 12,600 cfs, and above Turner Cut and Fourteenmile Slough the average flood tide flow is reduced to about 4,000 cfs. At the head of Old River near Mossdale, the average flood tide flow is reduced to about 1,000 cfs.

Tidal Hydraulics in Old River

Figure B1-8 shows the simulated tidal hydraulics at three Old River locations. Old River and connecting channels, including Franks Tract and Big Break, have a total surface area of about 10,000 acres and a volume of about 115,000 af. Flood tide flow actually enters Old River through Franks Tract from Dutch Slough and False River. Flood tide flow at the mouth of Old River moves from Franks Tract to the San Joaquin River.

The simulated tidal stage is similar at the three Old River locations. At Holland Tract, tidal range is about 3.8 feet, with a high tide of 2.6 feet and a low tide of -1.2 feet. At Coney Island, opposite the Clifton Court entrance gates, high tide is 2.6 feet and low tide is -0.9 feet, for a tidal range of 3.5 feet. The tidal lag from Benicia is about 4 hours at Holland Tract and increases to about 7 hours at Coney Island.

Table B1-2 lists simulated average flood tide flows in Old River. Simulated average flood tide flow in Old River at Rock Slough is about 9,300 cfs at an average velocity of 0.8 fps. At Woodward Canal, just north of Victoria Canal and Clifton Court, the average flood tide flow is about 7,700 cfs at an average velocity of 1.1 fps. At Coney Island, opposite the entrance to Clifton Court and north of Grant Line Canal, the average flood tide flow is about 5,700 cfs at an average velocity of 1.2 fps. Some of this flood tide flow joins Old River from Victoria Canal and Middle River.

Tidal Hydraulics in Middle River

Figure B1-9 shows simulated tidal hydraulics at four locations on Middle River. Middle River, including Turner and Columbia Cuts, Mildred Island, and Victoria Canal, has a surface area of about 4,000 acres and a volume of about 62,000 af. Flood tide flow from the San Joaquin River enters Middle River at the mouth and through Turner Cut. Flood tide flow reenters the San Joaquin River from Middle River through Columbia Cut.

The simulated tidal range in Middle River channels is quite uniform, with a high tide of about 2.6 feet and a low tide of -1.2 feet at the mouth and -0.8 feet at the head of Middle River. The tidal lag between Benicia and the mouth of Middle River is about 4 hours. The tidal lag increases to about 5 hours at Victoria Canal and about 7 hours at the head of Middle River.

Table B1-2 lists simulated average flood tide flows in Middle River. Simulated average flood tide flow entering the mouth of Middle River from the San Joaquin River is about 18,000 cfs at an average velocity of 0.5 fps. Upstream of Columbia Cut, average flood tide flow is about 14,700 cfs. At Victoria Canal, average flood tide flow is 4,300 cfs at an average velocity of 1.0 fps. Most of the flood tide flow (3,400 cfs) enters Victoria Canal, and a flow of only about 900 cfs continues upstream in Middle River.

Tidal Hydraulics in the South Delta

Simulated tidal hydraulics in the south Delta are of particular interest because fluctuations in tidal stage are important for agricultural diversions, and tidal flows provide flushing of agricultural drainage water. Simulated tidal hydraulics at four south Delta locations are shown in Figure B1-10.

Three inflows to the south Delta channels are the Old River near Byron, Middle River at Victoria Canal, and the head of Old River near Mossdale. High tide is about 2.6 feet in Old and Middle Rivers and about 2.2 feet at Mossdale. Low tide is about -1.0 feet in Old and Middle Rivers and about -0.3 feet at Mossdale. The tidal lag from Benicia to the south Delta varies from about 5 hours to 7 hours.

Because the south Delta is near the southern boundary of the estuary, tidal flows are relatively small. The average flood tide flow in Middle River upstream (south) of Victoria Canal is only 900 cfs at an average velocity of 0.5 fps. The average flood tide flow is less than 50 cfs at the head of Middle River. The average flood tide flow in the Grant Line Canal (which includes the Fabian and Bell Canal) is about 3,500 cfs at the west end near Coney Island and decreases to about 2,700 cfs at the east end of Fabian Tract. The average flood tide flow in Old River near the CVP Tracy Pumping Plant is about 1,200 cfs at an average velocity of 0.5 fps. This flood tide flow in Old River is reduced to about 150 cfs near the town of Tracy. The average flood tide flow at the head of Old River is about 1,100 cfs at an average velocity of 1.0 fps, moving upstream from Grant Line Canal toward the San Joaquin River.

Various channel barriers have been installed in south Delta channels for maintenance of fisheries and water quality. A barrier at the head of Old River has been used periodically. Several tidal barriers and gates have been proposed and are being evaluated by DWR. None of these channel barriers were included in these basic tidal simulations of south Delta channels. The barrier at the head of Old River was included in simulations of the DW project alternatives and the No-Project Alternative.

Tidal Hydraulics in the Mokelumne River

In the north Delta, the Mokelumne River channels include the DCC, Georgiana Slough, North and South Forks of the Mokelumne River, Potato Slough, Little Potato Slough, White Slough, and several smaller channels between the Sacramento River and the San Joaquin River. The surface area of these channels is approximately 3,800 acres and volume is about 52,000 af. Tidal flood tide flows enter the Mokelumne River channels from the Sacramento River through the DCC (when simulated to be open) and Georgiana Slough. Flood tide flows also enter the Mokelumne River channels from the San Joaquin River through the Mokelumne River mouth and through Potato, Disappointment, and Fourteenmile Sloughs. Flood tide flows reenter the San Joaquin River from Potato Slough through Little Potato Slough around Venice Island.

Figure B1-11 shows the simulated tidal hydraulics in the Mokelumne River channels. The stage levels on the

Sacramento River at Walnut Grove (near the DCC and Georgiana Slough) and the San Joaquin River at the mouth of the Mokelumne River are almost identical. This similarity indicates that tidal flows enter the Mokelumne River channels from both the Sacramento and San Joaquin Rivers at the same time.

Simulated average flood tide flow from the Sacramento River into Georgiana Slough is about 950 cfs at an average velocity of 0.3 fps. The average flood tide flow from the Sacramento River into the DCC is about 2,000 cfs at an average velocity of 0.4 fps. Average flood tide flow from the San Joaquin River into the Mokelumne River mouth is about 8,100 cfs at an average velocity of 0.5 fps, and the average flood tide flow from the San Joaquin River into Potato Slough is about 9,300 cfs at an average velocity of 0.7 fps.

Tidal Hydraulics in Suisun Marsh

Figure B1-12 shows the simulated tidal hydraulics in the Suisun Marsh channels. The Suisun Marsh salinity control gate was open in the tidal simulation. Simulated tide stage at Grizzly Bay (south of Suisun Marsh) is about 1 hour ahead of the stage at Collinsville. Flood tide flow enters Suisun Marsh from Grizzly Bay and exits from Montezuma Slough into the Sacramento River at Collinsville. Ebb tide flow enters Suisun Marsh from the Sacramento River and empties from Suisun Marsh into Grizzly Bay.

Simulated average flood tide flow into Montezuma Slough from Grizzly Bay is about 13,700 cfs at an average velocity of 0.6 fps. Average flood tide flow into Suisun Slough from Grizzly Bay is about 7,800 cfs at an average velocity of 0.4 fps. Average flood tide flow at the Suisun Marsh salinity control gate on Montezuma Slough is about 4,700 cfs at an average velocity of 1.0 fps.

Tidal Hydraulics in Threemile Slough

Threemile Slough connects the Sacramento River at Emmaton with the San Joaquin River upstream of Jersey Point. Figure B1-13 shows the simulated tidal hydraulics for Threemile Slough. Tidal stage at the Sacramento River end of Threemile Slough is about an hour ahead of the tide at the San Joaquin River end. Ebb flow through Threemile Slough is from the San Joaquin River to the Sacramento River and flood tide flow is from the Sacramento River to the San Joaquin River.

Simulated average flood tide flow in Threemile Slough from the Sacramento River to the San Joaquin River is about 18,400 cfs at an average velocity of 1.4 fps.

Tidal Hydraulics in Steamboat and Sutter Sloughs

Steamboat and Sutter Sloughs, along with Cache and Miner Sloughs and the Sacramento Deep Water Ship Channel, have a surface area of about 4,250 acres and a volume of about 86,000 af. Simulated average flood tide flow from the Sacramento River into Cache Slough is about 28,800 cfs at an average velocity of 1.1 fps. Average flood tide flow at the mouth of Steamboat Slough is 4,700 cfs at an average velocity of 0.9 fps. At the upstream end of Steamboat Slough, the average flood tide flow into the Sacramento River is about 1,500 cfs. At the upstream end of Sutter Slough, average flood tide flow into the Sacramento River is about 1,900 cfs.

Summary Map of Tidal Flows

Simulated average flood tide flows throughout the Delta are summarized in Figure B1-14. Arrows indicate the direction of the flood tide flow. The RMA model uses the average tidal boundary pattern at Benicia as the basis for simulating monthly average Delta channel flows. Tidally averaged net channel flows caused by inflows and exports should be understood to be superimposed on the tidal flows shown on this "tidal map" of the Delta. In many cases, the tidal flows are much larger than the net channel flows. These fluctuating tidal flows are relatively constant from day to day, independent of the net channel flows.

Because the times of peak tidal flows are delayed as the tide progresses upstream, tidal flows in the south and north Delta are out of phase with the Benicia boundary condition. Nevertheless, these tidal flows occur during the tidal cycle and provide tidal exchange mixing that, along with Delta outflow, governs salinity intrusion, tidal flushing flows that may affect water quality, and tidal currents that may influence fish movement.

Simulation of Tidal Gate Operations in the Delta

Several tidal gates are operating in the Delta and several others are proposed. The most important Delta tidal gates are the gate at the entrance to Clifton Court Forebay and the Suisun Marsh salinity control gate. Operating tidal gates are also simulated on Tom Paine Slough in the south Delta and on Sandmound Slough at

Rock Slough. Gates on the DCC and at the head of Old River were also simulated, but they were either open or closed during an entire month and do not operate as tidal gates.

Clifton Court Forebay

Inflow to Clifton Court Forebay is controlled by a gated weir that allows inflow during high tide and prevents outflow during ebb tides. The gate is represented in the RMA Delta model by a channel that approximates the head loss through the control structure. Clifton Court inflow is computed based on channel hydraulic characteristics and the simulated head difference between Old River and Clifton Court and the assumption that there is a constant outflow to the Banks Pumping Plant. The gate is assumed to be open for several hours near high tides to approximate the current operating schedule.

Suisun Marsh Salinity Control Gate

The RMA Delta model includes tidal gates to control flow in Montezuma Slough. Almost all flood tide flow is blocked by the gates, producing a net ebb flow from the Sacramento River into Suisun Marsh. The magnitude of the net ebb flow depends on the Sacramento River flow. This tidal gate creates a net inflow of Sacramento River water into the Suisun Marsh channels for salinity control.

SIMULATIONS OF MONTHLY AVERAGE NET DELTA CHANNEL FLOWS USING HISTORICAL DELTA INFLOWS AND EXPORTS

To describe basic Delta channel flow patterns, historical monthly average Delta channel flows were simulated with the RMA model based on historical inflows and exports for water years 1967-1991. Net flows in Delta channels are governed by channel geometry and tidal hydrodynamics, in combination with Delta inflows, exports, diversions, and agricultural drainage.

Movements of water through the Delta are described based on channel flow divisions ("flow splits") and tracking of each inflow ("source tracking") simulated by the RMA model. Flow splits represent the relative proportions of flow simulated to enter two or more Delta channels at channel junctions. Source tracking was performed by numerically marking the water from a particular source (i.e., Sacramento River) and following the marked water through the Delta. Source tracking is used to indicate the percentage of water from a given source (Sacramento and San Joaquin Rivers, eastside streams, Yolo Bypass, San Francisco Bay, and Delta island drainage) that is simulated at each model node at the end of each month. The results from the RMA simulations of channel flow splits were incorporated in the DeltaSOS assessment model.

The purpose of this description of simulated historical Delta channel flows is to:

- describe the simulated relationships between inflows, exports, and assumed Delta gate operations and channel flows;
- describe the simulated divisions of flow (flow splits) between several important Delta channels; and
- provide a foundation for describing simulated changes in Delta channel flows resulting from proposed DW project operations.

Historical Monthly Average Inflows and Exports

For purposes of impact assessments, river inflows and Delta exports are the most important simulation terms; rainfall and estimated agricultural diversions and drainage are assumed to remain unchanged from the historical values (except for diversions to and drainage from DW islands under proposed project operations).

The RMA Delta model requires inputs specifying inflows for the Sacramento River, Yolo Bypass, eastside streams (Mokelumne, Cosumnes, and Calaveras Rivers), and the San Joaquin River. Inflows to the Delta represented by rainfall and agricultural drainage are specified as components of monthly net Delta channel depletion (or gain) estimates.

The RMA Delta model requires specification of exports at SWP North Bay Aqueduct, SWP Banks Pumping Plant, CVP Tracy Pumping Plant, and diversions at Contra Costa Water District (CCWD) Rock Slough intake. Agricultural diversions are estimated as a component of net Delta channel depletions with an assumed irrigation efficiency of 70% (DWR 1994). The RMA model estimates diversions to each of the agricultural siphons and pumps in the Delta at each model node based on the proportional acreage of Delta islands adjacent to the model nodes.

Model input values for historical Delta inflows and exports for water years 1967-1991 were obtained from

DWR's DAYFLOW database. The historical island flooding events and subsequent pumping discharges to empty the flooded islands that are reported as "exports" were not simulated, however.

Table B1-3 gives the monthly historical Delta inflows and exports that were used in the simulation of historical Delta channel flows with the RMA Delta model for water years 1968-1991. The only deviations from actual historical DAYFLOW estimates of channel flow are the removal of the island flooding events and some differences in the simulated DCC closure rules. The RMA model input specifies the DCC status for each month, as a function of Sacramento River inflow and Delta outflow, while actual historical DCC closure was governed by daily flows and other operational considerations.

Sacramento River and Yolo Bypass Flows

Figure B1-15 shows the historical monthly average Sacramento River flow at Sacramento and Yolo Bypass flow for water years 1967-1991. The average combined flow during this period was 28,400 cfs, average flow in the Sacramento River was 23,950 cfs, and average Yolo Bypass flow was about 4,450 cfs. Figure B1-16 shows, however, that the maximum channel flow capacity of the Sacramento River is about 80,000 cfs; flows greater than this capacity are diverted into Yolo Bypass upstream of the City of Sacramento. The maximum monthly average Yolo Bypass flow during 1967-1991 was approximately 130,000 cfs. Flows of less than about 40,000 cfs remain in the Sacramento River channel. When Sacramento River flows are between 40,000 cfs and 80,000 cfs, some water begins to be diverted into the Yolo Bypass.

Minimum monthly average Sacramento River flows of about 10,000 cfs have occurred during late summer of most years, with flows of less than 10,000 cfs persisting for several months in 1977 and 1991 (Figure B1-15). Such low-flow periods are the most critical for maintaining salinity control in the Delta.

Sacramento River and Yolo Bypass flows consist of uncontrolled runoff downstream of reservoirs and reservoir spills or releases. A large proportion of the Sacramento River and Yolo Bypass flow during periods of high runoff cannot be controlled by upstream reservoirs.

All releases and spills from upstream Sacramento Valley SWP and CVP reservoirs enter the Delta through the Sacramento River and Yolo Bypass. These Delta inflows may change directly with alternative operations of the CVP and SWP systems and with various possible operations of the proposed DW project. Because Yolo Bypass flows become substantial only during relatively rare events when Sacramento River flows are greater than about 40,000 cfs, the Sacramento River inflow is the inflow most directly changed by upstream CVP and SWP reservoir operations.

San Joaquin and Eastside Stream Flows

Historical 1967-1991 monthly average inflows for the San Joaquin River at Vernalis and eastside streams (Mokelumne, Cosumnes, and Calaveras Rivers) are shown in Figures B1-17 and B1-18, respectively. The average flow in the San Joaquin River for 1967-1991 was 4,875 cfs, and the combined average flow in the eastside streams for 1967-1991 was about 1,600 cfs.

Most runoff occurs during winter storms and spring snowmelt, with maximum San Joaquin River flows exceeding 20,000 cfs and combined flows of the eastside streams exceeding 10,000 cfs. Historical minimum flows on the San Joaquin River have been less than 1,000 cfs, although releases from New Melones Reservoir (part of the CVP system completed in 1979 and first filled in 1983) have been used to maintain San Joaquin River flows above 1,000 cfs in recent years. Periods of high flow in the San Joaquin River correspond with high flows in the other eastside streams and in the Sacramento River.

Delta CVP and SWP Exports and CCWD Rock Slough Diversions

Figure B1-19 shows the historical monthly average Delta CVP and SWP exports and CCWD diversions for water years 1967-1991 obtained from DWR's DAYFLOW database. Exports were limited in the first part of the period because the SWP facilities were not completed. Banks Pumping Plant began operating in 1968, San Luis Reservoir was completed in 1967 and filled in 1969, and Edmonston Pumping Plant was completed in 1973. Delta exports increased throughout the historical period, except when limited by drought conditions in 1976-1977 and 1988-1991 and during extremely wet periods, such as 1983 and 1986. Historical CCWD exports are relatively small and have averaged about 135 cfs.

CVP demands for Delta exports are dominated by agricultural uses with large seasonal fluctuation. CVP export pumping has become more uniform because the CVP portion of San Luis Reservoir is filled before the irrigation season, and its releases are used to help supply the CVP demands. CVP exports are often limited by the capacity of the Tracy Pumping Plant (4,600 cfs) or the pumping capacity at O'Neil Forebay (4,200 cfs).

SWP exports at Banks Pumping Plant increased significantly during the historical period of water years 1967-1991. Although exports have been limited by the Banks Pumping Plant capacity, an additional four pumps became operational in 1992, increasing pumping capacity from 6,800 cfs to about 10,300 cfs during periods of high San Joaquin River inflows (see Appendix A1).

Delta Rainfall, Evapotranspiration, and Channel Depletion

Rainfall and evapotranspiration (ET) are significant terms in the historical water budget of the Delta. Rainfall and pan evaporation can be measured but soil moisture retention and release cannot. Therefore, a soil moisture accounting procedure is used to estimate the monthly average net channel depletion in the Delta. The RMA Delta model requires that agricultural drainage and diversions be separately estimated as components of net Delta channel depletion.

Figure B1-20 shows the monthly pattern of measured rainfall, average monthly evaporation pan data, and Delta channel depletion estimated with the DeltaDWQ model (see Appendix C4, "DeltaDWQ: Delta Drainage Water Quality Model"), a soil moisture accounting for the 1967-1991 historical period. With a total Delta area of 678,200 acres, average monthly values representing rainfall and potential ET are quite large. Average long-term Delta channel depletion was estimated to be 1,175 cfs.

Estimated (DAYFLOW) irrigation diversions from the Delta are quite large in July and August and correspond to a Delta channel depletion flow of about 5,000 cfs. These unmeasured Delta diversions can have a substantial effect on the Delta outflow during summer. Channel depletion estimates are a major source of potential error in Delta hydrodynamic simulations.

Delta Outflow

Delta outflow is an important Delta flow that can be estimated as the difference between Delta inflows and the combination of Delta exports and net channel depletion. Figure B1-21 shows Delta outflow calculated from historical inflows, exports, and estimated net channel depletion. The average estimated Delta outflow for 1967-1991 was about 28,000 cfs, and the maximum monthly average outflow was about 260,000 cfs. Minimum monthly average Delta outflow has been less than 10,000 cfs during summer in almost all years, with considerably lower Delta outflow persisting for several months during several of the years (1976-1977 and 1987-1991).

Figure B1-22 shows the cumulative distribution of monthly average estimated Delta outflow for 1967-1991. Estimated monthly average Delta outflow was less than 10,000 cfs in approximately 45% of the months for 1967-1991 historical conditions. Delta outflow was less than 12,000 cfs about 50% of the time, so 12,000 cfs is the median monthly average Delta outflow for 1967-1991. Delta outflow was less than 40,000 cfs about 80% of the time and less than 80,000 cfs about 90% of the time.

Upstream reservoir operations and Delta exports cannot greatly modify high Delta outflow events, as discussed above. Reservoir operations and Delta export limits can more easily affect lower Delta outflows.

Delta Channel Pathways

Seven major pathways convey water through the Delta. As illustrated in Figure B1-23, these pathways represent groups of Delta channels to reflect the general movement of water from Delta inflow to Delta outflow and Delta exports. The primary Delta channels are the Sacramento and San Joaquin Rivers. Numerous other channels play an important role in the hydrodynamics of the Delta.

Pathway 1 is the Sacramento River channel between the Sacramento River inflow at Sacramento and Delta outflow at Chipps Island. A relatively small portion of Sacramento River flow is diverted into Suisun Marsh through Montezuma Slough downstream of Collinsville.

Pathway 2 is the natural diversion from the Sacramento River into Steamboat and Sutter Sloughs. This pathway returns to the Sacramento River at Rio Vista through Steamboat, Miner, and Cache Sloughs. Yolo Bypass flow joins this pathway and enters the Sacramento River at Rio Vista.

Pathway 3 encompasses the Mokelumne River channels that connect the DCC and Georgiana Slough, carrying Sacramento River diversions, with the San Joaquin River in the central Delta. The combined flow of the Mokelumne River and the Sacramento River diversions through the DCC and Georgiana Slough enters the San Joaquin River channel through five separate channels (Mokelumne River mouth and Potato, Little Connection, Disappointment, and Fourteenmile Sloughs).

Pathway 4 consists of the San Joaquin River channel between the San Joaquin River inflow at Vernalis and the mouth of the Mokelumne River in the central Delta. Inflow from the Calaveras River joins this pathway downstream of Stockton.

Pathway 5 consists of Old River and Grant Line Canal between the head of Old River on the San Joaquin River at Mossdale and the Tracy and Banks Pumping Plants for Delta exports. A major portion of the San Joaquin River flow is diverted into Old River along this pathway unless a barrier is installed at the head of Old River. Very little flow is diverted from Old River into Middle River at the head of Middle River.

Pathway 6 is the combination of Old and Middle Rivers between the Delta export locations and the mouth of Old and Middle Rivers on the San Joaquin River in the central Delta. Rock Slough, which connects Old River with the CCWD diversion location, is located on this pathway.

During high San Joaquin River inflows, water moves down Old River past the Delta export pumps and then down Old River and Victoria Canal to Middle River and into the central Delta. During periods when Delta exports exceed flows diverted from the San Joaquin River into Old River, water moves upstream in Pathway 6 from the central Delta to the Delta export pumps at Tracy and Banks Pumping Plants. Thus, Pathway 6 transports water in both directions, with the direction of flow depending on the relative magnitudes of Delta exports and Old River diversions from the San Joaquin River.

Pathway 7 is the lower San Joaquin River channel between the mouth of Old River and the confluence with the Sacramento River downstream of Antioch. This pathway includes Fishermans Cut, False River, and Dutch Slough, which connect Franks Tract to the west with the San Joaquin River. The net flow through these San Joaquin River channels is referred to as QWEST. Threemile Slough is considered a part of this pathway because under normal flow conditions a substantial flow from the Sacramento River moves to the San Joaquin River through Threemile Slough.

Delta outflow past Chipps Island flows through Suisun Bay to Benicia and toward San Pablo and San Francisco Bays. Salinity intrusion from tidal exchange mixing can transport a significant quantity of salt from Suisun Bay into the Sacramento and lower San Joaquin River pathways during periods of low Delta outflow.

The following sections describe RMA model simulations of channel flows and flow splits along these transport pathways, based on historical Delta inflows and exports. The results are given in Table B1-4 for 1968-1991 for selected channel locations.

Historical Simulations

Assumed Operation of Delta Gates for Historical Simulations

Currently operating Delta gates include the DCC, the Suisun Marsh salinity control gate, and temporary barriers in south Delta channels. For the monthly historical simulation, the DCC gates were simulated in a general way that reflects the basic DCC operations to limit diversions of fish and provide flood control. If the monthly average Sacramento River flow was greater than 25,000 cfs, the DCC gates were assumed to be closed for flood control purposes. During January-April, if Delta outflow was estimated to be greater than 12,000 cfs, the DCC gates were assumed to be closed to limit diversion of fish from the Sacramento River into the central Delta. The actual historical gate operations might have changed on a daily basis. Other gates and barriers were not simulated.

Sacramento River Channel Flows

Sacramento River diversions into Steamboat and Sutter Sloughs, the DCC, and Georgiana Slough are determined by channel geometry and tidal hydraulics. With a uniform simulated tidal cycle, the average monthly flow diversions are governed by stage differentials and conveyance capacities of the diversion channels.

Figure B1-24 shows the historical monthly average Sacramento River inflows at Sacramento (as previously shown in Figure B1-15) and simulated combined diversions to Steamboat and Sutter Sloughs and diversions to the DCC and Georgiana Slough for water years 1967-1991. The diversion channel flows are governed primarily by Sacramento River inflow and operation of the DCC gates. Delta exports, Mokelumne River or Yolo Bypass inflows, and other Delta conditions do not have a substantial effect on these Sacramento River diversions, according to the RMA model results.

Steamboat and Sutter Slough Diversions. Figure B1-25 shows the simulated combined diversions into Steamboat and Sutter Sloughs as a function of Sacramento River inflow and DCC gate operation. The combined diversions into Steamboat and Sutter Sloughs are shown as diversion flow (cfs) and as a percentage of the Sacramento River inflow.

When the DCC gates are open, the combined Steamboat and Sutter Slough flow is a major portion of the Sacramento River inflow, with approximately 2,000 cfs (20%) diverted at a Sacramento River inflow of 10,000 cfs and about 7,500 (30%) diverted at a Sacramento River inflow of 25,000 cfs.

When the DCC gates are closed, the combined Steamboat and Sutter Slough flow is an even greater portion of the Sacramento River inflow, ranging from 10,000 cfs (33%) at a Sacramento River inflow of 30,000 cfs to about 30,000 cfs (39%) at a Sacramento River inflow of 80,000 cfs.

These simulated Delta channel flows based on historical inflows indicate that a considerable portion (20%-40%) of the Sacramento River inflow is diverted into Steamboat and Sutter Sloughs and returned to the Sacramento River channel at Rio Vista.

Delta Cross Channel and Georgiana Slough Diversions. Figure B1-26 shows the simulated combined diversions into the DCC and Georgiana Slough as a function of Sacramento River inflow and DCC gate operation. The combined diversions into the DCC and Georgiana Slough are shown as diversion flow (cfs) and as a percentage of the Sacramento River inflow.

When the DCC gates are open, the combined DCC and Georgiana Slough flow is a major portion of the Sacramento River inflow, with approximately 5,500 cfs (55%) diverted at a Sacramento River inflow of 10,000 cfs and about 10,000 cfs (40%) diverted at a Sacramento River inflow of 25,000 cfs. The proportion diverted decreases with increasing Sacramento River flow because of the respective channel configurations of the river and the DCC.

When the DCC gates are closed, the Georgiana Slough diversion flow constitutes a smaller portion of the Sacramento River inflow, ranging from about 4,000 cfs (20%) at a Sacramento River inflow of 20,000 cfs to about 12,000 cfs (15%) at a Sacramento River inflow of 80,000 cfs. The DCC gates were not closed in the simulations at Delta outflows of less than 12,000 cfs.

Comparing the simulated flow into Georgiana Slough with the Sacramento River flow downstream of the DCC (at the head of Georgiana Slough) indicates a consistent hydraulic relationship between flow in the two channels, with about 25% of the Sacramento River flow below the DCC entering Georgiana Slough. The RMA model results indicate that the proportion diverted to Georgiana Slough corresponds to 15%-20% of the Sacramento River inflow at Sacramento (i.e., above the Sutter and Steamboat Slough diversions) (Figure B1-26).

These simulated Delta channel flows indicate that a considerable portion (15%-60%) of the Sacramento River inflow is diverted into the DCC and Georgiana Slough and is conveyed into the central Delta. The simulated channel flows indicate that the DCC flow is greater than the Georgiana Slough flow when the DCC is open (Figure B1-26). Closing the DCC increases the Georgiana Slough flow but reduces the total diversions from the Sacramento River to the Mokelumne River by about half.

Threemile Slough Diversions. The RMA model simulates flows entering Threemile Slough from the Sacramento River as generally increasing with Sacramento River flow at Emmaton, which includes Yolo Bypass inflows. Flows in Threemile Slough are influenced, however, by the average hydraulic gradient (difference in water surface elevation) in the slough between the Sacramento River and the San Joaquin River. The hydraulic gradient can be correlated with the ratio of QWEST flow to Sacramento River flow. QWEST flow is estimated as the simulated flow in the San Joaquin River at Antioch minus the Threemile Slough flow. QWEST therefore represents the San Joaquin River outflow from the central Delta, as is calculated in DAYFLOW. A portion of the QWEST flow moves through False River and Dutch Slough, as well as the San Joaquin River channel.

As simulated by the RMA model, Threemile Slough flow can be as much as 40% of Sacramento River flow whenever central Delta outflow (QWEST) is negative (reversed) and equal to half the Sacramento River flow (Figure B1-27). When central Delta outflow (QWEST) is zero, simulated Threemile Slough flows are about 20% of Sacramento River flow. When central Delta outflow is about 75% of Sacramento River flow, simulated Threemile Slough flows are zero. When central Delta outflow is equal to Sacramento River flow (i.e., ratio of 1:1), the net flow direction in Threemile Slough reverses and conveys about 10% of the central Delta outflow to the Sacramento River.

These simulated historical Delta channel flows indicate that a considerable portion of Sacramento River flow is diverted through Threemile Slough to the San Joaquin River (Figure B1-27). The proportion of the Sacramento River flow diverted into Threemile Slough is greatest when the ratio of central Delta outflow (QWEST) to Sacramento River flow is negative (i.e., San Joaquin River flows are reversed into the central Delta). The diverted Threemile Slough flow is usually greater than the reversed central Delta flow (as a fraction of Sacramento River flow); therefore, the simulated flows at Antioch (which are the sum of QWEST and Threemile Slough flows) were almost always positive (see "Flows through Franks Tract and Connecting Channels", below).

Montezuma Slough Diversions. For the simulations based on historical inflows and exports, the Suisun Marsh salinity control gate was assumed to be open. Simulated net channel flows diverted through Montezuma Slough into Suisun Marsh are about 2% of Delta outflow for moderate and high Delta outflows (Figure B1-28). At a Delta outflow of 10,000 cfs, however, the Montezuma Slough net flow is simulated to be zero. When Delta outflow is less than 10,000 cfs, a small upstream net flow transports water from Suisun Marsh into the Sacramento River channel near Collinsville.

The salinity control gate on Montezuma Slough began operation in 1989. Approximately 2,200 cfs plus 0.5% of Delta outflow enters Suisun Marsh through Montezuma Slough when the tidal gates are operated to be open on ebb tide and closed on flood tide. Delta outflow past Chipps Island is reduced by about 2,000 cfs during periods of low Delta outflow when the tidal gates are operating.

San Joaquin River Channel Flows

The San Joaquin River channel divides into several channels through the Delta. Near Mossdale, the San Joaquin River branches into Old River and then branches again into Middle River. Under conditions without Delta exports, San Joaquin River inflow moves down all three channels toward the central Delta, where the Middle and Old River channels rejoin the San Joaquin River. Franks Tract (now permanently flooded), located near the mouth of Old River, connects with the lower San Joaquin River channel through False River, Fishermans Cut, and Dutch Slough. The San Joaquin River joins the Sacramento River through Broad Slough near Collinsville, although a substantial portion of the San Joaquin River flow moves through New York and Middle Sloughs to the Sacramento River near Pittsburg.

Old River and Middle River Diversions. Some San Joaquin River inflow at Vernalis is diverted into the head of Old River near Mossdale. Figure B1-29 shows the monthly average historical San Joaquin River flows and simulated flows downstream of the head of Old River for water years 1967-1991. These simulated channel flows do not include the effects of temporary barriers at the head of Old River that have been installed during fall in some years to increase flows past Stockton.

Figure B1-30 shows the simulated flow split at the head of Old River. The relationship between flows at the head of Old River and San Joaquin River inflow when above 2,000 cfs is governed by San Joaquin River inflow only (i.e., both are straight-line relationships above 2,000 cfs in Figure B1-30). During periods of low San Joaquin River inflows, most San Joaquin River inflow is diverted into the Old River channel near Mossdale. The simulated channel flows indicate slight reverse net flows in the San Joaquin River channel upstream of Stockton (i.e., 100-200 cfs) as indicated by the negative values of San Joaquin River flow at Stockton. Stagnant conditions are simulated whenever the San Joaquin River inflow is less than about 2,000 cfs. During periods of higher San Joaquin River flow, about 40% remains in the San Joaquin River channel and flows past Stockton.

Flows through Franks Tract and Connecting Channels. Water from the central Delta flows out of the Delta through the San Joaquin River and through Franks Tract and connecting channels (False River and Dutch Slough). Central Delta water includes inflows from the San Joaquin River and eastside streams, as well as Sacramento River flow diverted through the DCC and Georgiana Slough.

Figure B1-31 shows the simulated central Delta outflow (QWEST) and the simulated San Joaquin River flow at Antioch. The flow through False River and Dutch Slough is a significant portion of the total central Delta outflow. False River is the major channel, although Dutch Slough flow is also important because of its effects on salt transport. The flow at Antioch includes central Delta outflow and Threemile Slough flow from the Sacramento River.

Figure B1-32 shows the flow split of central Delta outflow between the main San Joaquin River channel and the Franks Tract channels. False River carries a nearly constant fraction of about 40% of the central Delta outflow (QWEST), and Dutch Slough carries about 5%. About 55% of the total central Delta outflow remains in the main channel of the San Joaquin River.

Old and Middle River Channel Flows

As simulated by the RMA model, Old and Middle River channel flows move downstream during periods of high San Joaquin River inflow, but during periods of low San Joaquin River inflow, Old and Middle River flows are often reversed and move from the central Delta toward the Delta export locations at the Banks and Tracy Pumping Plants. Hydraulic relationships govern channel flows in Old and Middle Rivers regardless of the direction of flow.

During periods when Delta exports exceed the San Joaquin River diversion into Old River, central Delta water moves through Old and Middle River channels toward the export pumps. Central Delta water may the enter Old and Middle River channels at their mouths or flow through Turner, Empire, and Columbia Cuts, which connect the upper San Joaquin River with Middle River, or flow through Franks Tract channels, which connect Old River with the lower San Joaquin River. Most Middle River flow moves through Victoria Canal to Old River near the CVP and SWP pumping plants.

The total flow between the central Delta and the Delta export locations is equal to the total exports plus south Delta channel depletions (estimated as 65% of total Delta channel depletions) unmet by the head of Old River diversion from the San Joaquin River near Mossdale. The unmet export term can be negative when San Joaquin River diversions into Old River exceed the export pumping demand. When the barrier on Old River is closed, none of the exports can be met with head of Old River diversions.

Figure B1-33 shows the simulated combined channel flows in Old and Middle Rivers for water years 1967-1991. Head of Old River diversions from the San Joaquin River can sometimes meet export pumping demand and provide excess flow to the central Delta in Old and Middle Rivers. More often, total Delta exports (shown as a negative flow in Figure B1-33) are greater than the head of Old River diversions from the San Joaquin River, and a negative net flow in Old and Middle Rivers toward the export locations is required to meet Delta export pumping demands.

Several Delta channels connect Middle and Old River channels. Victoria Canal carries almost all Middle River flow southwestward to Old River near Coney Island and the Clifton Court entrance gates. Woodward Canal, Santa Fe Cut, and Connection Slough connect the Middle and Old River channels. These connecting channels shift flows between the Middle and Old River channels. However, the total flow between the central Delta and the export locations is the amount of exports and channel depletions unmet by head of Old River diversions (Figure B1-33).

Figure B1-34 shows the simulated flow split of unmet Delta exports between Old and Middle River channels at Bacon Island for water years 1967-1991. The simulation location is north of Santa Fe Cut and Woodward Canal, which redistributes flows between Old and Middle Rivers, and corresponds to the tidal flow measurement stations installed by USGS (in 1987). The simulated channel flows indicate that Old River conveys about 60% of the net flow and Middle River conveys about 40% of the net flow. The USGS measurements indicate, however, that Old River conveys 45% and Middle River conveys 55% of the total net flow. This difference has not been resolved. Both USGS measurements and RMA simulations indicate that the tidal flows are about the same for the Old and Middle River channels (Table B1-2). The only difference between the USGS measurements and the RMA simulations is the net flow split for the two channels. This division of flow remains consistent whether the flow is downstream during high San Joaquin inflows or upstream to supply unmet Delta export pumping.

Mokelumne River Channel Flows

Mokelumne River channels are located in the northeast portion of the Delta. The inflow from the Mokelumne and Cosumnes Rivers (the major proportion of eastside streamflow) combines with DCC and Georgiana Slough flows. The North and South Forks of the Mokelumne River channel split just downstream of the DCC and rejoin just upstream of Georgiana Slough at the northwest corner of Bouldin Island. The mouth of the Mokelumne River at the San Joaquin River carries most of the Mokelumne River outflow. Little Potato Slough connects the South Fork of the Mokelumne River with Potato and Little Connection Sloughs, which join the San Joaquin River channel at Venice Island. Disappointment and Fourteenmile Sloughs also connect with the San Joaquin River farther upstream.

Figure B1-35 shows the simulated monthly average Mokelumne River outflows for historical Delta inflows and exports for water years 1967-1991. Mokelumne River outflow is the sum of flow in the North and South Forks of the Mokelumne River and in Georgiana Slough. Most Mokelumne River outflow originates from DCC and Georgiana Slough diversions from the Sacramento River. During periods of high runoff, the eastside streams contribute substantial inflow. During high Sacramento River flow, the DCC gates are normally closed.

Although DCC and Georgiana Slough diversions from the Sacramento River are not changed substantially by Delta exports, the distribution of flows in the Mokelumne River channels that connect with the San Joaquin River depend on the unmet export flows. Figure B1-36 illustrates simulated relationships between unmet export flows and proportions of Mokelumne River outflow in the connecting channels. Channel flow relationships shift during periods of excess San Joaquin River inflow to the Delta (i.e., San Joaquin inflow greater than export pumping). During normal periods with positive unmet exports (i.e., central Delta water flowing toward the Delta export pumps), the Mokelumne River channel carries about 65% of the total Mokelumne River outflow (Figure B1-36).

Little Connection Slough carries a greater fraction of the Mokelumne River outflow as the magnitude of the unmet export pumping increases. Little Connection Slough conveys water southward from the east end of Bouldin Island toward the mouth of Middle River in the central Delta. When unmet export values are low, Little Connection Slough carries about 15% of the Mokelumne River outflow toward the Delta export pumps. When unmet export values are high, Little Connection Slough carries about 25% of the Mokelumne River outflow.

In contrast to the pattern for Little Connection Slough, Potato Slough carries a smaller fraction of the Mokelumne River outflow as the magnitude of the unmet export pumping increases. Potato Slough conveys water westward along the south edge of Bouldin Island toward the mouth of Old River in the central Delta. About 15% of the Mokelumne River outflow flows through Potato Slough at low unmet exports values, but this fraction is reduced to less than 5% at high unmet export values. Flow is shifted from Potato Slough to Little Connection Slough as the unmet export amount increases.

Disappointment Slough carries between 5% and 10% of the Mokelumne River outflow. Fourteenmile Slough carries a small fraction of the Mokelumne River outflow when unmet export values are high.

Little Connection Slough acts as a side channel for the San Joaquin River and its flows can reverse during high San Joaquin River flows (Figure B1-36). At high San Joaquin River inflows, water moves from the San Joaquin River upstream into Fourteenmile Slough and back out through Disappointment Slough. Similarly, San Joaquin River water can move into Little Connection Slough and back out through Potato Slough. During most conditions, however, these channels transport a fraction of the Mokelumne River outflow to the San Joaquin River in the central Delta.

Source Tracking of Historical Delta Inflows

The RMA Delta model was used to track water from each inflow source as it moved through the Delta. An inflow source can be identified at any model node. The RMA model used a series of "numerical dye" tracers to track the contribution of each Delta water source. A constant inflow concentration of the tracer (i.e., 1,000 parts per million [ppm]) was specified at the source to be tracked, and the concentrations at the end of each month at other Delta locations indicate the relative contribution of the water from that source.

Delta inflow water sources consist of the Sacramento River, San Joaquin River, eastside streams, Yolo Bypass, Delta agricultural drainage, salinity intrusion from the Benicia boundary, and DW project island discharges. Net rainfall (minus evaporation) was not tracked but was represented by small "missing" fractions in the sum of the other source contributions. The results of the RMA source tracking simulations were incorporated in the DeltaDWQ assessment model (Appendix C4, "Delta-DWQ: Delta Drainage Water Quality Model").

The purpose of describing the source of water at important Delta locations is to:

- provide a description of how water from each inflow moves through the Delta,
- describe a general method for simulating the movement of salts and passive fish life stages through the Delta channels, and
- demonstrate how DW project releases into Delta channels may replace other sources of water at the Delta export or outflow locations.

Selected Locations for Describing Source Tracking

Five Delta locations were selected for describing the tracking of Delta water sources: Chipps Island, Antioch, the CCWD Rock Slough intake, SWP Banks Pumping Plant, and CVP Tracy Pumping Plant. The monthly contributions from inflow sources at each of these locations were simulated by the RMA model based on the (DAYFLOW) historical Delta inflow and export record for 1967-1991. The reasons these locations were selected are discussed below.

Water at Chipps Island represents the combined Delta outflow from all possible water sources, and source contributions of Chipps Island represent the mixture of water flowing into Suisun Bay. Sacramento River and Yolo Bypass inflow will usually dominate source contributions at Chipps Island. Contributions from other sources, including salinity intrusion from Benicia, can be important at Chipps Island, however.

Water at Antioch represents combined San Joaquin River outflow from the central Delta and includes some portion of Sacramento River diversions through the DCC, Georgiana Slough, and Threemile Slough. Eastside streams and San Joaquin River inflows contribute directly to source contributions at Antioch. Delta agricultural drainage may contribute a substantial percentage of the water at Antioch. Salinity intrusion from Benicia can be important at Antioch during periods of low Delta outflow. The water supply intake for the City of Antioch is located here.

The three major Delta export/diversion locations are generally in the southwest portion of the Delta but may have slightly different source contribution patterns because of their different locations and intake configurations. The CCWD intake is at the end of Rock Slough, which connects to Old River south of Holland Tract. The SWP Banks Pumping Plant draws water from Clifton Court, which connects to Old River near Coney Island with a tidal gate that is usually open during high tides. The CVP Tracy Pumping Plant connects to Old River just south of the entrance to Clifton Court. Each of these locations was therefore considered separately in the RMA Delta model source tracking simulation.

Table B1-5 gives the simulated monthly average source contributions from the Benicia boundary (representing salinity intrusion), the Sacramento River, Yolo Bypass, the San Joaquin River, the eastside streams, and Delta agricultural drainage at the CCWD diversion and SWP and CVP export locations for historical inflows and exports (presented in Table B1-3) for water years 1968-1991. Hydrologic variation accounts for the majority of fluctuations in these simulated source contributions. The patterns of source water contribution at each location depends on the relative source flows and the Delta channel configuration, as described in the next sections.

Source Tracking Simulation Results

The RMA simulations of historical source contributions indicated that some of the source contributions were different at the CCWD intake and SWP and CVP export locations (Table B1-5). For example, the seawater intrusion effects were simulated by the RMA Delta model to be slightly higher at the CCWD intake. San Joaquin River source contributions were simulated to be generally higher at the CVP location. Agricultural drainage effects were often simulated to be higher at the CCWD intake. However, the basic patterns of source contributions at the three locations were similar.

The following example calculations from the simulations of historical conditions and Alternative 1 are described to illustrate the simulated source contributions (see Table B1-5). During August 1968, the simulated historical south Delta diversions totaled 7,559 cfs, consisting of 194 cfs of CCWD diversions, 775 cfs of SWP pumping, 3,909 cfs of CVP pumping, and 2,682 cfs of agricultural diversions (assuming that these represent 65% of total Delta agricultural diversions with an irrigation efficiency of 70%). During the same month the simulated water from south Delta sources totaled 1,994 cfs, consisting of 707 cfs of San Joaquin River inflow, 138 cfs of eastside stream inflow, and 1,149 cfs of agricultural drainage (30% of diversions). The average export source contribution calculations assumed that the south Delta sources are fully mixed by tidal flows and that each diversion will have the same source contributions.

Because the simulated source rates are less than the diversion rates, additional water from the Sacramento River (5,565 cfs) would be required to satisfy the diversions. The source contribution is calculated as the source flow divided by the total diversion flow. The agricultural drainage of 1,149 cfs would contribute 15.2% of the total diversion flow. The San Joaquin River flow of 707 cfs would contribute 9.4% of the total diversion flow. The estimated Benicia contribution (salinity intrusion) was about 0.5%, with an effective outflow of about 5,500 cfs. The remainder of the water would come from eastside streams (2.0%) and Sacramento River inflow (73.6%).

Chipps Island

Figure B1-37 shows simulated monthly average contributions of the Sacramento River, Yolo Bypass, San Joaquin River, eastside streams, agricultural drainage, and salinity intrusion from Benicia at Chipps Island for water years 1967-1991. Separate panels in the figure show percentages of water from the different inflow sources at Chipps Island. All percentages shown for a single month sum to 100% of the water at Chipps Island.

As expected, the Sacramento River is the dominant water source most of the time at Chipps Island. Yolo Bypass, San Joaquin River, and eastside streams contribute episodically during periods of high inflows. Agricultural drainage contributes seasonally at Chipps Island, but the drainage is usually less than 2% of the Delta outflow. Seawater intrusion from Benicia is a significant source of water at Chipps Island during periods of low Delta outflow. Even small Benicia water source contributions can have a very large effect on the simulated salt concentrations (see Appendix B2, "Salt Transport Modeling Methods and Results for the Delta Wetlands Project").

RMA model results for the historical 1967-1991 Delta inflows and exports suggest that the average contribution at Chipps Island from the Sacramento River was 71.6%, Yolo Bypass contributed about 4.1%, the San Joaquin River contributed an average of 3.8%, eastside streams contributed about 2.1%, agricultural drainage contributed 1.3%, and water from the Benicia boundary contributed 16.1%. A small percentage of rainfall (1.1%) was not tracked with the RMA model.

Antioch

Figure B1-38 shows the simulated monthly average contributions from the seven tracked sources at Antioch. The Sacramento River is the dominant source of water at Antioch, even though Antioch is located along the lower San Joaquin River. Sacramento River water diverted through the DCC, Georgiana Slough, and Threemile Slough provides the Sacramento River source contribution at Antioch. The Sacramento River is the dominant source contribution most of the time. The episodic contributions from the San Joaquin River and eastside streams are proportionally larger at Antioch than at Chipps Island.

Yolo Bypass and seawater intrusion from Benicia have smaller contributions at Antioch than at Chipps Island. Contributions from agricultural drainage are larger at Antioch than at Chipps Island because most of the agricultural drainage at Antioch is from the Delta lowlands (as described in Appendix C4, "DeltaDWQ: Delta Drainage Water Quality Model").

For the historical Delta inflows and exports for 1967-1991, the average contribution at Antioch from the Sacramento River was 78.2%, Yolo Bypass contributed about 2.0%, the San Joaquin River contributed an average of 8.1%, eastside streams contributed about 5.0%, agricultural drainage contributed 2.3%, and water from the Benicia boundary contributed 4.1% (calculated from the salinity simulations). The Yolo Bypass contribution at Antioch was less than at Chipps Island. The reduced Benicia boundary contribution allowed the other inflow sources to contribute higher percentages at Antioch than at Chipps Island.

CCWD Rock Slough Intake

Figure B1-39 shows the simulated monthly average contributions of the tracked Delta inflow sources at the CCWD Rock Slough intake. The Sacramento River is the dominant source most of the time, often supplying 80%-90% of CCWD exports. During periods of high San Joaquin River inflow, a large portion of the CCWD exports are contributed by the combination of flows from the San Joaquin River and eastside streams. The Sacramento River contribution is reduced during high Sacramento River inflows because the DCC is closed. Agricultural drainage contributions are moderately high (10%) during the irrigation season each year and can be extremely high (40%-50%) during winter drainage periods as a result of excess rainfall and salt leaching practices.

Table B1-5 shows the monthly source contributions at CCWD Rock Slough intake for 1968-1991. For the historical Delta inflows and exports for 1967-1991, the simulated average contribution at the CCWD intake from the Sacramento River was 62.3%, Yolo Bypass contributed 0%, the San Joaquin River contributed an average of 21.3%, eastside streams contributed about 5.6%, agricultural drainage contributed about 10.1%, and water from the Benicia boundary contributed 0.2%.

SWP Banks Pumping Plant

Figure B1-40 shows the simulated monthly average contributions of the Delta inflow sources at the SWP Banks Pumping Plant. The Sacramento River contributed most of the water for SWP exports most of the time, but the episodic contributions from the San Joaquin River and eastside streams are greater than for CCWD diversions. Agricultural drainage is not as large a source of SWP exports as it is of CCWD diversions, contributing about 5% during the irrigation season and about 15% during wet winter periods. Yolo Bypass contributions are very small because when Yolo Bypass flows are high (during wet periods), San Joaquin and Sacramento inflows are high also and there is no pathway for Yolo Bypass water to move toward the exports. The average simulated contribution from the Benicia boundary is only about 0.1%.

Table B1-5 shows the monthly source contributions at SWP Banks Pumping Plant for 1968-1991. For the historical Delta inflows and exports for 1967-1991, the simulated average contribution to the SWP Banks Pumping Plant from the Sacramento River was about 54.9%, Yolo Bypass contributed 0%, the San Joaquin River contributed an average of 35.0%, eastside streams contributed about 5.4%, agricultural drainage contributed about 4.2%, and water from the Benicia boundary contributed 0.1%.

CVP Tracy Pumping Plant

Figure B1-41 shows the simulated monthly average contributions of the Delta inflow sources at the CVP Tracy Pumping Plant. Because of the direct connection between the San Joaquin River and the CVP pumps at Tracy, Old River diversions supply most of the CVP exports when San Joaquin inflows are sufficient. During many months, however, San Joaquin River inflow is limited, and the Sacramento River contributes 60%-80% of the CVP Tracy Pumping Plant exports. The eastside streams contribute less to CVP exports than to SWP exports because the eastside streams enter the central Delta and eastside stream water is transported down

Middle River and Old River to the export locations. The agricultural drainage contribution is similar, but is slightly higher for CVP exports than for SWP exports.

Table B1-5 shows the monthly source contributions at CVP Tracy Pumping Plant for 1968-1991. For the historical Delta inflows and exports for 1967-1991, the simulated average contribution to the CVP exports at Tracy from the Sacramento River was about 39.0%, Yolo Bypass contributed 0%, the San Joaquin River contributed an average of 52.0%, eastside streams contributed about 2.7%, agricultural drainage contributed about 5.9%, and water from the Benicia boundary contributed 0.1%.

VARIABLES FOR MEASURING HYDRODYNAMIC EFFECTS OF DW OPERATIONS

Assessment of the Delta hydrodynamic impacts of DW project operations was accomplished by considering hydrodynamic variables in the Delta and selecting those that could possibly be changed or influenced by DW operations. These selected "impact variables" were then described and analyzed with the RMA Delta model to determine whether significant changes from conditions under the simulated No-Project Alternative would likely occur with any proposed DW operations.

The Delta hydrodynamic variables considered in the selection of impact variables included a wide range of possible hydrologic and tidal effects, some of which were determined from RMA model simulation results to be outside the influence of DW project operations. The evaluation of possible impact variables recognized that the basic hydrologic conditions in the Sacramento and San Joaquin River basins and tidal fluctuations from San Francisco Bay are beyond the control of any proposed DW operation.

Possible Hydrodynamic Impact Variables

The following general types of Delta hydrodynamic variables might be affected by proposed DW operations and these were selected as the response variables:

- Delta tidal hydraulics that result from changes in tidal prism volume caused by flooding or diking of tidal wetlands, changes in channel geometry, or changes in the operation of tidal gates or major siphons;
- Delta inflows that result from changes in upstream reservoir operations or water transfers to the DW islands;
- Delta exports that result from changes in pumping limitations (physical or regulatory), export demands, Delta inflows, Delta water quality standards, or required minimum Delta outflows;
- Delta outflows that result from changes in requirements for minimum outflows, Delta inflows, Delta exports, or net in-Delta diversions;
- Delta channel net flows, including QWEST flows, that respond to changes in Delta inflows, diversions, and exports; modified operations of Delta facilities (the DCC, Clifton Court Forebay, and Suisun Marsh salinity control gate); and modified channel conveyance capacities that might be affected by dredging, widening, clearing, cutting of new Delta channels, or installation of barriers or by different hydraulic gradients (water surface slope); and
- Delta source contributions that respond to changes in DW diversions and discharges.

These selected impact variables are summarized in Table B1-6, with the method of analysis and assessment and the Delta locations selected to represent possible hydrodynamic effects of DW operations. Possible effects of DW operations on each response variable are briefly described below.

Delta Tidal Hydraulics

The DW project might change Delta tidal hydraulics in local channels adjacent to proposed DW siphons or discharge pumps. These possible effects were evaluated with RMA Delta model simulations of tidal flow, velocity, and stage with typical Delta inflow and Delta export conditions that would allow maximum DW diversions or discharges. Simulations of tidal hydraulics during periods of maximum diversion and discharge were analyzed for Delta channels surrounding each DW island (Bacon Island, Bouldin Island, Holland Tract, and Webb Tract). Results of these simulations are discussed later in this appendix.

Delta Inflow

The DW project might affect Delta inflow through changes in the upstream storage and release patterns of reservoirs operated by the CVP, the SWP, or other water agencies that might transfer water to and/or from the DW islands. DW project operations could not cause changes in long-term average Delta inflow but might influence the monthly pattern of inflow released from upstream reservoir storage. For purposes of this EIR/EIS, however, potential changes in Delta inflow conditions have not been simulated. Appendix A1, "Delta Monthly Water Budgets for Operations Modeling of the Delta Wetlands Project", describes the assumed Delta inflows that were simulated by DWRSIM for the selected No-Project Alternative conditions.

Potential operations of the DW project depend directly on Sacramento and San Joaquin River inflows. Figure B1-42 shows simulated monthly inflows for the Sacramento and San Joaquin Rivers for the No-Project Alternative for water years 1967-1991. Historical inflows are shown as a reference baseline for understanding the No-Project Alternative conditions.

Delta Export

The DW project would change Delta export by providing an additional source of water. Possible effects of an additional water source on Delta exports have been analyzed for unspecified water supply destinations with the DeltaSOS model, as described in Appendix A3. The effects of these possible export changes on Delta channel flows were simulated with the RMA Delta model and are described in this appendix. Figure B1-42 shows monthly combined SWP and CVP exports for water years 1967-1991 for the No-Project Alternative, with the historical export conditions shown as a reference baseline. Differences between values for the No-Project Alternative and historical conditions are explained below under "Simulation Results for the No-Project Alternative" in the section "Simulated Effects of DW Operations on Delta Channel Flows and Source Contributions".

Delta Outflow

The DW project would change Delta outflow by diverting water for seasonal storage during periods of excess Delta inflows, or by discharging some or all of the stored water for increased Delta outflow to potentially benefit fish and estuarine habitat conditions later in the year during periods of lower Delta outflow. Possible effects on Delta outflows have been analyzed for a variety of assumed DW project operations with the DeltaSOS model, as described in Appendix A3. The effects of these outflow changes on Delta channel flows were simulated with the RMA Delta model and are described in this appendix. Figure B1-43 shows simulated monthly Delta outflow at Chipps Island for the No-Project Alternative for water years 1967-1991, with historical outflow conditions shown for reference. Differences between values for the No-Project Alternative and historical conditions are explained below under "Simulation Results for the No-Project Alternative".

Delta Channel Net Flow

The DW project would change flows in some Delta channels because diversions to and discharges from the DW islands would be modified from No-Project Alternative agricultural operations. Changes in diversion and discharge from no-project conditions include:

- reduced agricultural diversions,
- increased riparian or appropriative diversions for waterfowl habitat flooding,
- diversion of excess Delta inflow for seasonal storage, and
- discharge of seasonal storage to increase Delta export and/or increase Delta outflow.

DW operations would also modify hydraulic gradients in some Delta channels. During the diversion period, lowered stage levels at the DW siphons may cause tidal flows in several central Delta channels to shift slightly. During the discharge period, increased stage at the DW discharge locations may cause tidal flows in Old and Middle Rivers and their connecting canals to shift slightly. The effects of DW diversions and discharges on Delta channel flows were simulated with the RMA Delta model and are described in this appendix. Potential channel scour effects of DW project operations are discussed in Chapter 3D, "Flood Control".

Figure B1-43 shows monthly diversions from the Sacramento River through the DCC and Georgiana Slough to the central Delta for the No-Project Alternative and for historical conditions. Figure B1-43 also shows central Delta outflow (QWEST flow) downstream of the Mokelumne River for the No-Project Alternative and for historical conditions. Simulated DCC and Georgiana Slough flows depend on Sacramento River inflow and are not substantially affected by exports, whereas the central Delta outflow (QWEST flow) is reduced by exports.

Figure B1-44 shows Delta channel flows at three locations that have been selected to describe the overall effects of the DW project operations on Delta hydrodynamics:

- San Joaquin River flow at Antioch includes net Delta outflow from the central Delta, along with Threemile Slough flow from the Sacramento River. This flow is almost the same as the flow that will be measured by the USGS UVM stations at Jersey Point and Dutch Slough (Antioch flow also includes Dutch Slough flow).

- Threemile Slough flow represents flow between the Sacramento River near Emmaton and the San Joaquin River near Bradford Island, upstream of Jersey Point and False River. Threemile Slough flows are influenced by Sacramento River flow and San Joaquin River flows from the central Delta (QWEST flow). Closure of the DCC increases Threemile Slough flow because Sacramento River flows are increased and QWEST flows are reduced (see Figure B1-27).

- Old River flow at Bacon Island indicates flow in Old River past Bacon Island and Holland Tract. Negative flows indicate that net flow is moving toward the Delta exports pumps. The Old River channel carries approximately half the total net flow toward the export pumps. The remainder flows in Middle River on the east side of Bacon and Victoria Islands. Because flows in Old and Middle Rivers are about the same, Old River flow is assumed to also represent Middle River flow. Most periods of historical positive flows in Old River (i.e., downstream and northward) are reduced or eliminated in the No-Project Alternative simulations because of greater simulated exports.

The sum of Old River and Middle River channel flows, if positive, is the excess San Joaquin River diversions to the head of Old River flowing past the export pumps toward the central Delta. The sum of these channel flows, if negative, is the net flow from the central Delta to the export pumps. Because the DW project islands are in the central Delta, DW operations would directly affect one or more of these selected channel flows. DW diversions would reduce Antioch flows, increase Threemile Slough flows, and increase reverse flows in the lower Old and Middle River channels. DW discharges for export would increase Old and Middle River flows toward the export pumps.

Delta Source Contributions

The DW project might change the pattern of source contributions of water at Delta exports or in Delta outflow by diverting water that would otherwise have been transported to other locations, specifically to the Delta export pumps and Delta outflow. During the discharge period, the DW seasonal storage facilities would supply a new source of water that might replace other inflow sources to Delta exports or Delta outflow. Historical source contributions were simulated using the water quality module of the RMA Delta model as described in Appendix B2, "Salt Transport Modeling Methods and Results for the Delta Wetlands Project". The possible effects of DW operations on simulated Delta source contributions are described in this appendix, however, because these source contributions are determined by hydrodynamic processes. These source contribution changes were incorporated into the DeltaDWQ assessment model (Appendix C4, "DeltaDWQ: Delta Drainage Water Quality Model").

MAXIMUM HYDRODYNAMIC EFFECTS ON LOCAL CHANNEL FLOWS, VELOCITIES, AND STAGES

Direct effects of DW project operations during filling and discharge operations would be greatest in Delta channels surrounding the DW project islands. Effects of the maximum possible proposed diversion rates and discharge rates on tidal hydraulics in Delta channels surrounding the DW project islands were simulated with the RMA Delta hydrodynamic model. These conditions would occur at the beginning of diversions or discharge periods; average hydrodynamic effects during the entire diversion or discharge period would be smaller because the diversion and discharge rates decline as the DW reservoir islands are filled or emptied.

For the tidal simulations of maximum DW filling operations, Delta inflows and exports were specified to produce maximum expected flows and velocities in Delta channels during a high inflow period. The proposed DW diversion rate would be limited to a daily maximum of 9,000 cfs for all alternatives evaluated; this rate would decrease as the reservoir islands are filled and head differential decreases.

For the tidal simulations of maximum DW discharge operations, Delta inflows were specified to produce maximum expected flows and velocities in Delta channels during a typical DW discharge period. Exports were set at 5,000 cfs to allow an additional export of 6,000 cfs of water discharged from the DW project. Table B1-7 lists the assumed Delta flows and exports for simulations of maximum DW diversion effects and Table B1-8 lists the assumed and simulated Delta channel flows for maximum DW discharge effects.

Hydrodynamics during Maximum DW Diversions

Simulated Hydrodynamic Changes

Hydrodynamic changes caused by maximum DW project diversions would not persist throughout an entire diversion period of several weeks. After the first few days of diversions, hydrodynamic effects would decrease as siphoning rates decreased during filling in response to decreasing head differential.

Simulated net Delta channel flows under maximum flow conditions specified for a typical diversion period, but without the DW project, are shown in Figure B1-45. The simulated Sacramento River inflow was 80,000 cfs to provide the maximum possible Georgiana Slough flow (of about 12,000 cfs) to the central Delta (with the DCC closed). San Joaquin River inflow was 5,000 cfs and eastside stream inflow was 1,000 cfs. Channel depletion was assumed to be 0 cfs. CCWD diversions were set at 150 cfs, North Bay Aqueduct pumping at 50 cfs, CVP pumping at approximately 4,200 cfs (winter maximum), and SWP pumping at approximately 8,345 cfs (Table B1-7). The SWP pumping was estimated as 6,680 cfs plus one third of the San Joaquin River inflow, as specified in the SWP's U.S. Army Corps of Engineers (Corps) permit.

The 1995 WQCP would allow a maximum of 35% of the Delta inflows (30,100 cfs for these river inflows) to be exported during February-June and a maximum of 65% to be exported during July-January. The maximum DW diversions of 9,000 cfs is assumed to be included in the specified percentage for exports. The maximum DW diversions with maximum SWP and CVP exports (of approximately 12,900 cfs) could occur with a combined river inflow of about 61,000 cfs during those months under the 35% inflow criterion. Maximum DW diversions could occur with a combined river inflow of about 32,000 cfs during months with an inflow criterion of 65%, assuming that outflow and channel depletion would be satisfied with the 11,200 cfs (35% of inflow) reserved for these purposes.

The maximum DW diversions would occur at four siphon stations with capacities of 2,250 cfs each. Two stations are on Bacon Island, one on Middle River and one on Old River. The other two are on Webb Tract, one on the San Joaquin River and the other on False River adjacent to Franks Tract. Proposed DW project filling would cause greatest hydrodynamic changes in Delta channels adjacent to the DW project islands in the central Delta. The simulated effects of proposed project diversions adjacent to each DW island are described below.

Table B1-7 lists the net flows in each major Delta channel simulated for the typical diversion period, with and without the maximum DW diversions of 9,000 cfs (4,500 cfs to Bacon Island and 4,500 cfs to Webb Tract). Figure B1-45 shows the directions of these net flows in the major Delta channels without DW diversions. The Sacramento River provides the largest Delta inflow, and diversions from the Sacramento River to the San Joaquin River and south toward Delta export pumps are of interest for evaluating effects on fisheries (see Chapter 3F, "Fishery Resources").

An extreme tidal stage record for Benicia was used in these simulations to approximate maximum tidal flows. The total Delta inflows were 86,000 cfs, and the total Delta exports were 12,745 cfs, so the net outflow at Benicia was 73,255 cfs.

The simulated Georgiana Slough diversion flow was about 12,220 cfs without the DW diversions and increased by only 45 cfs with the maximum DW diversions (0.5% change). The simulated DCC flow was 0 cfs because the DCC would be closed at this high Sacramento River inflow rate (80,000 cfs). Flow at the mouth of the Mokelumne River was 8,785 cfs, and the remainder of the Georgiana Slough flow (and Mokelumne River inflow of 700 cfs) entered the San Joaquin River channel through Potato, Little Connection, and Disappointment Sloughs.

The San Joaquin River inflow at Vernalis was 5,000 cfs and the simulated diversion at the head of Old River was about 3,369 cfs, so the simulated San Joaquin River flow past Stockton was 1,630 cfs. Some of the San Joaquin River flow entered Empire (Turner) and Columbia Cuts and the mouth of Middle River and moved toward the export pumps and Bacon Island DW diversions. Middle River flow at Columbia Cut increased from about 4,888 cfs to 7,197 cfs (2,309-cfs increase) with maximum DW diversions of 2,250 cfs from Middle River onto Bacon Island. Empire Cut flow increased from 951 cfs to about 1,169 cfs (218-cfs increase) with the maximum DW diversions. Flows in Middle River south of the Bacon Island diversion were not significantly changed.

The flow from the mouth of Old River into Franks Tract increased from about 5,687 cfs to 6,978 cfs (1,290-cfs increase) with maximum DW diversions. Flows in Old River south of the Bacon Island diversion were not significantly changed.

Webb Tract maximum diversions of 4,500 cfs were supplied from the San Joaquin River channel opposite the Mokelumne River mouth and from False River and Franks Tract. The maximum DW diversions of 9,000 cfs were supplied by reduced outflow from the central Delta. San Joaquin River flow north of Webb Tract was reduced by 6,014 cfs, from about 3,324 cfs to -2,690 cfs (reversed upstream flow), with the maximum DW diversions. False River flow from Franks Tract was reduced by 2,834 cfs, from about 2,278 cfs to -556 cfs. Dutch Slough flow was reduced by 323 cfs, from 432 cfs to 110 cfs, by the maximum DW diversions.

The reduced central Delta outflow caused flow changes in Threemile Slough, in the San Joaquin River at Antioch, and at Chipps Island and Montezuma Slough. Threemile Slough flows from the Sacramento River increased by 2,879 cfs, from about 15,015 cfs to 17,894 cfs, with the maximum DW diversions. Antioch flow was reduced by 6,077 cfs, from 20,541 cfs to 14,465 cfs, with maximum DW diversions. The increased Georgiana Slough and Threemile Slough diversions to the San Joaquin River and the reduced San Joaquin River flows at Antioch (45 + 2,879 + 6,077 = 9,001 cfs) account for the water supply for maximum DW diversions.

Delta outflow past Chipps Island was reduced by about 8,780 cfs, from 70,357 cfs to about 61,577 cfs, with maximum DW diversions. Montezuma Slough net flow (with the tidal gate operating) was reduced by about 218 cfs, from 2,896 cfs to about 2,678 cfs, with maximum DW diversions. The changes in these Delta outflows were about equal to the maximum DW diversion of 9,000 cfs.

The changes in the hourly flow and velocity patterns in several major Delta channels are shown below to fully disclose the effects of maximum DW diversions on Delta hydrodynamics. The major change in flows were simulated to occur in the San Joaquin River channel between Antioch and the mouth of Old River. However, because the San Joaquin River channel cross-sectional area is large, the changes in flow and velocity were quite small (as a fraction of tidal flows and velocities).

A relatively large increase in flow (2,894 cfs) was simulated to occur in Threemile Slough with maximum DW diversions. The simulated tidal hydraulics for Threemile Slough are shown in Figure B1-46. Simulated tidal flows from the Sacramento River to the San Joaquin River ranged from about 60,000 cfs to -25,000 cfs. Velocities ranged from about 4 ft/sec to about -2 ft/sec. The channel cross-sectional area for Threemile Slough is therefore approximately 13,500 ft^2 (54,000/4 = 13,500).

A relatively large reduction in flow was simulated to occur in False River with maximum DW diversions. However, the tidal flows were quite large, ranging from about 50,000 cfs to -50,000 cfs, and the velocities ranged from about 2.5 ft/sec to -2.5 ft/sec, with a conveyance area of about 20,000 ft^2.

Relatively large increases in flow were simulated to occur in Old and Middle River channels. For example, Figure B1-47 shows the simulated tidal flows and velocities in Middle River between Columbia Cut and Bacon Island. The tidal flow ranged from 15,000 cfs to about -25,000 cfs. The tidal velocity ranged from 0.8 ft/sec to -1.2 ft/sec. The conveyance area of the Middle River channel is therefore about 20,000 ft^2. The net flow direction in Middle River was toward the Delta export pumps. Maximum DW diversions increased the net flow by about 2,309 cfs, but the change in the tidal flow and velocity was relatively small (10%).

Summary of Hydrodynamic Effects during Maximum DW Diversions

The hydrodynamic simulation results for maximum DW siphoning rates indicate that maximum channel flows and velocities would be within the range of conditions normally encountered during tidal fluctuations in the Delta channels surrounding the DW project islands. Because the maximum DW diversions would occur when Delta inflows and exports are relatively high and because DW diversions would occur at four separate siphon stations located on two islands, the incremental changes in tidal stages, flows, and velocities would be relatively small. Table B1-7 and Figures B1-46 and B1-47 indicate that maximum DW diversions are not expected to change the tidal hydraulics in the Delta channels.

Hydrodynamics during Maximum DW Discharges

Simulated Hydrodynamic Changes

Hydrodynamics in the channels surrounding the project islands were simulated with maximum DW discharges to estimate maximum expected changes during DW project discharge operations for all project alternatives. Figure B1-48 shows simulated net Delta channel flows for the hydrodynamic simulations during maximum DW discharges, but without the DW project.

CVP and SWP exports were set at 2,500 cfs each to allow maximum DW discharges of 6,000 cfs to be exported in the RMA simulations of the No-Project

Alternative (Table B1-8). For simulation of maximum DW discharge effects, pumping at CVP Tracy Pumping Plant was increased to 4,600 cfs (capacity) and at SWP Banks Pumping Plant was increased to 6,400 cfs. CCWD diversions were 150 cfs and North Bay Aqueduct pumping was 50 cfs.

Table B1-8 lists the net flows in each major Delta channel simulated for the typical discharge period, with and without the maximum DW discharges of 6,000 cfs (4,000 cfs from Bacon Island and 2,000 cfs from Webb Tract). Figure B1-48 shows the direction of these net flows in the major Delta channels without DW discharges. The Sacramento River provides the largest Delta inflow (20,000 cfs), and diversions from the Sacramento River to the San Joaquin River and south toward Delta export pumps are of interest for assessment of impacts on fisheries (see Chapter 3F, "Fishery Resources"). Delta channel depletion was assumed to be 3,000 cfs. San Joaquin River inflow was 1,000 cfs. The DCC was simulated to be open during the maximum DW discharge period.

Measured tidal stage values at Benicia for a representative day with a large tidal fluctuation were used in these simulations. The total Delta inflows were 21,250 cfs, and the total Delta exports (without DW exports) were 5,200 cfs, with 3,000 cfs of Delta channel depletion, so the expected base Delta outflow was about 13,050 cfs. However, the simulated Benicia outflow was 12,220 cfs (830 cfs less than expected) and the simulated Delta outflow past Chipps Island and in Montezuma Slough was 12,480 cfs (570 cfs less than expected). This simply means that there was an increase in water elevations during the tidal cycle upstream of Chipps Island that reduced the net outflow by 570 cfs. In addition, tidal stages between Chipps Island and Benicia increased during this particular tidal cycle, reducing the outflow at Benicia by 830 cfs. Over a longer time period, the effects of the tidal hydraulics on net channel flows would be reduced.

The simulated Georgiana Slough diversion flow was about 2,836 cfs without the DW discharges and did not change with maximum DW discharges for export. The simulated DCC flow was 5,810 cfs and also did not change with maximum DW discharges. Flow at the mouth of the Mokelumne River was 5,408 cfs, and the remainder of the simulated DCC and Georgiana Slough flow entered the San Joaquin River channel through Potato, Little Connection, and Disappointment Sloughs.

Threemile Slough flow was about 1,592 cfs and did not change substantially with maximum DW discharges. Because DW discharges were simulated for export, very little change in Delta channels located "downstream" of Bacon and Webb Tract was caused by maximum DW discharges.

The San Joaquin River inflow at Vernalis was 1,000 cfs and the simulated diversion at the head of Old River was about 813 cfs, so the simulated San Joaquin River flow past Stockton was 187 cfs (3%). Diversions at the head of Old River increased to 1,089 cfs with maximum DW discharges, indicating a slight reverse flow of -89 cfs in the San Joaquin River at Stockton. The increased export pumping of 6,000 cfs caused about 276 cfs to be drawn from the San Joaquin River at the head of Old River. San Joaquin River flow downstream of the mouth of Old River was not changed by maximum DW discharges.

Maximum DW discharges of 2,000 cfs from Webb Tract (into False River and Franks Tract) and 4,000 cfs from Bacon Island (into Santa Fe Cut) would change flows in Old and Middle River channels. Middle River flow at Victoria Canal (south of Bacon Island discharge pumps) increased from about 1,701 cfs to 3,605 cfs (1,904-cfs increase) with maximum DW discharges. Middle River flows north of Bacon Island were increased by about 474 cfs from maximum DW discharges from Webb Tract.

Flow near the mouth of Old River into Franks Tract was reduced from about 3,270 cfs to 2,486 cfs (about a 785-cfs reduction) with maximum DW discharges. This flow moves down the San Joaquin and Middle River channels to the export pumps. Reverse flows in Old River south of Woodward Canal were increased from about 3,230 cfs to about 7,049 cfs (3,819-cfs increase) by maximum DW discharges for export.

The changes in the tidal flow and velocity patterns in several major Delta channels are shown below to fully disclose the effects of maximum DW discharges on Delta hydrodynamics. The major change in flows were simulated to occur in the Old and Middle River channels between Webb Tract or Bacon Island and the SWP Banks and CVP Tracy export pumps.

Because the Bacon Island discharge pumps would be located along Santa Fe Cut, the simulated tidal flows and velocities at both ends of Santa Fe Cut were substantially increased. Tidal flows without DW discharges ranged from 2,000 cfs to -1,000 cfs, with a net flow of 424 cfs from Middle River to Old River. Simulated tidal velocities ranged from 0.5 ft/sec to -0.5 ft/sec without DW discharges. The maximum DW discharges of 4,000 cfs from Bacon Island increased the flow at both ends of Santa Fe Cut by about 2,000 cfs. Maximum DW discharges increased the tidal velocities by about 0.5 ft/sec at both ends of Santa Fe Cut.

Figure B1-49 shows the simulated tidal flows and velocities in Middle River south of Bacon Island at Victoria Canal. Tidal flows ranged from 4,000 cfs to about -8,000 cfs without maximum DW discharges. The tidal velocities ranged from about 1 ft/sec to -1.8 ft/sec without maximum DW discharges. The maximum DW discharges were simulated to increase flows toward the export pumps by between 1,000 cfs and about 4,000 cfs and to increase velocities by between 0.2 ft/sec and about 0.8 ft/sec, depending on the tidal hydraulics.

Figure B1-50 shows the simulated tidal flows and velocities in Old River south of Woodward Canal. The simulated tidal flows ranged from about 8,000 cfs to -14,000 cfs without maximum DW discharges. The tidal velocities ranged from about 1 ft/sec to -1.8 ft/sec without maximum DW discharges. The maximum DW discharges were simulated to increase flows toward the export pumps by between 1,000 cfs and about 4,000 cfs and to increase velocities by between 0.2 ft/sec and about 0.8 ft/sec, depending on the tidal hydraulics.

Simulated Stage Changes during Maximum DW Diversions and Discharges

Table B1-9 lists simulated channel stages during periods of maximum DW diversions and discharges. The results indicate that stages would not be substantially changed by DW operations. The minimum and maximum stages would be lowered in some channels by as much as 0.25 foot (3 inches). However, because these south Delta channels normally experience tidal fluctuations of more than 5 feet, this is not considered a substantial change (5%) for these south Delta channels. These simulations did not include DWR's proposed south Delta project barriers. These tidal gates are designed to help control minimum tidal stages in south Delta channels and may also reduce the potential effects of DW operations on channel stages.

Measured Tidal Hydraulics in the Old and Middle River Channels

Figure B1-51 shows the tidal stage measurements from the USGS UVM station on Old and Middle River on each side of Bacon Island for half the lunar cycle for October 17-30, 1987. The tidal stage varied in approximately the same way at these two locations, indicating a nearly flat water surface gradient between these stations. The difference between the Middle River stage and the Old River stage was usually less than 0.1 foot. The variation is produced by the tidal hydraulics in this portion of the Delta; Middle River stage is slightly higher during falling tides.

The largest tidal range was observed on October 26, when the low tide was -1.0 foot msl and the high tide was about 3.25 feet msl (spring tide). The smallest tidal range was observed on October 19, when the low tide was about -0.25 foot and the high tide about 2.5 feet (neap tide). However, these daily variations in tidal fluctuations are moderate, with an average tidal range that is similar to the RMA-simulated tidal range of -1.0 foot to 2.5 feet msl for the long-term average tidal boundary at Benicia (Figure B1-9).

The 25-hour moving average tidal stage is also shown in Figure B1-51. The average stage varied from about 0.75 foot to about 1.25 feet (maximum during the spring tide period). This demonstrates the variations in average Delta stage caused by tidal variations in the lunar cycle, which may produce a fluctuating tidal component of daily average Delta outflow.

Figure B1-52 shows the measured tidal flows in Old and Middle Rivers during the period of October 17-30, 1987. The channel flows were quite similar at these two locations, with nearly identical flows in each channel. The highest flows correspond to the largest change in tidal stage, rather than the highest or lowest tides. The flows in both Old River and Middle River fluctuated between about -15,000 cfs (flood tide toward the export pumps) to about 12,000 cfs (ebb tide toward the bay). The 25-hour moving average flow was approximately 2,500 cfs in each channel, indicating a net combined channel flow of about 5,000 cfs moving toward the export locations. SWP and CVP exports averaged 5,100 cfs during this period. CVP export pumping is nearly constant from Old River. Because the SWP exports are diverted from Old River into Clifton Court Forebay on high tides, the effects on the tidal flows are not uniform.

These measured peak tidal flows of about 10,000 cfs (adjusted for 0 net flow) are larger than the peak tidal flows simulated with the RMA hydrodynamic model for Middle River at Bacon Island without DW discharges (Figure B1-49) and are about the same as the simulated peak Old River tidal flows (Figure B1-50) (adjusted for zero net flow). Therefore, these simulated typical tidal hydraulics during maximum DW discharge are confirmed to be representative of actual measured tidal flow conditions during October 17-30, 1987. The effects of the maximum DW discharges on Old and Middle River channel flows are moderate and within the range of normal fluctuations of tidal hydraulics in this portion of the Delta.

Summary of Hydrodynamic Effects during Maximum Discharges

The RMA hydrodynamic model results for maximum anticipated DW discharge rates indicate that maximum possible channel flows and velocities are within the range of conditions normally encountered during tidal fluctuations in the Delta channels surrounding the DW project islands. The comparison with measured tidal flows in Old and Middle Rivers confirms that DW discharges will not change the range of normal tidal flows. DW discharges will not change the maximum Delta export pumping and therefore will not change the maximum net reverse flows in Old and Middle Rivers. DW discharges will change the source of the water but not the maximum flows in Old and Middle Rivers.

SIMULATED EFFECTS OF DW OPERATIONS ON DELTA CHANNEL FLOWS AND SOURCE CONTRIBUTIONS

The channel flows and source contributions simulated with the RMA Delta hydrodynamic model for historical monthly average inflows and exports for water years 1967-1991 were summarized with "channel split" and "source contribution" equations that were incorporated into the DeltaSOS and DeltaDWQ assessment models. This allowed hydrodynamic impact assessment of the DW alternatives to be performed for the 70-year period of water years 1922-1991 using DeltaSOS without the RMA Delta hydrodynamic model being used for the entire 70-year period for each alternative. In addition, water quality and fishery assessment methods relied on the DeltaSOS simulations of channel flows and source contributions, which were derived from the RMA Delta hydrodynamic simulations of channel flows using the 1967-1991 historical inflows and exports.

The No-Project Alternative was the basis of comparison for the impact assessments for the EIR/EIS. Monthly average Delta channel net flows for each of the DW alternatives, including the No-Project Alternative, were simulated with the DeltaSOS model. The results of these simulations are described below for each of the impact assessment variables identified in Table B1-6.

Simulation Results for the No-Project Alternative

Table B1-10 presents the assumed monthly Delta inflows and simulated monthly exports and channel flows at selected locations for the No-Project Alternative for water years 1968-1991. These No-Project Alternative conditions can be compared with the historical conditions presented in detail above under "Simulations of Monthly Average Net Delta Channel Flows Using Historical Delta Inflows and Exports" to provide a reference baseline. The simulated No-Project Alternative conditions are considerably different from the historical conditions because the simulations for the No-Project Alternative were performed based on existing demands for SWP and CVP exports, which are higher than historical demands, and on Delta objectives and requirements that differ from the standards that historically governed Delta operations (see Appendix A3, "DeltaSOS Simulations of the Delta Wetlands Project Alternatives" for an explanation of the modeling assumptions).

Simulated No-Project Alternative Delta exports are generally higher than simulated historical Delta exports because of the assumed increase in export demands above historical levels (Figure B1-42). Simulated Delta outflows are less for the No-Project Alternative than for historical conditions, although the assumed minimum Delta outflows required to satisfy 1995 WQCP objectives and carriage-water requirements result in simulated outflow that is higher than historical outflow for some months of some years. Average annual Delta inflows are about the same for historical conditions and the No-Project Alternative, although the monthly pattern of simulated inflows is shifted slightly to satisfy increased export demands and minimum outflow requirements in the No-Project Alternative simulations.

The differences between the simulated DCC and Georgiana Slough diversions under the No-Project Alternative and historical conditions are related to Sacramento River flow and DCC closure criteria being different (see Chapter 3A, "Water Supply and Water Project Operations"). Differences in central Delta outflows (QWEST flows) are related to changes in DCC and Georgiana Slough diversions and increased Delta exports (Figure B1-43).

Simulated Delta Channel Flows for the No-Project Alternative

As discussed above under "Possible Hydrodynamic Impact Variables", three Delta channel locations were selected for analysis of Delta hydrodynamic effects of DW project operations. DW project operations would most directly modify channel flows in the San Joaquin River downstream of the DW project islands (e.g., Antioch), in Threemile Slough, and in Old and Middle Rivers between the DW islands and the Delta export pumps. (Old River is used as the selected location because flow in the two channels is nearly equivalent.)

Simulated flows for the No-Project Alternative in the San Joaquin River at Antioch are generally less than the simulated historical conditions by several thousand cfs most of the time (Figure B1-44). Lower San Joaquin River net flows in the No-Project Alternative simulation are primarily the result of exports being increased in comparison with historical conditions, although some changes in Sacramento River inflows and diversions through the DCC, Georgiana Slough, and Threemile Slough also modify net flows past Antioch.

Flows in Threemile Slough were considerably higher in the No-Project Alternative simulations than under simulated historical conditions because for the No-Project Alternative, 1995 WQCP criteria for DCC closure were simulated for November-May and simulated exports were usually higher (Figure B1-44). Because more water is required for the increased Delta exports and DCC closure is simulated for the fall and spring months, flows simulated for Threemile Slough are larger under the No-Project Alternative than under historical conditions (Tables B1-4 and Table B1-10).

Table B1-11 presents selected channel flows simulated for the No-Project Alternative for comparison of operations of the DW alternatives.

Simulated flows in Old River (and Middle River) were higher in the upstream (negative) flow direction toward the Delta export pumps for the No-Project Alternative simulation than under historical conditions (Figure B1-44). Periods of downstream flows in Old and Middle Rivers caused by San Joaquin River inflows in excess of total Delta export pumping were simulated to occur in wet years for the No-Project Alternative (e.g., 1983).

Simulated Source Contributions for the No-Project Alternative

Simulated source contributions from each Delta inflow to the CCWD Rock Slough intake and Delta export locations (SWP Banks and CVP Tracy Pumping Plants) were previously shown in Figures B1-39 to B1-41 for the historical inflows and exports for water years 1967-1991. The historical patterns of source contributions were discussed under "Source Tracking of Historical Delta Inflows".

Impact assessment of effects of the DW alternatives on export water quality, presented in Chapter 3C, "Water Quality", depends on the simulated monthly average source contributions for south Delta exports (representative of CCWD diversions and SWP and CVP exports) and monthly water quality estimates for each inflow source. The DW alternatives are compared with the No-Project Alternative for impact assessment purposes. Table B1-12 presents the monthly source contributions from each Delta inflow for these combined Delta exports (including CCWD diversions), as estimated from DeltaSOS simulations of Delta exports, for the No-Project Alternative.

Simulated DW discharges for export increased both the source and diversion flow totals, and reduced the contributions from other sources during DW discharges for export. For example, for August 1968 the DW discharge for Alternative 1 (1,623 cfs) was simulated to contribute 12.2% of the south Delta exports and to reduce the agricultural drainage contribution from 6.4% (estimated for the No-Project Alternative) to 5.5% (Table B1-12). The San Joaquin River contribution was reduced from 8.5% to 7.5% with the DW discharge. The Sacramento River contribution was reduced from 81.6% to 71.8%. DW discharges would therefore reduce the percentage contributions from other sources. The corresponding change in water quality would depend on the water quality estimates for this particular month for all sources, including DW discharges.

Simulated DW diversions increased the total south Delta diversion flow and changed the simulated contributions from other sources. For example, for December 1969 the DW diversion (3,892 cfs) for Alternative 1 was simulated to change the agricultural drainage contribution from 13.2% (estimated for the No-Project Alternative) to 9.5% (Table B1-12). The DW diversions reduced the San Joaquin River contribution in south Delta exports from 14.5% to 10.8%. The eastside stream contribution was reduced from 5.4% to 4.2%. The Sacramento River contribution was increased from 66.8% to 75.1%. The contribution from the Benicia boundary was increased from 0.1% to 0.3%. These shifts in source contributions during DW diversions are controlled by the increased total diversions and the limited supply from agricultural drainage, eastside streams, and the San Joaquin River. The Sacramento River contributions increase to supply the increased total diversions, and tidal mixing from Benicia increases because of reduced outflow.

The average source contributions for south Delta exports have been used for water quality impact assessment of the DW alternatives, which is presented in Chapter 3C. The simulated average source contribution effects of the DW alternatives are considered appropriate for the monthly average impact assessments used throughout this EIR/EIS. Although variations in these percentages for monthly average simulated source contributions are expected because of daily variations in flows and tidal mixing characteristics, these variations cannot be accurately estimated with monthly model results. Therefore, simulated changes in average monthly source contributions in representative south Delta exports are described in this chapter and used in Chapter 3C for water quality impact assessment.

The patterns of simulated source contributions for the No-Project Alternative are generally similar to those for the historical source contributions shown in Table B1-5 because the source contributions are related to the hydrologic inflows, which were approximately the same for the historical and No-Project Alternative conditions for many months. However, because exports under the simulated No-Project Alternative are often higher than historical exports, the simulated San Joaquin River, eastside stream, and agricultural drainage source contribution percentages are often lower for the No-Project Alternative than for the historical conditions. The Sacramento River contributions are generally higher in the No-Project Alternative simulations because Sacramento River water supplies most of the increased exports under the No-Project Alternative.

Simulation Results for Alternative 1

Under Alternative 1, water would be diverted for storage on Bacon Island and Webb Tract and a habitat management plan (HMP), with limited conjunctive water storage, would be implemented on Bouldin Island and Holland Tract. Chapter 2, "Delta Wetlands Project Alternatives", provides a complete description of Alternative 1.

Alternative 1 Operations

In DeltaSOS simulations of this alternative, the maximum storage volume of the two reservoir islands is approximately 238 thousand acre-feet (TAF). Maximum storage may increase slightly over the life of the project because of subsidence on the reservoir islands. Incidental storage on the habitat islands during certain seasons would be approximately 9 TAF. As simulated in DeltaSOS, the maximum monthly average DW diversion rate to the reservoir islands is 4,000 cfs, and the maximum monthly average DW discharge rate from the reservoir islands is 4,000 cfs. The maximum diversion rate is assumed to be 9,000 cfs, and the maximum discharge rate is assumed to be 6,000 cfs.

Under this alternative, DW diversions are treated consistently with the 1995 WQCP objectives for Delta exports at the SWP and CVP pumping plants. That is, DW diversions are considered to be the same as SWP and CVP exports in complying with the WQCP objectives, although DW's new water rights for diversions have a lower priority than the senior SWP and CVP water rights. As simulated in DeltaSOS, DW diversions to storage would occur only when the volume of allowable water for export (i.e., the lesser of the amount specified by the export limits and the amount of available water) is greater than the permitted pumping rate of the export pumps. This would occur when two conditions are met: 1) when all Delta outflow requirements are met and the export limit is exceeded and 2) when water that is allowable for export is not being exported by the SWP and CVP pumps. For purposes of modeling Alternative 1, the second condition is assumed to occur only when water that is allowable for export exceeds the permitted pumping rate.

For DeltaSOS simulations of Alternative 1, it is assumed that discharges of water from the DW islands would be exported in any month when unused capacity within the permitted pumping rate exists at the SWP and CVP pumps, and strict interpretation of the export limits (percentage of total Delta inflow) specified in the 1995 WQCP does not prevent use of that capacity. Such unused capacity could exist when the amount of available water (i.e., total inflow less Delta outflow requirements) is less than the amount specified by the export limits. Under this alternative, DW discharges would be treated as additions to total Delta inflow. Export of DW discharges thus would be limited to the lesser of the permitted export pumping capacity and the amount calculated under the "percent inflow" export limit, based on the adjusted inflow amount (including DW discharges).

Under Alternative 1, DW has two choices regarding allocation of discharges. If DW chooses to discharge at the maximum DW discharge rate, some of the releases must be used to increase Delta outflow while the balance is exported, according to the specified "percent inflow" criterion. Alternatively, DW could choose to limit discharges so that no allocation to Delta outflow is needed. The DeltaSOS simulations of Alternative 1 assumed that DW discharges were limited to allowable exports, with none allocated to Delta outflow.

DW monthly operations were simulated with DeltaSOS as reported in Appendix A3. The 70-year average annual DW operations were simulated to be 222 TAF/yr of diversions, with 188 TAF/yr of discharge for export. DW diversions would normally occur during one of the fall or winter months, and DW discharges would generally occur in July and August.

Simulated Channel Flows for Alternative 1

Table B1-11 presents the changes in the selected channel flows simulated for Alternative 1 compared with the channel flows simulated for the No-Project Alternative. As presented in detail above under "Simulations of Monthly Average Net Delta Channel Flows Using Historical Delta Inflows and Exports", the Delta channel flows simulated with the RMA Delta hydrodynamic model can be summarized with relatively simple channel flow-split relationships that depend on Delta inflows and exports.

The effects of DW project diversions and discharges on export pumping can be summarized according to these general channel flow relationships. DW diversions would reduce Delta outflow and QWEST flow (outflow from the central Delta) by the same amount as the DW diversion because DCC and Georgiana Slough flows are not changed by increased exports or DW diversions. The hydraulic relationship between Threemile Slough flow and QWEST flow indicates that Threemile Slough flow would increase by about 31% of the reduction in QWEST. Antioch flow would therefore decrease by 69% of the QWEST reduction. If the DW diversions are specified, these corresponding changes in Delta channel flows can be easily calculated.

DW discharges for export pumping would only change Delta channel flows in Old and Middle Rivers. Because the Old and Middle River channels near Bacon Island have approximately equal tidal and net flows, the change in flow in each channel would equal approximately half the DW discharge rate. If the DW discharges are from Bacon Island, only the channel flows from Bacon Island to the export pumps would change. If the DW discharges are from Webb Tract, about half the DW discharge would move directly down the Old River channel and the other half would flow toward Middle River (via the San Joaquin River or Connection Slough). Delta outflow and QWEST flows would not be changed by DW discharges for Delta export.

Simulated Source Contributions for Alternative 1

The simulated percent source contributions for Alternative 1 are shown in Table B1-12. As described in detail above under "Source Tracking of Historical Delta Inflows", the source contribution from DW discharges would be approximately equal to the DW discharges divided by the total south Delta diversions (exports and agricultural diversions). Because the total simulated exports are increased by the amount of the simulated DW discharges, the percent source contribution from all other sources will decrease during periods with DW discharges.

The maximum source contribution from DW discharges will occur with a large DW discharge (4,000 cfs monthly maximum) during a month with limited SWP and CVP pumping. The maximum simulated DW source contribution for Alternative 1 was approximately 35%. The RMA source tracking for historical inflows and exports demonstrated that there may be differences in the source contributions between the export locations. However, the average monthly contribution from DW discharges is expected to be similar to these simulated monthly values. The possible water quality impacts of these changes in source contributions at the export locations are described in the impact assessment in Chapter 3C, "Water Quality".

Simulation Results for Alternative 2

Alternative 2 would have the same physical arrangement and operating capacities as Alternative 1. Chapter 2 provides a complete description of Alternative 2.

Alternative 2 Operations

The diversion-period modeling assumptions for this alternative are the same as for Alternative 1. In DeltaSOS simulations of Alternative 2, it is assumed that releases of water from the DW islands would be exported by the SWP and CVP pumps when unused capacity within the permitted pumping rate exists at the SWP and CVP pumps. DW discharges would be allowed to be exported in any month when such capacity exists and would not be subject to strict interpretation of the export limits (percentage of total Delta inflow). Under this alternative, it is assumed that export of DW discharges is limited by the 1995 WQCP Delta outflow requirements and the permitted combined pumping rate of the export pumps but is not subject to strict interpretation of the 1995 WQCP "percent inflow" export limit. Because the 1995 WQCP limits exports to an amount equal to the San Joaquin River inflow during the April-May pulse-flow period, DeltaSOS does not allow DW discharges to be exported during the pulse-flow period.

Alternative 2 monthly operations were simulated with DeltaSOS as reported in Appendix A3. The 70-year average annual DW operations were simulated to be 225 TAF/yr of diversions, and 202 TAF/yr of discharge for export. DW diversions would normally occur during one of the fall or winter months, and DW discharges would generally occur in February or March or in summer (June or July). The February and March discharges were simulated to occur in years when inflows were not high enough to allow full SWP and CVP export pumping.

Simulated Channel Flows for Alternative 2

Table B1-11 presents the changes in the selected channel flows for Alternative 2 compared with the No-Project Alternative channel flows. DW diversions and discharges were simulated to occur during only one or two months each year, so that most of the time there is no simulated change in Delta channel flows. The simulated average monthly change in outflow and QWEST during DW diversions for Alternative 2 was 292 cfs. The simulated average monthly change in Old and Middle River flow during DW discharge for Alternative 2 was 295 cfs.

Simulated Source Contributions for Alternative 2

The simulated source contributions for Alternative 2 are shown in Table B1-12. The DW percentage source contributions for Alternative 2 are slightly higher than for Alternative 1 because the allowable DW exports are greater (limited by permitted pumping rate rather than percent inflow limits). The possible water quality impacts of these changes in source contributions at the export locations are described in the impact assessment in Chapter 3C.

Simulation Results for Alternative 3

Under Alternative 3, water would be diverted for storage in reservoirs on all four DW project islands. A habitat reserve would be created on Bouldin Island north of State Route 12. Chapter 2 provides a complete description of Alternative 3.

Alternative 3 Operations

In DeltaSOS simulations of this alternative, DW initial storage volume is assumed to be approximately 406 TAF; this volume may increase slightly over the life of the project. Incidental storage in the habitat management area would be minimal. The maximum monthly DW diversion rate to the four islands is simulated to be 6,000 cfs, which would allow almost the entire DW storage volume to be filled in a single month; the initial daily average maximum is assumed to be 9,000 cfs. The maximum monthly average DW discharge rate is 6,000 cfs for simulation purposes (maximum discharge rate of 12,000 cfs).

The diversion-period modeling assumptions for this alternative are the same as for Alternatives 1 and 2. The discharge-period modeling assumptions for this alternative are the same as for Alternative 2 (permitted export pumping rate limits).

Alternative 3 monthly operations were simulated with DeltaSOS as reported in Appendix A3. The 70-year average annual DW operations were simulated to be 356 TAF/yr of diversions, with 302 TAF/yr of discharge for export. DW diversions would normally occur during one of the fall or winter months, and DW discharges would generally occur in February or March or in summer (June, July, and August). The February and March discharges are simulated to occur in years when inflows are not high enough to allow full SWP and CVP export pumping. Discharges are usually limited by the export pumping capacity, and more than one month is required to empty the DW storage.

Simulated Channel Flows for Alternative 3

Table B1-11 presents the changes in the selected channel flows for Alternative 3 compared with the No-Project Alternative channel flows. DW diversions and discharges were simulated to occur during only one or two months each year, so that most of the time there was no simulated change in Delta channel flows. The simulated average monthly change in outflow and QWEST during DW diversions for Alternative 3 was 457 cfs. The simulated average monthly change in Old and Middle River flow during DW discharge for Alternative 3 was 452 cfs.

Simulated Source Contributions for Alternative 3

The simulated source contributions for Alternative 3 are shown in Table B1-12. The DW source contributions for Alternative 3 are about the same as for Alternative 2 because the allowable DW exports are the same in most months. Alternative 3 requires more months of discharges, however, to empty the DW storage in many years. The possible water quality impacts of these changes in source contributions at the export locations are described in the impact assessment in Chapter 3C.

CITATIONS

California. Department of Water Resources. 1993. Sacramento-San Joaquin Delta atlas. Sacramento, CA.

__________. 1994. Mathematical models for estimating Delta island diversions and drainage flows. Division of Planning, Delta Modeling Section. Sacramento, CA.

Smith, D. J., and T. J. Durbin. 1989. Mathematical model evaluation of the proposed Delta Wetlands project on the hydrodynamic and water quality response of Suisun Bay and the Sacramento-San Joaquin River Delta System. (RMA 8808.) Resource Management Associates, Inc. Lafayette, CA.

Table B1-1. Specified Channel Geometry in the RMA Delta Model

Channel Location	Surface Area (acres)	Channel Volume (acre-feet)	Mean Depth (feet)
San Joaquin River: Vernalis to Old River Split	513	2,781	5.4
San Joaquin River: Mossdale to Mokelumne	3,586	82,935	23.1
Lower San Joaquin River: Mokelumne River to Broad Slough	7,190	153,041	21.3
Old River: Mossdale to Tracy and Grant Line Canal	932	8,974	9.6
Old River: Clifton Court to Rock Slough	1,106	17,033	15.4
Old River: Rock Slough to San Joaquin River	1,147	21,695	18.9
Old River: Paradise Cut and Tom Paine Slough	272	1,331	4.9
Clifton Court Forebay	2,109	31,635	15.0
Indian and Rock Sloughs	363	3,000	8.3
Franks Tract and Big Break	6,265	64,141	10.2
Middle River and Victoria Canal	4,111	62,178	15.1
Mokelumne River: Georgiana, White, Potato, and Little Potato Sloughs	3,838	52,039	13.6
Sutter, Steamboat, and Miner Sloughs: Sacramento Ship Channel and Cache Slough	4,249	85,951	20.2
American River to Delta Cross Channel	2,037	33,586	16.5
Sacramento River: Delta Cross Channel to Rio Vista	1,495	29,761	19.9
Sacramento River: Rio Vista to Chipps Island	9,581	217,671	22.7
Delta (upstream of Chipps Island)	48,794	857,206	17.6
Suisun Bay	24,570	442,682	18.0
Suisun Marsh	2,530	68,161	26.9
Total Delta, Suisun Bay, and Suisun Marsh	75,894	1,368,050	18.2

Table B1-2. Tidal Flows, Velocities, and Excursions at Selected Delta Locations Simulated with the RMA Delta Hydrodynamic Model for Mean Tide Conditions (5.67-Foot Tidal Range at Benicia)

Delta Channel Location	RMA Channel Number	Average Flood Tide Flow[a] (cfs)	Average Flood Tide Velocity[a] (ft/sec)	Average Channel Area[b] (ft^2)	Tidal Excursion[c] Range (miles)
Benicia	441	321,919	1.8	176,925	12.13
Suisun Bay	440	133,880	1.7	77,184	11.49
Roe Island (Port Chicago)	439	126,995	1.4	90,252	9.25
Honker Bay	438	121,364	1.2	100,714	7.90
Chipps Island	437	203,222	1.8	111,626	11.80
Pittsburg	436	145,695	1.4	105,460	8.88
Sac. R. at Collinsville	435	100,258	1.3	76,762	8.16
Sac. R. at Rio Vista	430	45,772	0.8	57,548	4.84
Sac. R. at Walnut Grove	421	6,511	0.8	8,469	4.95
Sac. R. at Sacramento	410	623	0.1	10,255	0.36
Mouth of Suisun Slough	458	7,777	0.4	21,137	2.19
Mouth of Montezuma Slough	465	13,707	0.6	21,293	4.05
Suisun Marsh salinity control gate	461	4,740	1.0	4,573	6.30
Threemile Slough	309	18,371	1.4	13,505	8.46
SJR at Antioch	51	95,332	1.6	61,305	10.18
SJR at Jersey Point	49	86,076	1.4	59,514	9.24
SJR at Mokelumne R.	45	57,192	0.9	62,464	5.76
SJR at Columbia Cut	37	12,580	0.6	22,771	3.43
SJR at 14-Mile Slough	23	4,072	0.2	17,760	1.44
SJR below Head of Old River	8	944	0.7	1,274	4.53
SJR at Vernalis	1	63	0.1	1,184	0.34
Dutch Slough	274	4,851	1.1	4,231	6.81
False River	279	39,275	2.0	20,125	13.15
Fisherman's Cut	280	2,347	0.4	5,544	2.85
Mouth of Old River	124	2,918	0.1	20,296	0.64
Old River at Rock Slough	106	9,276	0.8	11,149	5.27
Old River at Woodward Canal	92	7,739	1.1	7,308	6.58
Old River at SWP Clifton Court	83	5,693	1.2	4,853	7.20
Old River at CVP Tracy	80	1,205	0.5	2,382	3.01
Head of Old River	54	1,061	1.0	1,099	5.96
Grant Line Canal	210	3,494	0.7	4,949	4.42
Middle River at Columbia Cut	159	14,731	0.7	19,759	4.72
Middle River at Victoria Canal	135	4,282	1.0	4,193	6.24
Head of Middle River	125	35	0.2	139	1.67
Mouth of Mokelumne River	349	8,098	0.5	14,925	3.70
Mouth of Cache Slough	398	28,823	1.1	25,375	6.54
Head of Georgiana Slough	366	942	0.3	3,667	1.62
Delta Cross Channel	365	2,025	0.4	4,978	2.17
Head of Steamboat Slough	383	1,474	0.9	1,662	5.25
Head of Sutter Slough	379	1,942	0.8	2,573	4.48

Notes: [a] Average during 12.5-hour period of flood tide flows and velocities
[b] Channel area equals average flood flow divided by average flood velocity (A = Q/V)
[c] Excursion is the distance between the position of a "floating object" at high tide and at low tide.

Table B1−3. Monthly Historical Delta Inflows (cfs) and Exports (cfs) for 1968−1991

Water Year	Sac. R. at Freeport	Yolo Bypass	SJR at Vernalis	Eastside Streams	DCC & Georgiana	CCWD Intake	CVP Pumps	SWP Pumps	Total Exports	Channel Depletion	QWEST	Threemile Slough	SJR at Antioch	Island Breaks	Total Outflow
1968															
OCT	16,184	22	2,730	1,328	6,836	102	1,589	107	1,798	1,688	8,000	(422)	7,578	0	16,779
NOV	14,617	15	3,479	431	6,376	92	965	77	1,134	1,180	8,385	(768)	7,616	0	16,228
DEC	17,208	41	3,641	234	7,136	79	429	167	676	(86)	10,392	(890)	9,501	0	20,535
JAN	20,514	900	2,946	603	5,354	91	640	438	1,170	(508)	8,062	1,224	9,286	0	24,300
FEB	41,272	6,861	2,715	2,611	7,648	60	1,724	47	1,897	(2,453)	12,670	5,525	18,195	0	54,015
MAR	36,080	2,848	3,099	1,872	5,869	51	3,288	1,155	4,495	(981)	6,983	5,496	12,478	0	40,386
APR	14,460	283	1,438	624	6,330	130	3,777	1,481	5,388	1,469	2,049	1,215	3,264	0	9,948
MAY	13,340	51	893	384	6,002	159	4,173	1,291	5,621	2,298	164	1,516	1,681	0	6,749
JUN	11,371	27	592	150	5,425	224	4,207	287	4,716	3,753	(988)	1,464	476	0	3,672
JUL	12,616	3	504	104	5,790	224	4,746	209	5,177	4,359	(1,613)	1,820	207	0	3,690
AUG	13,026	8	770	138	5,910	194	3,909	775	4,877	3,792	(524)	1,583	1,059	0	5,273
SEP	13,141	27	940	154	5,944	186	3,603	1,825	5,612	2,636	(288)	1,599	1,312	0	6,014
1969															
OCT	11,650	21	1,387	139	5,507	150	3,792	2,319	6,260	1,475	(185)	1,390	1,205	0	5,462
NOV	13,625	14	1,607	203	6,086	114	2,301	2,634	5,051	(740)	3,326	749	4,075	0	11,138
DEC	22,976	858	2,537	752	5,855	88	1,107	2,575	3,772	(2,376)	6,917	2,128	9,044	0	25,728
JAN	55,502	45,392	13,839	11,015	8,212	60	2,888	2,808	5,759	(4,835)	28,984	12,610	41,594	1,466	123,359
FEB	71,919	45,264	32,611	9,975	10,396	60	3,003	1,650	4,715	(4,153)	51,084	8,964	60,048	(119)	159,325
MAR	49,818	10,707	30,929	5,448	7,456	53	2,210	1,145	3,409	101	40,640	(398)	40,241	(280)	93,672
APR	45,423	1,071	22,152	4,739	6,872	74	1,889	1,255	3,218	962	30,200	(304)	29,896	(280)	69,486
MAY	40,679	699	24,657	4,018	6,241	109	2,191	978	3,276	2,378	30,374	(1,471)	28,903	(280)	64,679
JUN	23,161	148	27,931	1,390	6,761	113	1,893	494	2,498	3,742	31,433	(6,154)	25,280	(280)	46,671
JUL	14,241	32	5,813	696	6,267	154	2,707	527	3,388	4,359	6,684	(481)	6,203	(130)	13,166
AUG	18,378	21	2,329	571	7,478	177	4,374	559	5,107	3,792	2,886	1,399	4,285	(80)	12,480
SEP	21,050	26	3,260	737	8,261	140	2,247	179	2,565	2,336	8,222	265	8,487	(46)	20,220
1970															
OCT	16,723	25	4,470	1,096	6,994	105	1,632	274	2,010	785	10,039	(914)	9,125	0	19,518
NOV	16,967	21	4,635	413	7,065	78	367	629	1,074	967	10,411	(1,001)	9,411	0	19,996
DEC	35,314	6,352	2,663	1,853	6,702	94	0	727	823	(912)	10,989	4,688	15,676	0	46,272
JAN	70,386	98,337	11,136	9,372	10,192	49	413	653	1,118	(5,352)	33,060	26,521	59,582	0	193,465
FEB	66,176	33,056	9,207	4,518	9,632	84	1,483	386	1,953	(516)	21,740	13,898	35,638	0	111,521
MAR	44,285	3,009	7,192	3,787	7,600	72	1,760	436	2,269	(81)	16,363	4,062	20,425	0	56,085
APR	14,643	123	1,675	657	6,384	128	3,650	881	4,660	1,394	3,150	871	4,022	0	11,045
MAY	14,290	48	2,397	474	6,281	166	3,568	286	4,019	2,410	3,567	609	4,176	0	10,780
JUN	11,806	33	2,741	267	5,552	197	4,237	573	5,005	3,618	1,204	865	2,069	0	6,224
JUL	13,198	16	1,333	315	5,961	212	4,455	571	5,237	4,359	(462)	1,561	1,099	0	5,266
AUG	15,004	23	1,046	297	6,490	215	3,565	838	4,616	3,792	752	1,513	2,264	0	7,962
SEP	18,543	43	1,321	432	7,526	161	2,285	650	3,094	2,636	4,473	1,006	5,478	0	14,610

Table B1–3. Continued

Water Year	Sac. R. at Freeport	Yolo Bypass	SJR at Vernalis	Eastside Streams	DCC & Georgiana	CCWD Intake	CVP Pumps	SWP Pumps	Total Exports	Channel Depletion	QWEST	Threemile Slough	SJR at Antioch	Island Breaks	Total Outflow
1971															
OCT	15,288	25	1,469	473	6,573	116	2,049	425	2,589	1,219	5,134	349	5,482	0	13,447
NOV	22,556	226	1,658	1,010	5,119	78	471	1,482	2,034	(2,743)	7,535	1,884	9,420	0	26,159
DEC	64,085	11,002	5,053	4,086	9,354	63	8	1,846	1,918	(3,213)	18,663	9,518	28,181	0	85,521
JAN	52,416	6,639	5,213	2,182	7,802	64	24	1,820	1,908	276	13,110	7,708	20,818	0	64,266
FEB	31,251	836	4,399	1,372	6,643	65	2,316	762	3,145	443	8,982	3,042	12,024	0	34,271
MAR	30,535	1,272	2,594	1,769	6,400	71	3,811	828	4,710	(666)	6,486	3,871	10,357	0	32,126
APR	38,332	852	1,964	1,283	6,173	80	3,344	1,015	4,438	951	4,365	6,185	10,550	0	37,043
MAY	29,242	590	1,836	914	7,870	97	3,616	845	4,557	1,572	5,041	3,398	8,439	0	26,453
JUN	27,594	185	2,326	640	10,179	142	4,447	1,191	5,777	3,715	4,952	2,299	7,251	0	21,252
JUL	21,018	14	1,068	455	8,252	165	4,571	1,786	6,521	4,359	420	2,559	2,979	0	11,675
AUG	22,505	5	893	113	8,688	180	4,380	2,154	6,713	3,792	517	2,801	3,317	0	13,011
SEP	24,433	36	1,097	668	9,252	128	2,784	1,004	3,913	2,630	5,395	1,676	7,071	0	19,691
1972															
OCT	16,100	8	2,257	980	6,811	118	2,863	839	3,819	1,543	5,225	430	5,655	0	13,982
NOV	15,879	16	1,649	318	6,746	85	2,325	641	3,052	1,045	4,982	500	5,482	0	13,765
DEC	21,797	57	2,403	939	7,623	92	1,946	401	2,440	(1,255)	9,340	450	9,790	0	24,010
JAN	20,036	115	3,122	619	7,546	66	1,036	516	1,618	897	9,086	31	9,117	0	21,377
FEB	22,947	148	2,803	931	8,892	70	3,259	408	3,871	166	8,647	577	9,224	0	22,793
MAR	23,939	96	1,382	664	6,976	94	3,911	2,689	6,694	1,278	1,498	3,386	4,884	0	18,110
APR	13,141	6	1,038	728	5,944	161	3,533	2,674	6,366	993	698	1,383	2,081	0	7,554
MAY	12,871	8	746	379	5,865	214	4,073	2,223	6,507	2,348	(1,043)	1,802	758	0	5,149
JUN	13,859	17	588	133	6,154	229	3,324	1,807	5,359	3,577	(3,574)	2,678	(896)	2,765	2,896
JUL	15,027	2	482	81	6,497	181	4,235	669	5,083	4,359	(785)	1,955	1,170	(73)	6,222
AUG	15,686	15	544	112	6,690	215	4,398	2,386	6,998	3,792	(1,202)	2,227	1,025	(915)	6,482
SEP	16,844	7	1,566	173	7,029	194	3,943	2,886	7,022	1,982	1,364	1,722	3,086	(906)	10,492
1973															
OCT	16,106	10	1,995	153	6,813	112	3,374	2,938	6,423	467	2,800	1,245	4,045	(566)	11,940
NOV	23,241	641	2,220	281	6,442	75	0	3,476	3,553	(2,916)	7,524	1,847	9,370	(238)	25,985
DEC	27,471	469	2,506	472	7,135	67	0	3,389	3,458	300	6,480	2,759	9,240	(20)	27,181
JAN	60,239	30,223	4,066	6,095	8,842	63	1,474	1,428	2,967	(4,210)	18,772	13,195	31,968	0	101,866
FEB	65,371	20,167	8,002	7,541	9,525	64	632	483	1,180	(2,442)	25,475	9,726	35,202	0	102,344
MAR	51,734	12,144	7,625	4,614	7,711	67	642	575	1,284	(2,212)	20,103	6,813	26,917	0	77,044
APR	20,703	669	4,210	1,576	7,513	84	2,477	797	3,357	1,574	8,919	332	9,251	0	22,227
MAY	16,445	89	2,942	1,163	6,389	190	4,485	1,839	6,512	2,408	2,417	1,446	3,863	0	11,719
JUN	14,961	37	2,580	765	5,344	194	4,598	2,576	7,367	3,753	(1,117)	2,351	1,234	0	7,223
JUL	15,195	14	1,084	380	5,096	233	4,649	2,827	7,707	4,359	(3,980)	3,309	(671)	0	4,607
AUG	16,151	13	1,069	320	6,826	218	4,497	3,075	7,788	3,792	(2,038)	2,561	524	0	5,973
SEP	17,515	33	1,473	356	7,225	168	3,812	1,800	5,777	2,429	1,698	1,708	3,406	0	11,171

Table B1–3. Continued

Water Year	Sac. R. at Freeport	Yolo Bypass	SJR at Vernalis	Eastside Streams	DCC & Georgiana	CCWD Intake	CVP Pumps	SWP Pumps	Total Exports	Channel Depletion	QWEST	Threemile Slough	SJR at Antioch	Island Breaks	Total Outflow
1974															
OCT	16,752	11	2,551	472	7,002	105	3,348	2,484	5,937	(247)	4,248	942	5,191	0	14,096
NOV	48,114	10,950	2,285	2,044	8,663	84	2,998	1,828	4,911	(1,560)	9,095	8,862	17,957	0	60,041
DEC	61,742	10,408	3,593	3,411	9,042	56	1,553	1,734	3,344	(734)	13,178	10,472	23,650	0	76,542
JAN	74,959	51,283	7,795	5,485	10,800	58	1,237	682	1,978	(1,402)	23,014	19,498	42,512	0	138,946
FEB	52,481	6,028	5,102	1,258	7,810	58	3,480	1,926	5,464	123	8,626	8,979	17,606	0	59,282
MAR	64,796	9,027	4,826	4,622	9,448	66	4,245	1,976	6,286	(728)	13,084	10,792	23,876	0	77,713
APR	66,390	37,558	5,859	3,834	9,660	78	2,568	1,564	4,209	(291)	15,334	16,949	32,283	0	109,723
MAY	29,229	174	4,114	1,653	9,954	115	4,387	2,640	7,143	2,438	6,994	2,165	9,159	0	25,590
JUN	24,453	51	3,866	1,249	9,258	188	4,403	4,555	9,144	3,504	2,951	2,390	5,341	0	16,970
JUL	21,790	24	1,639	546	7,960	198	4,506	6,008	10,710	3,908	(3,105)	3,924	819	0	9,381
AUG	23,991	12	1,618	468	8,453	193	4,528	4,772	9,490	3,792	(1,417)	3,798	2,381	0	12,806
SEP	25,100	61	2,850	703	9,448	115	3,326	1,624	5,063	2,636	6,224	1,533	7,757	0	21,015
1975															
OCT	20,155	20	3,503	763	7,999	98	3,446	1,060	4,603	1,276	6,833	609	7,442	0	18,562
NOV	22,039	15	3,897	904	8,551	71	0	1,881	1,952	873	10,832	(303)	10,530	0	24,030
DEC	25,691	127	4,169	789	7,071	59	10	2,749	2,819	(110)	9,281	1,441	10,722	0	28,067
JAN	19,467	38	3,773	304	7,797	67	2,692	2,722	5,482	581	6,016	795	6,810	0	17,520
FEB	47,601	3,990	6,223	2,533	7,605	83	4,196	2,449	6,728	(3,811)	12,110	6,582	18,692	0	57,430
MAR	51,033	9,425	5,695	5,336	8,332	73	3,766	2,250	6,089	(1,554)	14,284	7,650	21,934	0	66,953
APR	33,227	1,719	3,963	2,630	8,978	97	4,220	1,997	6,314	651	8,834	3,197	12,031	0	34,574
MAY	30,318	286	3,979	2,294	10,977	112	3,956	1,526	5,592	2,438	10,073	1,252	11,324	0	28,847
JUN	23,748	28	5,717	1,311	9,052	167	4,003	360	4,527	3,732	9,126	343	9,469	0	22,544
JUL	18,316	13	1,721	551	7,460	175	4,620	400	5,194	4,259	1,771	1,706	3,477	0	11,149
AUG	19,531	7	1,684	562	7,816	171	4,498	4,337	9,004	3,241	(1,049)	2,835	1,786	0	9,540
SEP	20,413	109	2,657	699	8,074	137	3,643	4,033	7,811	2,626	1,912	2,119	4,031	0	13,440
1976															
OCT	19,208	18	4,551	913	7,722	87	3,610	3,878	7,574	186	5,491	933	6,424	0	16,930
NOV	22,286	13	3,912	892	8,623	61	3,839	4,123	8,023	1,130	4,670	1,633	6,302	0	17,949
DEC	25,591	40	3,752	344	9,592	42	3,888	3,904	7,834	1,904	4,616	2,149	6,765	0	19,989
JAN	15,159	37	3,332	120	6,535	102	4,062	4,111	8,274	1,011	1,056	1,606	2,662	0	9,362
FEB	13,252	35	2,194	166	6,051	166	4,593	3,049	8,086	(216)	465	1,532	1,998	0	7,777
MAR	14,600	51	1,826	170	6,372	144	4,571	3,651	8,366	410	(265)	1,963	1,698	0	7,872
APR	12,745	0	1,295	183	5,828	173	4,406	468	5,046	330	2,045	938	2,983	0	8,847
MAY	10,929	40	941	99	5,296	208	4,548	744	5,497	2,438	(746)	1,396	650	0	4,073
JUN	10,952	1	799	49	5,302	222	3,741	198	4,158	3,722	(427)	1,218	791	0	3,921
JUL	12,099	0	672	55	5,639	233	3,465	421	4,117	4,359	(584)	1,416	832	0	4,350
AUG	13,372	4	1,057	74	6,012	212	4,572	2,066	6,848	3,141	(1,747)	2,055	307	0	4,517
SEP	12,530	4	1,068	357	5,765	191	4,546	3,608	8,344	1,940	(2,415)	2,194	(221)	0	3,676

Table B1-3. Continued

Water Year	Sac. R. at Freeport	Yolo Bypass	SJR at Vernalis	Eastside Streams	DCC & Georgiana	CCWD Intake	CVP Pumps	SWP Pumps	Total Exports	Channel Depletion	QWEST	Threemile Slough	SJR at Antioch	Island Breaks	Total Outflow
1977															
OCT	8,117	1	1,276	28	4,472	135	3,176	1,304	4,614	1,178	396	648	1,044	0	3,630
NOV	7,836	6	1,138	94	4,389	162	2,522	1,566	4,250	1,174	608	538	1,146	0	3,650
DEC	7,757	1	967	58	4,366	125	1,572	1,092	2,789	1,774	1,450	229	1,678	0	4,220
JAN	9,819	3	1,093	51	4,971	115	3,636	3,302	7,055	(462)	(640)	1,341	701	0	4,373
FEB	8,017	1	790	40	4,443	161	2,254	1,928	4,343	(427)	1,208	472	1,680	0	4,933
MAR	6,585	4	525	50	4,023	125	2,032	1,663	3,820	268	604	387	991	0	3,075
APR	5,971	1	212	25	3,843	120	1,004	175	1,297	1,823	1,597	(110)	1,487	0	3,088
MAY	7,610	1	400	31	4,324	110	1,660	1,223	2,992	1,045	1,084	360	1,444	0	4,006
JUN	6,876	1	118	23	4,032	182	311	249	740	3,753	994	131	1,124	0	2,525
JUL	8,263	1	93	67	4,441	145	354	351	847	4,359	920	343	1,264	0	3,218
AUG	7,700	1	124	16	4,350	141	1,096	296	1,532	3,792	494	400	894	0	2,518
SEP	6,849	1	179	13	4,100	123	1,643	95	1,859	2,284	845	239	1,084	103	2,796
1978															
OCT	4,502	0	247	9	3,413	136	489	140	764	1,824	1,627	(359)	1,269	91	2,078
NOV	6,698	0	430	34	4,056	123	1,640	891	2,655	391	1,505	119	1,624	107	4,011
DEC	11,766	0	507	275	5,541	111	2,172	3,638	5,923	(1,949)	1,596	1,049	2,645	70	8,503
JAN	45,571	18,734	2,280	4,438	7,639	51	3,878	5,932	9,863	(5,168)	7,813	10,908	18,722	40	66,289
FEB	44,782	8,633	7,331	3,070	8,928	36	4,072	6,218	10,327	(2,769)	10,802	7,043	17,844	0	56,257
MAR	55,670	18,401	11,495	3,180	9,099	36	3,992	1,901	5,929	(2,880)	19,717	8,997	28,714	0	85,696
APR	38,946	1,380	20,062	3,456	6,010	63	2,745	469	3,277	(807)	26,777	(362)	26,415	0	61,375
MAY	25,238	21	19,153	1,915	7,584	90	2,070	904	3,063	2,318	24,083	(3,533)	20,549	0	40,947
JUN	12,680	17	7,081	708	5,809	137	4,140	3,356	7,633	3,753	3,525	276	3,801	0	9,100
JUL	14,325	17	1,911	189	6,291	193	4,513	3,398	8,102	4,359	(2,544)	2,390	(154)	0	3,982
AUG	15,996	7	1,421	747	6,781	179	4,174	4,090	8,440	3,792	(1,957)	2,510	553	0	5,938
SEP	17,962	1	2,735	1,001	7,356	124	3,787	3,590	7,499	2,387	2,040	1,670	3,710	0	11,812
1979															
OCT	12,509	1	3,333	805	5,754	101	2,957	2,076	5,133	1,866	3,547	347	3,894	0	9,650
NOV	12,463	3	3,503	471	5,688	89	3,211	2,282	5,581	(87)	4,137	282	4,419	0	10,946
DEC	13,227	7	2,817	313	5,969	88	3,184	2,790	6,062	1,507	2,058	946	3,004	0	8,795
JAN	23,232	426	5,243	1,946	5,309	66	2,704	1,340	4,111	(3,842)	10,884	1,067	11,951	0	30,577
FEB	32,500	1,665	7,150	4,449	5,153	54	1,229	1,661	2,944	(3,603)	16,150	1,873	18,023	0	46,422
MAR	29,216	334	8,667	3,482	4,761	68	1,990	2,298	4,355	(809)	13,081	1,693	14,774	0	38,154
APR	16,573	30	3,512	1,537	4,495	88	3,187	2,615	5,891	1,254	2,839	1,833	4,671	0	14,508
MAY	18,016	31	2,528	1,502	7,372	158	2,996	3,105	6,256	2,362	3,611	1,200	4,811	0	13,459
JUN	12,226	18	2,257	936	5,676	198	2,992	3,163	6,351	3,753	79	1,271	1,349	0	5,335
JUL	16,442	15	1,336	464	6,911	223	4,557	4,577	9,356	3,508	(2,925)	2,900	(24)	0	5,394
AUG	15,705	13	1,454	482	6,695	210	4,566	5,606	10,380	3,792	(4,215)	3,164	(1,051)	0	3,482
SEP	14,590	7	1,844	538	6,368	172	4,389	4,717	9,277	2,636	(2,240)	2,436	195	0	5,067

Table B1-3. Continued

Water Year	Sac. R. at Freeport	Yolo Bypass	SJR at Vernalis	Eastside Streams	DCC & Georgiana	CCWD Intake	CVP Pumps	SWP Pumps	Total Exports	Channel Depletion	QWEST	Threemile Slough	SJR at Antioch	Island Breaks	Total Outflow
1980															
OCT	12,600	9	2,795	660	5,786	152	3,917	3,676	7,744	485	1,181	1,175	2,356	0	7,834
NOV	15,228	10	2,324	649	6,555	112	1,032	4,722	5,866	149	3,565	883	4,448	0	12,195
DEC	20,356	921	2,491	592	6,476	79	0	5,903	5,984	(687)	4,022	2,197	6,219	0	19,063
JAN	58,740	40,718	13,092	8,655	8,643	59	0	6,330	6,389	(3,605)	26,345	12,928	39,273	0	118,422
FEB	54,549	48,251	19,348	8,350	8,115	54	2,758	3,383	6,417	(2,139)	30,786	12,357	43,143	0	126,220
MAR	55,437	17,825	25,277	4,926	8,204	54	3,242	1,053	4,348	(231)	34,209	4,372	38,581	0	99,348
APR	22,623	56	10,266	1,784	4,575	75	3,843	1,432	5,352	641	10,856	761	11,618	0	28,735
MAY	15,922	36	9,930	1,748	3,589	137	2,920	1,584	4,639	2,048	9,297	(155)	9,142	0	20,949
JUN	17,842	29	5,314	1,432	6,315	165	2,868	2,938	5,971	3,753	4,651	1,000	5,651	0	14,893
JUL	17,757	27	3,390	716	7,297	174	4,577	2,132	6,881	3,798	2,052	1,558	3,610	0	11,211
AUG	14,943	21	1,973	344	6,472	197	4,549	4,484	9,228	3,792	(2,905)	2,636	(269)	0	4,261
SEP	15,912	8	3,808	521	6,756	181	3,514	4,001	7,695	2,636	1,676	1,437	3,112	0	9,918
1981															
OCT	11,364	7	4,080	458	5,097	165	3,573	2,969	6,705	1,822	1,746	797	2,543	0	7,381
NOV	10,896	11	3,283	556	3,363	118	3,858	2,491	6,467	1,599	(304)	1,738	1,433	0	6,681
DEC	16,717	17	2,955	264	6,992	76	3,795	2,905	6,775	667	3,002	1,272	4,274	0	12,511
JAN	18,543	977	3,256	552	5,628	86	4,091	4,100	8,279	(3,310)	3,309	2,360	5,668	0	18,358
FEB	24,282	718	2,884	346	4,060	78	3,662	3,512	7,252	(234)	190	4,771	4,960	0	21,212
MAR	24,537	260	3,127	1,360	4,094	79	1,945	2,817	4,843	(2,073)	5,086	3,304	8,390	0	26,515
APR	17,252	32	2,536	439	4,807	107	3,689	4,308	8,103	486	(636)	3,039	2,403	0	11,671
MAY	13,805	21	1,970	278	5,414	212	3,142	1,134	4,486	2,429	1,598	1,300	2,897	0	9,159
JUN	10,746	18	1,501	130	5,242	239	3,463	338	4,039	3,753	395	932	1,327	0	4,603
JUL	15,321	17	1,267	120	6,583	238	4,359	2,465	7,058	4,361	(1,923)	2,359	436	0	5,306
AUG	14,891	13	1,272	114	6,457	203	4,117	5,013	9,332	3,792	(3,954)	2,951	(1,003)	0	3,166
SEP	12,818	4	1,184	136	5,849	173	3,319	3,318	6,808	2,636	(1,353)	1,872	519	0	4,698
1982															
OCT	9,913	5	1,389	154	4,998	143	2,115	3,683	5,941	293	410	988	1,398	0	5,227
NOV	32,962	3,767	1,567	1,103	6,512	86	1,438	3,202	4,725	(1,354)	5,337	5,374	10,710	0	36,029
DEC	62,460	24,497	1,854	3,205	9,138	40	786	4,350	5,176	108	8,951	15,118	24,069	0	86,733
JAN	64,725	21,325	3,896	8,341	9,439	49	1,807	3,326	5,185	(4,779)	19,597	11,820	31,417	0	97,880
FEB	59,751	26,409	6,657	7,909	8,777	50	3,795	5,622	9,469	(1,676)	14,964	13,255	28,219	0	92,932
MAR	62,925	5,275	10,080	8,224	9,200	48	4,130	6,255	10,436	(4,164)	19,774	7,679	27,454	0	80,231
APR	76,703	38,279	23,000	11,614	11,032	53	3,458	6,108	9,619	(2,454)	37,622	12,387	50,009	0	142,431
MAY	42,433	316	18,687	4,985	6,474	135	2,989	2,881	6,004	2,438	22,557	1,211	23,767	0	57,979
JUN	26,118	50	7,596	2,337	6,177	171	2,940	831	3,942	3,600	9,829	1,344	11,173	0	28,561
JUL	17,664	31	6,174	1,187	7,269	172	2,916	953	4,039	4,137	7,902	(290)	7,612	0	16,879
AUG	20,666	23	4,024	652	8,149	183	4,357	3,572	8,110	3,792	2,250	1,969	4,218	0	13,462
SEP	24,957	11	6,132	711	9,406	117	2,069	3,108	5,292	550	10,598	262	10,861	0	25,968

C—061528

Table B1–3. Continued

Water Year	Sac. R at Freeport	Yolo Bypass	SJR at Vernalis	Eastside Streams	DCC & Georgiana	CCWD Intake	CVP Pumps	SWP Pumps	Total Exports	Channel Depletion	QWEST	Threemile Slough	SJR at Antioch	Island Breaks	Total Outflow
1983															
OCT	19,263	17	8,194	1,394	7,738	83	2,243	2,969	5,294	548	11,676	(996)	10,680	0	23,026
NOV	31,574	454	6,986	3,824	7,627	69	3,342	2,669	6,082	(2,461)	13,954	1,428	15,382	0	39,215
DEC	57,838	12,319	16,523	9,041	8,523	61	3,144	5,238	8,443	(1,817)	26,825	5,965	32,790	0	89,096
JAN	47,597	21,679	19,102	8,655	7,161	40	3,871	6,189	10,103	(2,984)	26,755	6,164	32,919	0	89,915
FEB	79,178	60,586	31,659	11,944	11,361	91	3,954	6,218	10,263	(2,961)	46,626	15,249	61,874	0	176,064
MAR	78,430	130,590	40,107	17,969	11,262	150	3,941	1,287	5,381	(5,448)	67,498	24,873	92,371	0	267,163
APR	60,597	17,948	36,505	6,938	8,890	59	3,668	93	3,820	(131)	48,598	963	49,561	0	118,299
MAY	62,414	3,525	31,828	5,448	9,132	96	2,828	376	3,299	1,032	42,436	(149)	42,288	0	98,883
JUN	48,458	1,108	26,125	4,232	7,275	170	2,980	1,871	5,018	3,753	30,175	157	30,332	0	71,152
JUL	31,045	50	19,262	3,156	6,606	172	3,978	1,067	5,216	4,359	20,974	(1,120)	19,854	0	43,938
AUG	25,083	34	9,051	1,438	9,443	174	4,274	2,756	7,203	3,792	10,264	205	10,469	0	24,610
SEP	24,656	27	11,328	1,592	9,318	154	3,350	708	4,210	1,842	16,830	(1,789)	15,041	0	31,552
1984															
OCT	21,186	189	13,346	1,494	8,301	82	2,085	335	2,501	1,364	19,754	(3,195)	16,559	0	32,350
NOV	48,898	5,995	10,894	6,002	9,299	68	956	731	1,757	(4,224)	27,184	2,302	29,487	0	74,257
DEC	75,518	51,985	19,160	9,182	10,874	54	1,607	483	2,146	(2,036)	38,394	15,040	53,433	0	155,735
JAN	56,904	16,729	25,775	4,206	8,399	46	1,375	302	1,723	806	36,133	3,757	39,889	0	101,085
FEB	33,588	1,350	11,240	2,412	5,327	68	3,817	1,890	5,984	(469)	13,300	2,714	16,014	0	43,074
MAR	31,482	1,082	7,515	2,144	5,018	61	4,291	2,577	6,929	303	7,551	3,978	11,528	0	34,991
APR	17,962	333	4,292	1,231	4,376	143	3,967	3,587	7,697	1,366	1,314	2,716	4,029	0	14,755
MAY	15,434	64	3,245	858	5,493	190	2,995	2,756	5,939	2,438	2,072	1,519	3,591	0	11,223
JUN	15,014	38	2,300	627	6,493	215	2,990	2,972	6,175	3,753	805	1,503	2,309	0	8,051
JUL	21,671	21	1,907	505	8,443	254	4,684	4,539	9,474	4,359	(1,452)	3,247	1,794	0	10,271
AUG	18,817	16	2,183	587	7,607	250	4,386	4,898	9,532	3,785	(1,614)	2,865	1,250	0	8,287
SEP	17,722	18	2,922	740	7,286	186	3,123	2,199	5,507	2,223	3,996	1,038	5,034	0	13,672
1985															
OCT	13,259	20	4,037	774	5,979	150	3,620	1,846	5,615	536	4,825	152	4,977	0	11,937
NOV	26,322	1,492	2,870	1,186	5,858	103	3,900	4,005	8,009	(2,134)	3,292	4,152	7,444	0	25,995
DEC	32,616	1,133	4,783	1,271	5,168	57	3,963	4,459	8,479	203	2,612	5,752	8,364	0	31,122
JAN	16,820	49	4,078	473	3,068	79	3,865	1,900	5,846	426	1,495	2,686	4,182	0	15,147
FEB	18,303	157	3,248	1,014	3,265	97	4,046	3,484	7,628	(523)	239	3,451	3,690	0	15,617
MAR	14,335	5	2,747	953	4,521	129	3,956	4,546	8,631	(1,042)	268	2,235	2,503	0	10,451
APR	12,515	0	2,449	892	5,760	148	3,906	3,301	7,354	1,579	721	1,239	1,961	0	6,924
MAY	13,456	0	2,138	462	5,563	219	2,996	3,013	6,226	2,438	352	1,566	1,918	0	7,392
JUN	13,331	0	1,754	231	5,380	231	3,005	3,307	6,540	3,552	(1,485)	2,085	600	0	5,224
JUL	16,064	0	2,572	148	6,801	257	4,581	4,648	9,482	4,359	(2,796)	2,747	(49)	0	4,942
AUG	13,472	0	2,621	157	6,041	228	4,384	5,520	10,129	3,792	(3,775)	2,661	(1,113)	0	2,329
SEP	12,212	0	1,932	232	5,671	175	4,103	4,458	8,733	2,426	(2,475)	2,132	(343)	0	3,216

Table B1–3. Continued

Water Year	Sac. R. at Freeport	Yolo Bypass	SJR at Vernalis	Eastside Streams	DCC & Georgiana	CCWD Intake	CVP Pumps	SWP Pumps	Total Exports	Channel Depletion	QWEST	Threemile Slough	SJR at Antioch	Island Breaks	Total Outflow
1986															
OCT	9,728	20	2,076	210	4,575	185	3,934	3,599	7,717	932	(1,463)	1,590	127	0	3,384
NOV	10,434	25	1,932	310	4,705	127	3,725	3,488	7,341	(1,542)	609	1,223	1,832	0	6,902
DEC	16,135	182	2,209	599	5,835	107	3,878	5,890	9,876	(198)	(1,105)	2,765	1,660	0	9,447
JAN	20,000	143	2,063	1,152	5,445	145	3,888	5,052	9,086	(965)	201	3,374	3,575	0	15,236
FEB	69,013	115,593	8,759	14,819	10,009	72	3,947	2,062	6,085	(7,428)	28,577	31,726	60,302	3,754	205,774
MAR	75,117	58,769	25,080	9,930	10,821	58	2,439	706	3,205	(3,088)	45,604	14,345	59,949	(970)	169,749
APR	25,868	1,153	19,621	3,510	4,271	84	2,787	1,832	4,704	228	23,976	(2,213)	21,763	(1,425)	46,647
MAY	12,784	43	8,779	1,965	3,573	181	3,003	3,087	6,271	2,262	7,477	(320)	7,158	(901)	15,939
JUN	11,839	43	6,243	1,050	5,562	223	2,997	2,968	6,186	3,753	4,331	(105)	4,226	(101)	9,337
JUL	16,911	43	2,899	489	7,049	230	4,458	3,937	8,622	4,322	(995)	2,338	1,343	0	7,397
AUG	15,140	34	3,189	542	6,530	224	4,393	5,354	9,968	3,792	(2,173)	2,444	271	0	5,144
SEP	18,169	20	4,187	681	6,234	195	4,017	6,298	10,507	1,756	(545)	2,818	2,272	0	10,795
1987															
OCT	15,473	20	3,748	853	5,383	134	4,007	3,439	7,579	1,868	1,191	1,849	3,039	0	10,647
NOV	12,700	25	2,846	738	5,815	148	3,699	3,024	6,871	1,694	1,427	1,050	2,476	0	7,744
DEC	13,133	25	3,713	566	5,253	148	4,018	3,107	7,273	1,162	1,504	1,285	2,789	0	9,003
JAN	13,194	25	2,309	485	2,585	121	4,011	2,129	6,262	(1,087)	(177)	2,563	2,386	0	10,838
FEB	17,434	31	2,140	581	3,333	109	4,037	2,710	6,857	(3,560)	1,511	2,986	4,498	0	16,889
MAR	21,616	220	3,421	1,112	4,241	133	2,383	3,093	5,610	(2,198)	4,593	2,749	7,342	0	22,957
APR	11,845	46	2,872	427	5,249	184	4,346	2,504	7,033	1,856	308	1,325	1,634	0	6,301
MAY	10,014	43	2,182	379	4,423	239	3,003	2,083	5,322	2,335	143	1,117	1,260	0	4,960
JUN	10,084	43	1,993	326	5,048	244	3,003	1,947	5,192	3,753	(264)	1,034	770	0	3,501
JUL	15,169	43	1,635	316	6,538	246	4,443	4,282	8,968	4,359	(3,312)	2,771	(541)	0	3,836
AUG	14,464	34	1,630	337	6,332	240	4,573	5,007	9,817	3,792	(3,983)	2,895	(1,088)	0	2,856
SEP	11,644	20	1,599	250	5,505	225	4,291	4,571	9,084	2,636	(3,443)	2,332	(1,111)	0	1,793
1988															
OCT	9,526	20	1,372	127	4,190	182	4,005	1,733	5,919	1,330	(1,090)	1,493	403	0	3,796
NOV	8,143	25	1,551	113	4,230	153	3,937	1,379	5,470	64	383	783	1,166	0	4,299
DEC	15,772	25	1,280	154	6,715	125	4,040	4,834	9,001	(1,241)	(45)	2,174	2,129	0	9,472
JAN	25,445	1,574	1,486	336	5,303	128	4,070	6,236	10,435	(1,224)	(2,516)	5,845	3,329	0	19,627
FEB	12,645	17	1,441	176	5,873	133	4,252	6,015	10,399	721	(368)	1,634	1,266	0	3,159
MAR	11,368	26	2,245	265	5,424	185	4,090	4,181	8,456	899	(1,106)	1,664	558	0	4,550
APR	16,917	46	2,150	293	7,050	206	4,090	4,290	8,585	(701)	1,362	1,898	3,260	0	11,519
MAY	10,993	43	1,784	193	4,326	194	2,976	3,105	6,274	1,984	(1,260)	1,820	560	0	4,755
JUN	10,597	43	1,714	206	4,887	209	2,998	2,705	5,910	3,447	(1,345)	1,542	197	0	3,203
JUL	14,668	43	1,359	197	6,391	247	4,487	3,250	7,981	4,360	(2,867)	2,552	(315)	0	3,927
AUG	13,310	34	1,560	173	5,993	255	4,539	4,017	8,809	3,792	(3,547)	2,572	(975)	0	2,476
SEP	11,557	20	1,455	133	5,480	223	4,600	3,312	8,133	2,637	(2,780)	2,113	(667)	0	2,395

Table B1–3. Continued

Water Year	Sac. R. at Freeport	Yolo Bypass	SJR at Vernalis	Eastside Streams	DCC & Georgiana	CCWD Intake	CVP Pumps	SWP Pumps	Total Exports	Channel Depletion	QWEST	Threemile Slough	SJR at Antioch	Island Breaks	Total Outflow
1989															
OCT	9,330	20	1,129	57	4,827	197	3,553	1,892	5,642	1,664	(708)	1,164	456	0	3,232
NOV	11,376	25	1,276	83	5,426	152	3,608	2,338	6,099	(9)	695	1,159	1,854	0	6,672
DEC	12,410	25	1,374	102	5,730	147	4,173	2,875	7,197	(557)	372	1,459	1,831	0	7,272
JAN	12,847	25	1,257	131	5,858	138	4,190	5,884	10,213	408	(3,231)	2,591	(639)	0	3,641
FEB	12,078	16	1,236	204	5,626	137	4,104	3,975	8,216	(1,097)	(437)	1,686	1,249	0	6,416
MAR	43,450	428	2,027	1,472	7,407	125	4,119	6,036	10,279	(1,922)	1,876	7,917	9,793	0	39,019
APR	21,310	46	1,918	664	5,907	145	3,994	6,326	10,464	1,646	(3,044)	4,402	1,358	0	11,829
MAY	13,823	33	1,952	356	5,386	205	3,004	3,023	6,231	2,392	(89)	1,838	1,749	0	7,544
JUN	13,310	33	1,586	165	5,314	228	3,001	2,054	5,281	3,485	(481)	1,795	1,315	0	6,328
JUL	18,801	40	1,286	132	7,602	264	4,747	4,523	9,532	4,360	(3,345)	3,371	26	0	6,368
AUG	18,351	29	1,171	147	7,471	262	4,712	6,365	11,338	3,719	(4,967)	3,835	(1,132)	0	4,642
SEP	16,492	18	1,355	147	6,926	219	4,430	6,124	10,772	674	(2,782)	3,028	246	0	6,566
1990															
OCT	14,299	17	1,403	111	6,283	178	4,224	6,146	10,547	349	(2,976)	2,750	(226)	0	4,935
NOV	13,866	23	1,313	228	6,017	144	3,894	5,665	9,703	582	(2,523)	2,560	36	0	5,145
DEC	15,424	25	1,383	142	6,613	146	4,120	6,195	10,461	2,085	(3,676)	3,052	(624)	0	4,430
JAN	18,332	24	1,204	174	5,500	133	4,011	6,152	10,296	(172)	(3,307)	3,992	685	0	9,610
FEB	15,310	22	1,514	316	6,804	164	4,542	6,998	11,704	(2,101)	(1,705)	2,611	906	0	7,558
MAR	12,475	25	1,706	467	5,681	148	3,983	6,105	10,235	651	(2,804)	2,400	(404)	0	3,787
APR	15,808	48	1,355	351	6,775	208	4,402	5,396	10,006	1,303	(2,372)	2,749	377	0	6,253
MAY	10,420	33	1,281	285	5,039	217	2,775	407	3,398	772	2,707	362	3,069	0	7,851
JUN	10,537	33	1,118	233	5,181	215	2,992	293	3,498	3,416	814	791	1,605	0	5,008
JUL	13,530	33	1,011	163	6,058	238	3,667	2,353	6,257	4,360	(1,857)	2,051	194	0	4,122
AUG	13,416	25	1,001	171	5,957	223	2,940	3,311	6,472	3,669	(1,729)	2,046	318	0	4,471
SEP	10,381	37	907	170	5,206	234	3,307	2,587	6,126	2,685	(1,590)	1,537	(52)	0	2,685
1991															
OCT	7,620	15	993	234	4,323	185	1,107	2,258	3,549	1,816	821	403	1,224	0	3,498
NOV	7,723	26	1,115	201	4,353	149	1,588	2,121	3,858	650	1,390	313	1,703	0	4,558
DEC	10,818	25	918	64	5,260	148	2,277	2,780	5,205	196	910	991	1,901	0	6,245
JAN	8,984	25	816	68	4,722	146	1,883	2,883	4,912	969	66	910	976	0	4,013
FEB	8,133	16	758	87	4,473	137	2,606	1,778	4,521	(2,948)	2,712	174	2,886	0	7,420
MAR	25,755	893	1,779	1,226	5,184	111	3,722	5,929	9,763	(4,737)	1,504	4,743	6,247	0	24,626
APR	10,879	46	1,168	510	4,747	100	2,882	4,518	7,499	1,316	(1,930)	1,944	14	0	3,787
MAY	7,332	43	1,049	471	3,515	130	1,277	1,281	2,686	2,212	912	478	1,390	0	3,998
JUN	8,930	43	568	269	3,935	155	894	878	1,925	3,716	431	811	1,242	0	4,169
JUL	9,514	43	594	181	4,878	173	1,633	770	2,574	4,279	297	738	1,035	0	3,479
AUG	9,515	34	537	166	4,878	167	1,659	1,993	3,817	3,739	(666)	1,066	400	0	2,696
SEP	9,948	36	574	192	5,005	161	1,852	2,224	4,235	2,632	(174)	1,048	874	0	3,884

Note: Negative values shown in parentheses.

Table B1–4. RMA Delta Model Simulated Historical Channel Flows (cfs) and Exports (cfs) for 1968–1991

Water Year	Steamboat & Sutter	RMA DCC & Georgiana	Sac R. at Rio Vista	RMA Threemile Slough	Total Outflow	Montezuma Slough	Head of Old R.	SJR below Old R.	RMA QWEST	False River	Dutch Slough	SJR at Antioch	Old R. & Middle R.	RMA Channel Depletion	Total Exports
1968															
OCT	4,154	7,123	8,714	(613)	17,210	120	1,855	813	8,519	2,607	360	7,906	(100)	1,360	1,798
NOV	3,564	6,763	7,684	(1,048)	16,788	111	2,242	1,215	9,113	2,790	380	8,065	1,071	642	1,134
DEC	4,531	7,578	9,581	(1,054)	20,220	180	2,315	1,326	10,627	3,188	441	9,573	1,653	195	676
JAN	6,708	3,759	17,770	2,110	24,273	262	1,977	1,007	6,495	2,146	313	8,605	996	(497)	1,170
FEB	14,095	6,499	40,475	5,997	51,664	798	1,844	853	11,172	3,351	552	17,169	435	(2,031)	1,897
MAR	12,618	5,971	33,078	5,559	39,884	566	2,197	918	6,805	2,181	372	12,364	(2,150)	(449)	4,495
APR	3,439	6,963	7,594	775	10,789	(6)	1,232	198	3,214	1,162	164	3,989	(4,114)	883	5,388
MAY	3,010	6,730	6,172	1,054	7,353	(74)	791	(30)	1,217	628	84	2,271	(5,029)	1,956	5,621
JUN	2,248	6,064	4,051	1,142	3,237	(156)	514	(118)	(753)	123	9	389	(4,857)	4,521	4,716
JUL	2,593	6,557	4,581	1,451	3,202	(156)	456	(184)	(1,308)	(35)	(8)	143	(5,526)	5,185	5,177
AUG	2,780	6,657	5,211	1,176	5,213	(117)	650	(67)	62	332	42	1,238	(4,848)	4,127	4,877
SEP	2,873	6,708	5,720	1,166	6,179	(97)	832	(17)	501	443	59	1,667	(5,114)	2,693	5,612
1969															
OCT	2,451	6,191	5,172	956	5,885	(103)	1,214	121	734	510	65	1,690	(5,113)	1,148	6,260
NOV	3,134	6,762	6,774	542	10,115	(19)	1,332	274	3,334	1,206	164	3,876	(3,676)	242	5,051
DEC	6,620	9,205	15,390	298	26,155	298	1,897	776	10,723	3,119	446	11,021	(1,260)	(2,910)	3,772
JAN	20,568	8,718	93,606	13,825	125,212	2,253	8,330	5,723	31,538	8,711	1,525	45,363	3,609	(5,467)	5,759
FEB	27,723	10,906	107,248	11,494	158,589	2,888	19,035	13,721	51,298	13,993	2,350	62,792	15,033	(3,695)	4,715
MAR	18,298	7,682	52,750	(229)	93,168	1,621	18,000	12,925	40,427	11,188	1,704	40,198	14,593	453	3,409
APR	16,452	7,085	39,207	(346)	69,494	1,146	12,983	9,151	30,308	8,459	1,265	29,962	9,735	857	3,218
MAY	12,834	12,951	27,934	(5,050)	65,055	1,059	14,347	10,172	37,156	10,139	1,474	32,106	10,811	1,988	3,276
JUN	6,866	8,140	13,980	(6,786)	46,214	690	16,180	11,554	32,290	8,986	1,262	25,504	12,954	4,264	2,498
JUL	3,272	6,619	6,197	(644)	12,771	31	3,435	2,159	6,630	2,096	283	5,986	(749)	5,185	3,388
AUG	4,783	8,146	9,091	1,089	12,381	26	1,714	431	3,348	1,187	173	4,437	(4,019)	4,127	5,107
SEP	5,925	8,711	11,707	59	20,288	182	2,158	987	8,621	2,612	373	8,680	(737)	2,393	2,565
1970															
OCT	4,387	7,256	9,292	(1,042)	19,614	167	2,769	1,675	10,336	3,094	429	9,294	725	747	2,010
NOV	4,454	7,433	9,390	(1,237)	20,425	183	2,826	1,795	11,042	3,297	456	9,805	1,724	554	1,074
DEC	12,335	5,837	35,866	5,332	45,637	679	1,808	881	9,753	3,009	490	15,085	1,119	(389)	823
JAN	26,917	11,051	159,245	32,972	193,891	3,509	6,703	4,668	34,571	9,794	2,074	67,543	6,720	(5,983)	1,118
FEB	25,155	10,244	88,996	15,516	111,090	1,980	5,472	3,736	22,096	6,342	1,175	37,612	3,620	(63)	1,953
MAR	15,939	7,076	40,166	4,466	55,841	878	4,305	2,887	15,681	4,546	723	20,147	2,082	323	2,269
APR	3,523	6,974	7,586	468	11,769	13	1,353	305	4,196	1,427	198	4,664	(3,286)	983	4,660
MAY	3,379	6,880	6,947	208	11,420	5	1,714	544	4,510	1,527	207	4,718	(2,508)	2,026	4,019
JUN	2,419	6,095	4,499	592	5,779	(106)	1,939	610	1,340	686	86	1,932	(3,720)	4,387	5,005
JUL	2,808	6,657	5,078	1,230	4,792	(125)	1,039	62	(216)	252	31	1,014	(5,011)	5,185	5,237
AUG	3,478	7,231	6,630	1,127	7,903	(63)	830	28	1,333	665	93	2,460	(4,386)	4,127	4,616
SEP	4,920	8,166	9,677	676	14,755	73	983	211	5,121	1,676	240	5,797	(2,477)	2,693	3,094

C-061533

Table B1-4. Continued

Water Year	Steamboat & Sutter	RMA DCC & Georgiana	Sac R. at Rio Vista	RMA Threemile Slough	Total Outflow	Montezuma Slough	Head of Old R.	SJR below Old R.	RMA QWEST	False River	Dutch Slough	SJR at Antioch	Old R. & Middle R.	RMA Channel Depletion	Total Exports
1971															
OCT	3,760	7,135	7,935	15	13,826	53	1,104	323	5,909	1,906	263	5,924	(1,542)	926	2,589
NOV	6,522	9,057	13,864	116	24,027	257	1,255	461	10,135	2,995	428	10,251	(598)	(709)	2,034
DEC	24,178	9,934	66,407	9,691	86,850	1,501	3,149	2,089	20,388	5,770	986	30,079	2,148	(4,796)	1,918
JAN	19,258	8,294	50,864	7,622	64,957	1,060	3,172	2,055	14,090	4,149	706	21,712	1,403	(363)	1,908
FEB	10,778	5,242	26,736	3,810	34,334	457	2,783	1,616	7,602	2,418	383	11,412	(358)	568	3,145
MAR	10,471	5,172	26,636	4,634	31,525	403	1,924	669	4,892	1,672	282	9,526	(2,698)	(29)	4,710
APR	13,500	6,306	32,654	6,129	37,234	514	1,531	411	4,605	1,606	293	10,734	(2,941)	864	4,438
MAY	8,704	10,792	18,634	1,859	26,622	307	1,412	320	8,015	2,390	366	9,874	(3,346)	1,654	4,557
JUN	9,247	4,783	21,964	5,173	21,548	209	1,734	402	(363)	278	78	4,810	(4,633)	3,745	5,777
JUL	5,714	9,041	10,518	2,230	11,232	4	916	(77)	782	472	83	3,012	(6,460)	5,185	6,521
AUG	6,266	9,564	11,780	2,384	12,955	38	821	(115)	1,235	591	104	3,619	(6,524)	4,127	6,713
SEP	7,037	9,833	13,893	1,396	19,831	174	868	103	5,980	1,869	282	7,376	(3,444)	2,686	3,913
1972															
OCT	4,077	7,290	8,493	138	14,420	65	1,668	534	5,947	1,900	265	6,085	(2,263)	1,216	3,819
NOV	3,972	7,354	8,369	129	14,248	62	1,261	371	5,887	1,896	264	6,016	(1,816)	586	3,052
DEC	6,262	8,849	13,068	(30)	23,086	238	1,738	704	9,995	2,965	422	9,965	(562)	(400)	2,440
JAN	6,535	3,700	16,391	2,026	22,103	219	2,076	1,044	5,718	1,942	285	7,744	494	188	1,618
FEB	7,312	4,004	18,173	3,074	21,789	213	1,943	760	3,626	1,364	213	6,700	(1,779)	420	3,871
MAR	7,958	4,309	19,500	4,771	18,625	152	1,244	108	(854)	140	53	3,917	(5,484)	898	6,694
APR	2,970	6,587	6,251	1,061	7,497	(71)	966	8	1,267	635	87	2,328	(5,451)	1,224	6,366
MAY	2,818	6,616	5,649	1,373	5,406	(112)	727	(116)	(203)	244	31	1,170	(6,015)	2,343	6,507
JUN	3,036	6,966	5,677	1,444	5,204	(116)	539	(141)	(414)	196	27	1,030	(5,440)	4,345	5,359
JUL	3,406	7,362	6,186	1,582	5,659	(107)	436	(187)	(456)	182	27	1,126	(5,495)	5,185	5,083
AUG	3,677	7,628	6,908	2,039	5,518	(109)	586	(228)	(1,331)	(69)	(2)	708	(7,008)	4,127	6,998
SEP	4,230	7,891	8,406	1,570	9,686	(27)	1,347	119	1,316	637	97	2,886	(5,877)	2,039	7,022
1973															
OCT	4,007	7,607	8,340	1,048	11,260	3	1,640	341	2,933	1,081	156	3,981	(4,782)	615	6,423
NOV	6,698	9,453	14,744	588	24,061	257	1,678	608	9,285	2,756	398	9,873	(1,589)	(1,336)	3,553
DEC	9,289	4,739	23,532	3,836	28,709	349	1,825	730	5,165	1,760	279	9,001	(1,327)	(1,288)	3,458
JAN	22,542	9,442	82,288	14,345	102,289	1,809	2,684	1,570	19,944	5,673	1,042	34,289	654	(4,842)	2,967
FEB	24,794	10,072	75,986	10,587	101,805	1,800	4,786	3,292	25,799	7,218	1,236	36,386	4,026	(1,986)	1,180
MAR	18,990	8,161	56,183	7,021	76,548	1,292	4,563	3,128	20,347	5,791	952	27,368	3,670	(1,678)	1,284
APR	6,798	3,777	17,436	2,231	23,225	240	2,685	1,513	5,805	1,938	290	8,036	(676)	926	3,357
MAY	4,185	7,469	8,527	817	12,296	23	2,125	680	3,805	1,302	185	4,622	(4,576)	2,126	6,512
JUN	3,456	7,165	6,550	1,432	6,799	(85)	1,943	441	310	369	55	1,742	(6,105)	4,521	7,367
JUL	3,467	7,413	6,317	2,140	4,139	(137)	978	(125)	(2,109)	(283)	(32)	31	(7,521)	5,185	7,707
AUG	3,865	7,713	7,285	2,125	5,916	(101)	994	(112)	(1,309)	(72)	0	816	(7,390)	4,127	7,788
SEP	4,496	7,989	8,876	1,320	11,301	4	1,218	137	2,465	949	140	3,785	(4,877)	2,486	5,777

C — 0 6 1 5 3 3

Table B1-4. Continued

Water Year	Steamboat & Sutter	RMA DCC & Georgiana	Sac R. at Rio Vista	RMA Threemile Slough	Total Outflow	Montezuma Slough	Head of Old R.	SJR below Old R.	RMA QWEST	False River	Dutch Slough	SJR at Antioch	Old R. & Middle R.	RMA Channel Depletion	Total Exports
1974															
OCT	4,292	7,661	8,968	727	13,398	46	1,950	598	4,438	1,485	212	5,165	(3,969)	441	5,937
NOV	17,446	7,736	51,390	9,909	58,821	941	1,773	537	7,418	2,362	462	17,327	(2,997)	(539)	4,911
DEC	23,181	9,629	63,127	10,577	78,029	1,324	2,437	1,245	14,877	4,322	777	25,454	(434)	(2,320)	3,344
JAN	28,999	11,509	115,263	22,745	139,505	2,526	4,680	3,193	24,219	6,945	1,401	46,964	3,123	(2,039)	1,978
FEB	19,279	8,340	50,082	9,006	59,143	945	3,221	1,882	9,065	2,798	519	18,071	(2,227)	413	5,464
MAR	24,507	10,044	63,794	11,233	77,091	1,304	3,118	1,704	13,303	3,880	728	24,536	(3,075)	(140)	6,286
APR	25,229	10,328	93,545	18,993	109,193	1,940	3,589	2,266	15,661	4,641	965	34,654	(573)	296	4,209
MAY	8,739	10,623	18,424	1,692	26,785	310	2,763	1,260	8,385	2,464	378	10,077	(4,519)	1,689	7,143
JUN	7,026	9,805	13,706	2,115	17,202	122	2,681	1,003	3,546	1,178	190	5,661	(6,974)	3,616	9,144
JUL	5,985	9,366	11,105	3,291	8,926	(39)	1,516	(85)	(2,118)	(336)	(20)	1,173	(9,925)	4,735	10,710
AUG	6,779	9,953	12,882	3,062	12,739	35	1,456	(26)	(83)	210	58	2,979	(8,656)	4,127	9,490
SEP	7,264	9,991	14,426	1,273	21,145	199	2,036	686	6,763	2,075	312	8,036	(3,444)	2,693	5,063
1975															
OCT	5,644	8,495	11,433	328	18,981	156	2,387	1,072	7,566	2,316	333	7,894	(2,297)	950	4,603
NOV	6,356	8,871	13,026	(478)	24,382	263	2,490	1,396	11,364	3,347	477	10,886	504	515	1,952
DEC	7,564	9,960	15,766	(16)	27,729	329	2,661	1,508	11,951	3,478	505	11,935	(159)	192	2,819
JAN	6,317	3,691	15,701	3,005	17,757	134	2,550	1,222	2,060	943	150	5,065	(2,919)	379	5,482
FEB	17,211	7,620	44,811	6,803	56,709	897	3,903	2,445	11,866	3,481	588	18,669	(2,150)	(3,336)	6,728
MAR	18,674	8,093	52,629	8,187	66,398	1,090	3,566	2,167	13,763	3,984	695	21,950	(2,256)	(1,021)	6,089
APR	11,527	5,550	29,268	5,052	34,763	466	2,692	1,271	5,509	1,820	313	10,561	(3,591)	705	6,314
MAY	9,115	10,740	19,410	1,310	29,693	367	2,637	1,223	10,319	2,987	451	11,629	(3,175)	1,857	5,592
JUN	6,823	9,354	13,275	214	22,492	225	3,431	2,091	9,273	2,751	400	9,487	(1,735)	4,109	4,527
JUL	4,703	8,172	8,713	1,400	10,718	(6)	1,312	185	2,070	840	125	3,470	(4,700)	5,085	5,194
AUG	5,214	8,648	9,886	2,453	9,465	(30)	1,488	32	(369)	155	40	2,084	(8,044)	3,577	9,004
SEP	5,621	8,772	11,009	1,776	13,582	50	2,033	497	2,616	964	151	4,392	(6,164)	2,682	7,811
1976															
OCT	5,282	8,245	10,838	742	16,624	110	3,005	1,541	5,797	1,825	267	6,539	(4,573)	498	7,574
NOV	6,384	9,180	12,936	1,311	18,485	147	2,720	1,172	5,558	1,742	263	6,869	(5,356)	621	8,023
DEC	7,464	10,236	15,232	1,664	21,362	204	2,643	1,095	6,139	1,890	291	7,803	(5,247)	541	7,834
JAN	3,650	7,350	7,687	1,126	9,870	(23)	2,442	876	2,188	875	126	3,314	(5,825)	564	8,274
FEB	2,821	6,605	6,064	1,180	6,801	(84)	1,774	337	743	497	68	1,923	(5,957)	533	8,086
MAR	3,425	7,239	7,184	1,583	7,517	(70)	1,607	181	348	378	57	1,931	(6,763)	841	8,366
APR	2,824	6,504	5,995	650	8,335	(54)	1,100	154	2,358	948	127	3,008	(3,937)	949	5,046
MAY	2,220	5,960	4,457	947	4,609	(128)	818	(14)	190	370	41	1,137	(4,884)	2,163	5,497
JUN	2,130	5,899	3,780	912	3,476	(151)	634	(30)	(243)	268	26	669	(4,180)	4,490	4,158
JUL	2,443	6,331	4,288	1,076	3,860	(144)	523	(83)	(357)	230	24	719	(4,391)	5,185	4,117
AUG	2,895	6,867	5,534	1,611	4,428	(131)	955	(58)	(1,054)	19	2	557	(6,364)	3,477	6,848
SEP	2,687	6,555	5,440	1,767	3,801	(144)	1,069	(95)	(1,607)	(140)	(18)	160	(7,463)	1,998	8,344

C-061534

Table B1-4. Continued

Water Year	Steamboat & Sutter	RMA DCC & Georgiana	Sac R. at Rio Vista	RMA Threemile Slough	Total Outflow	Montezuma Slough	Head of Old R.	SJR below Old R.	RMA QWEST	False River	Dutch Slough	SJR at Antioch	Old R. & Middle R.	RMA Channel Depletion	Total Exports
1977															
OCT	1,526	4,747	3,132	397	3,974	(141)	1,066	169	860	582	62	1,257	(3,586)	910	4,614
NOV	1,477	4,580	3,076	294	4,211	(136)	961	156	1,145	662	72	1,439	(3,250)	640	4,250
DEC	1,479	4,478	3,134	(82)	5,518	(110)	784	174	2,390	1,009	118	2,308	(1,967)	487	2,789
JAN	1,919	5,568	4,151	1,099	3,639	(147)	1,075	18	(518)	178	15	581	(5,920)	269	7,055
FEB	1,508	4,694	3,182	406	4,056	(139)	733	54	879	588	63	1,285	(3,526)	454	4,343
MAR	1,205	3,996	2,446	363	2,854	(163)	527	(4)	422	483	45	785	(3,241)	556	3,820
APR	1,103	3,590	2,012	(127)	3,625	(148)	158	(31)	1,641	834	87	1,514	(1,284)	1,482	1,297
MAY	1,419	4,490	2,756	243	3,780	(145)	358	(44)	1,051	647	67	1,294	(2,791)	1,436	2,992
JUN	1,209	3,988	1,717	73	2,423	(172)	14	(89)	764	595	55	837	(1,361)	4,181	740
JUL	1,468	4,640	2,143	213	2,728	(167)	(15)	(123)	655	554	54	868	(1,748)	5,185	847
AUG	1,366	4,436	2,100	273	2,467	(171)	58	(120)	427	492	45	700	(2,145)	4,127	1,532
SEP	1,239	4,054	2,156	134	3,037	(160)	150	(81)	918	628	62	1,052	(2,038)	2,341	1,859
1978															
OCT	813	2,727	1,366	(166)	2,614	(168)	171	8	1,273	755	73	1,107	(740)	1,496	764
NOV	1,246	3,995	2,576	48	4,105	(138)	414	14	1,533	788	85	1,581	(2,196)	390	2,655
DEC	2,505	6,143	6,005	760	8,107	(58)	645	(58)	2,066	844	107	2,826	(4,899)	(1,535)	5,923
JAN	16,353	7,416	58,407	11,569	66,690	1,100	2,040	461	8,217	2,474	500	19,786	(6,718)	(5,799)	9,863
FEB	16,078	7,246	46,781	8,249	55,718	878	4,590	2,829	8,913	2,681	490	17,162	(5,279)	(2,312)	10,327
MAR	20,618	8,761	65,928	9,954	85,057	1,464	6,916	4,669	19,107	5,471	946	29,061	1,440	(2,345)	5,929
APR	13,839	6,167	34,223	(338)	60,752	974	11,796	8,267	26,533	7,466	1,107	26,195	8,602	(108)	3,277
MAY	7,626	8,749	16,185	(4,287)	42,103	610	11,235	7,850	25,951	7,246	1,025	21,664	8,043	1,442	3,063
JUN	2,788	6,226	5,444	(54)	9,544	(32)	4,258	2,638	4,143	1,404	188	4,089	(3,922)	3,791	7,633
JUL	3,152	7,171	5,698	1,974	3,569	(148)	1,562	123	(2,064)	(267)	(33)	(90)	(7,359)	5,185	8,102
AUG	3,830	7,583	7,255	2,120	5,886	(102)	1,274	(40)	(1,309)	(80)	(1)	811	(7,801)	4,127	8,440
SEP	4,708	7,985	9,305	1,362	11,927	17	2,067	550	2,662	987	148	4,024	(5,787)	2,445	7,499
1979															
OCT	2,790	6,185	5,905	41	10,095	(20)	2,305	959	4,216	1,451	194	4,257	(3,020)	1,539	5,133
NOV	2,785	6,234	6,115	42	10,509	(12)	2,431	1,070	4,392	1,497	201	4,434	(3,138)	328	5,581
DEC	3,009	6,585	6,522	458	9,905	(23)	2,097	718	3,389	1,221	166	3,847	(3,946)	404	6,062
JAN	7,699	4,079	20,459	1,798	29,978	373	3,294	2,085	9,470	2,867	416	11,268	(155)	(3,365)	4,111
FEB	11,236	5,330	29,654	1,849	45,821	682	4,349	2,922	16,135	4,620	690	17,984	2,026	(3,145)	2,944
MAR	10,006	4,860	24,762	1,700	37,636	522	5,210	3,465	12,876	3,786	566	14,576	978	(277)	4,355
APR	5,265	3,340	13,098	2,398	15,207	83	2,441	1,070	2,127	944	145	4,525	(3,431)	793	5,891
MAY	4,880	7,643	9,908	1,013	14,103	60	1,887	506	4,231	1,411	204	5,244	(4,574)	1,982	6,256
JUN	2,564	6,187	4,803	1,016	4,994	(121)	1,711	351	250	372	46	1,266	(5,302)	4,435	6,351
JUL	3,957	7,823	7,400	2,526	4,864	(122)	1,253	(114)	(2,477)	(398)	(43)	49	(8,736)	4,334	9,356
AUG	3,684	7,634	6,920	2,710	3,440	(150)	1,389	(120)	(3,421)	(654)	(78)	(711)	(9,591)	4,127	10,380
SEP	3,366	7,201	6,656	2,001	5,225	(115)	1,617	101	(1,389)	(97)	(6)	612	(8,009)	2,693	9,277

Table B1–4. Continued

Water Year	Steamboat & Sutter	RMA DCC & Georgiana	Sac R. at Rio Vista	RMA Threemile Slough	Total Outflow	Montezuma Slough	Head of Old R.	SJR below Old R.	RMA QWEST	False River	Dutch Slough	SJR at Antioch	Old R. & Middle R.	RMA Channel Depletion	Total Exports
1980															
OCT	2,799	6,380	6,057	880	7,724	(66)	2,145	635	1,681	750	102	2,561	(5,564)	622	7,744
NOV	3,729	7,167	7,949	614	11,968	17	1,813	510	4,021	1,377	194	4,635	(4,016)	359	5,866
DEC	5,679	8,651	12,848	1,044	19,266	163	1,924	603	6,397	1,978	290	7,441	(3,829)	(940)	5,984
JAN	21,934	9,193	91,354	14,499	118,796	2,130	7,878	5,378	27,393	7,643	1,366	41,892	2,291	(4,238)	6,389
FEB	19,415	8,319	91,394	13,598	121,471	2,177	11,052	7,695	30,059	8,413	1,476	43,657	5,215	(1,717)	6,417
MAR	20,602	8,581	64,618	4,722	98,901	1,739	14,784	10,489	34,292	9,553	1,517	39,014	10,446	216	4,348
APR	7,543	3,951	18,625	1,055	29,034	353	6,161	4,108	10,414	3,154	459	11,469	839	703	5,352
MAY	4,201	6,578	8,939	(1,838)	21,478	203	5,886	3,929	12,571	3,676	507	10,733	1,078	1,777	4,639
JUN	4,680	7,695	9,102	231	15,138	79	3,255	1,869	6,089	1,911	271	6,320	(3,286)	3,888	5,971
JUL	4,516	7,967	8,500	1,287	10,709	(7)	2,355	827	2,270	889	132	3,557	(5,263)	4,625	6,881
AUG	3,418	7,359	6,444	2,184	4,251	(134)	1,667	122	(2,137)	(297)	(34)	47	(8,168)	4,127	9,228
SEP	3,888	7,457	7,719	1,066	10,053	(20)	2,612	1,068	2,379	925	133	3,445	(5,429)	2,693	7,695
1981															
OCT	2,406	5,891	5,072	284	7,826	(65)	2,720	1,293	2,779	1,062	139	3,063	(4,106)	1,494	6,705
NOV	2,284	5,720	4,933	333	7,440	(72)	2,340	906	2,519	995	128	2,852	(4,184)	901	6,467
DEC	4,262	7,718	8,906	868	12,858	35	2,202	752	3,950	1,350	194	4,818	(4,566)	294	6,775
JAN	4,971	8,152	12,015	1,169	17,469	127	2,450	927	5,411	1,691	244	6,580	(5,288)	(2,488)	8,279
FEB	8,082	4,350	20,588	4,684	20,824	195	2,175	706	242	438	97	4,926	(5,019)	158	7,252
MAR	8,182	4,320	20,870	3,268	25,895	294	2,221	957	5,012	1,697	264	8,280	(2,270)	(1,484)	4,843
APR	4,460	7,905	9,221	1,423	11,625	11	2,027	508	2,420	925	140	3,843	(6,041)	683	8,103
MAY	3,191	6,799	6,584	439	10,034	(21)	1,482	376	3,487	1,251	169	3,926	(3,112)	1,808	4,486
JUN	2,116	5,768	3,874	592	4,662	(128)	1,114	194	844	561	65	1,436	(3,470)	4,027	4,039
JUL	3,501	7,493	6,364	1,948	4,822	(123)	1,075	(40)	(1,472)	(104)	(9)	476	(6,773)	5,185	7,058
AUG	3,370	7,449	6,291	2,453	3,125	(156)	1,213	(127)	(3,107)	(556)	(69)	(654)	(8,726)	4,127	9,332
SEP	2,754	6,647	5,435	1,423	4,859	(123)	1,059	0	(534)	159	20	889	(6,098)	2,693	6,808
1982															
OCT	1,969	5,507	4,260	718	5,005	(120)	1,221	161	757	530	63	1,475	(4,673)	543	5,941
NOV	11,399	5,553	31,067	6,180	34,406	460	1,290	277	3,330	1,271	240	9,510	(3,416)	119	4,725
DEC	23,487	9,788	77,525	15,985	88,167	1,528	1,518	387	10,632	3,234	692	26,617	(3,362)	(1,480)	5,176
JAN	24,477	10,039	77,476	12,666	98,412	1,734	2,697	1,412	20,868	5,820	1,045	33,534	(1,443)	(5,411)	5,185
FEB	22,362	9,362	77,119	14,340	92,459	1,613	4,180	2,523	15,328	4,388	858	29,668	(5,007)	(1,221)	9,469
MAR	23,699	9,735	59,443	7,892	79,618	1,354	6,187	4,034	20,134	5,560	942	28,026	(3,525)	(3,627)	10,436
APR	29,810	11,606	103,837	14,828	141,639	2,573	13,550	9,516	37,790	10,330	1,820	52,618	4,291	(1,753)	9,619
MAY	13,437	13,525	28,907	(2,743)	59,304	946	10,985	7,631	30,428	8,271	1,218	27,685	4,903	1,492	6,004
JUN	7,698	9,666	15,498	(567)	28,916	351	4,480	2,936	13,461	3,849	557	12,894	30	3,711	3,942
JUL	4,563	7,588	8,696	(400)	16,416	104	3,652	2,299	7,783	2,386	334	7,383	(1,189)	4,963	4,039
AUG	5,657	8,827	10,698	1,641	13,437	47	2,716	1,122	2,796	1,011	157	4,437	(6,015)	4,127	8,110
SEP	7,308	9,801	14,915	149	25,618	287	3,746	2,343	10,725	3,138	458	10,874	(1,617)	940	5,292

Table B1–4. Continued

Water Year	Steamboat & Sutter	RMA DCC & Georgiana	Sac R. at Rio Vista	RMA Threemile Slough	Total Outflow	Montezuma Slough	Head of Old R.	SJR below Old R.	RMA QWEST	False River	Dutch Slough	SJR at Antioch	Old R. & Middle R.	RMA Channel Depletion	Total Exports
1983															
OCT	5,398	7,898	11,207	(1,047)	22,974	234	4,942	3,234	11,779	3,443	487	10,732	(383)	648	5,294
NOV	10,891	5,238	27,045	2,901	37,812	526	4,292	2,744	10,740	3,185	489	13,641	(1,539)	(1,162)	6,082
DEC	21,555	8,962	62,083	5,961	90,482	1,572	9,867	6,788	28,361	7,793	1,260	34,322	2,079	(3,402)	8,443
JAN	17,301	7,518	62,748	6,388	90,525	1,573	11,367	7,879	27,731	7,649	1,238	34,119	1,973	(3,618)	10,103
FEB	30,932	11,971	128,427	19,671	175,471	3,186	18,502	13,255	47,018	12,817	2,318	66,689	8,768	(2,505)	10,263
MAR	30,516	12,170	198,181	38,249	266,543	4,946	23,315	16,988	68,302	18,477	3,596	106,551	18,981	(4,909)	5,381
APR	22,844	9,214	69,252	1,373	117,884	2,117	21,169	15,332	48,645	13,361	2,080	50,018	17,368	411	3,820
MAY	20,698	19,790	45,894	(5,835)	99,031	1,733	18,487	13,302	53,164	14,247	2,135	47,329	15,136	1,060	3,299
JUN	17,647	7,519	41,262	(108)	72,289	1,201	15,167	10,770	31,072	8,653	1,298	30,964	9,774	3,016	5,018
JUL	10,589	4,993	24,656	(234)	43,582	636	11,219	7,810	18,989	5,440	792	18,755	5,177	5,185	5,216
AUG	7,276	9,667	14,300	84	24,685	268	5,381	3,488	10,438	3,034	444	10,522	(2,423)	4,127	7,203
SEP	7,276	9,274	14,896	(1,740)	31,635	404	6,707	4,527	16,771	4,764	679	15,031	2,274	1,899	4,210
1984															
OCT	6,177	8,113	12,987	(3,119)	32,760	426	7,886	5,411	19,791	5,612	787	16,672	5,266	1,037	2,501
NOV	17,830	7,681	47,711	3,645	71,985	1,200	6,528	4,485	24,229	6,792	1,056	27,874	5,202	(2,153)	1,757
DEC	29,280	11,494	116,958	18,154	157,197	2,859	11,328	7,975	40,195	11,108	1,997	58,349	9,889	(3,621)	2,146
JAN	21,234	8,777	64,836	3,931	101,812	1,797	15,049	10,723	36,980	10,311	1,625	40,911	13,345	123	1,723
FEB	11,249	5,352	28,426	2,531	41,377	594	6,504	4,352	12,943	3,809	580	15,474	833	(34)	5,984
MAR	10,857	5,264	27,156	3,862	34,834	467	4,590	2,924	7,690	2,408	386	11,552	(2,342)	561	6,929
APR	5,765	3,526	14,513	3,144	15,254	85	2,857	1,393	761	565	98	3,905	(4,852)	1,115	7,697
MAY	3,801	7,199	7,778	530	11,877	15	2,257	850	4,136	1,403	195	4,666	(3,859)	2,075	5,939
JUN	3,478	7,172	6,597	1,193	7,639	(68)	1,728	376	1,102	592	84	2,295	(5,100)	4,521	6,175
JUL	5,931	9,293	10,915	2,908	9,778	(23)	1,615	58	(1,066)	(43)	17	1,842	(8,633)	5,185	9,474
AUG	4,908	8,450	9,223	2,470	8,241	(54)	1,803	192	(922)	7	18	1,548	(8,290)	4,120	9,532
SEP	4,630	7,885	9,231	736	13,787	53	2,091	721	4,593	1,523	218	5,329	(3,676)	2,280	5,507
1985															
OCT	3,066	6,420	6,685	(74)	11,875	14	2,683	1,337	5,202	1,708	233	5,128	(2,898)	643	5,615
NOV	7,727	10,277	17,625	2,082	24,293	262	2,225	680	6,647	2,004	312	8,729	(5,613)	(513)	8,009
DEC	11,247	5,493	28,604	5,365	32,636	425	3,157	1,677	4,020	1,407	251	9,385	(5,013)	(1,385)	8,479
JAN	5,343	3,381	13,545	2,456	15,837	96	2,707	1,380	2,288	993	151	4,744	(3,010)	(213)	5,846
FEB	5,872	3,580	14,883	3,379	15,173	84	2,373	876	293	440	82	3,672	(5,138)	(69)	7,628
MAR	3,390	6,888	7,583	1,054	9,934	(22)	2,162	605	2,350	900	129	3,404	(6,234)	(510)	8,631
APR	2,783	6,298	6,005	835	7,754	(66)	1,939	492	1,775	776	106	2,610	(5,380)	928	7,354
MAY	3,052	6,721	6,184	879	7,928	(62)	1,651	348	1,782	779	104	2,661	(4,766)	2,158	6,226
JUN	2,869	6,758	5,347	1,395	4,771	(125)	1,403	162	(518)	163	21	877	(5,748)	4,320	6,540
JUL	3,765	7,758	6,823	2,328	4,443	(130)	2,000	337	(2,309)	(344)	(38)	19	(8,255)	5,185	9,482
AUG	2,888	6,952	5,356	2,191	2,284	(174)	2,070	364	(3,012)	(526)	(69)	(821)	(8,644)	4,127	10,129
SEP	2,562	6,460	5,072	1,692	3,369	(152)	1,651	165	(1,664)	(152)	(22)	28	(7,387)	2,483	8,733

Table B1–4. Continued

Water Year	Steamboat & Sutter	RMA DCC & Georgiana	Sac R. at Rio Vista	RMA Threemile Slough	Total Outflow	Montezuma Slough	Head of Old R.	SJR below Old R.	RMA QWEST	False River	Dutch Slough	SJR at Antioch	Old R. & Middle R.	RMA Channel Depletion	Total Exports
1986															
OCT	1,904	5,482	4,052	1,051	3,574	(148)	1,731	314	(462)	192	17	589	(5,952)	808	7,717
NOV	2,121	5,695	4,707	908	5,262	(115)	1,652	293	539	455	54	1,447	(5,600)	52	7,341
DEC	4,010	7,566	9,150	1,690	10,738	(5)	1,937	341	1,571	665	100	3,261	(7,544)	(1,529)	9,876
JAN	5,547	8,506	12,059	1,686	15,842	96	1,819	306	3,767	1,235	188	5,453	(6,824)	(1,602)	9,086
FEB	26,245	10,972	175,436	38,298	208,706	3,774	5,411	3,619	33,192	9,371	2,125	71,490	652	(6,965)	6,085
MAR	29,125	11,427	123,142	18,572	168,171	3,057	14,710	10,469	45,001	12,395	2,220	63,573	12,016	(2,552)	3,205
APR	8,825	4,227	22,722	(1,720)	45,132	667	11,556	8,063	22,415	6,360	913	20,695	6,882	649	4,704
MAY	3,076	5,663	6,772	(1,327)	15,983	94	5,256	3,431	9,238	2,777	377	7,911	(1,085)	1,668	6,271
JUN	2,551	5,823	5,021	(313)	9,594	(31)	3,751	2,302	4,624	1,550	204	4,311	(2,913)	3,776	6,186
JUL	4,125	7,870	7,617	1,982	6,946	(81)	2,151	520	(604)	110	25	1,378	(7,252)	5,148	8,622
AUG	3,506	7,355	6,654	2,033	5,096	(118)	2,365	636	(1,499)	(130)	(10)	534	(8,192)	4,127	9,968
SEP	4,784	8,170	9,530	1,824	10,875	(3)	2,899	1,197	1,378	625	102	3,202	(7,762)	1,814	10,507
1987															
OCT	3,794	7,229	7,845	816	11,102	0	2,601	1,078	3,283	1,167	166	4,099	(5,136)	1,541	7,579
NOV	2,837	6,364	6,082	645	8,516	(51)	2,128	677	2,448	960	129	3,093	(4,787)	996	6,871
DEC	2,990	6,511	6,527	499	9,787	(26)	2,594	1,117	3,263	1,178	161	3,762	(4,605)	359	7,273
JAN	3,004	6,565	6,597	592	9,649	(28)	1,832	492	3,040	1,118	151	3,632	(4,336)	90	6,262
FEB	4,542	7,773	10,490	705	16,257	103	1,790	471	5,732	1,780	251	6,437	(4,400)	(3,025)	6,857
MAR	7,083	3,939	18,336	2,997	22,379	225	2,398	1,086	4,029	1,433	220	7,026	(2,769)	(1,664)	5,610
APR	2,552	6,139	5,516	687	7,338	(74)	2,150	695	1,849	807	107	2,536	(4,825)	1,043	7,033
MAY	2,000	5,459	4,027	470	5,341	(114)	1,639	408	1,352	691	82	1,822	(3,863)	2,212	5,322
JUN	1,913	5,474	3,368	808	3,058	(159)	1,494	302	(249)	266	24	559	(4,337)	4,521	5,192
JUL	3,445	7,450	6,281	2,370	3,353	(152)	1,417	(14)	(2,858)	(489)	(60)	(488)	(8,332)	5,185	8,968
AUG	3,235	7,251	6,082	2,437	2,808	(163)	1,475	(31)	(3,215)	(588)	(73)	(778)	(8,915)	4,127	9,817
SEP	2,370	6,288	4,637	1,890	1,964	(180)	1,450	24	(2,632)	(412)	(58)	(742)	(7,929)	2,693	9,084
1988															
OCT	1,856	5,378	3,905	763	4,210	(136)	1,190	136	325	416	45	1,088	(4,738)	998	5,919
NOV	1,537	4,750	3,299	491	4,004	(140)	1,315	234	704	533	57	1,195	(4,075)	342	5,470
DEC	3,850	7,608	8,344	1,824	8,886	(42)	1,321	5	522	401	62	2,346	(7,431)	(696)	9,001
JAN	8,477	4,569	22,970	6,164	20,340	186	1,531	31	(2,650)	(385)	(9)	3,514	(8,402)	(2,002)	10,435
FEB	2,734	6,693	5,821	2,117	3,423	(150)	1,475	(32)	(2,391)	(362)	(45)	(274)	(8,864)	552	10,399
MAR	2,369	6,103	5,084	1,273	4,724	(126)	1,862	358	(339)	211	26	934	(6,534)	822	8,456
APR	4,300	7,899	8,771	1,743	9,810	(24)	1,799	292	1,062	558	88	2,805	(6,782)	1,128	8,585
MAY	2,261	5,944	4,663	866	5,245	(116)	1,444	230	613	479	57	1,479	(4,958)	1,712	6,274
JUN	2,061	5,764	3,811	1,036	3,147	(157)	1,354	185	(611)	159	12	425	(5,087)	3,791	5,910
JUL	3,265	7,299	5,931	2,142	3,444	(151)	1,183	(56)	(2,417)	(362)	(45)	(275)	(7,577)	5,185	7,981
AUG	2,838	6,884	5,295	2,109	2,428	(171)	1,382	(8)	(2,808)	(465)	(61)	(699)	(7,985)	4,127	8,809
SEP	2,343	6,256	4,581	1,665	2,566	(168)	1,311	19	(1,974)	(228)	(34)	(309)	(7,118)	2,693	8,133

Table B1–4. Continued

Water Year	Steamboat & Sutter	RMA DCC & Georgiana	Sac R. at Rio Vista	RMA Threemile Slough	Total Outflow	Montezuma Slough	Head of Old R.	SJR below Old R.	RMA QWEST	False River	Dutch Slough	SJR at Antioch	Old R. & Middle R.	RMA Channel Depletion	Total Exports
1989															
OCT	1,785	5,317	3,655	808	3,614	(148)	997	68	(17)	328	32	791	(4,711)	1,393	5,642
NOV	2,381	6,090	5,190	847	6,291	(95)	1,156	118	1,102	611	78	1,949	(4,867)	348	6,099
DEC	2,694	6,492	5,868	1,160	6,540	(89)	1,283	100	663	477	63	1,823	(5,808)	156	7,197
JAN	2,790	6,762	6,110	2,065	4,110	(137)	1,342	(79)	(1,998)	(262)	(31)	67	(8,715)	(47)	10,213
FEB	2,569	6,390	5,682	1,442	5,294	(114)	1,226	7	(383)	187	26	1,059	(6,855)	23	8,216
MAR	15,506	7,089	36,841	8,420	37,353	518	1,831	201	522	460	155	8,942	(8,252)	(432)	10,279
APR	6,971	4,016	17,152	5,336	12,791	38	1,760	140	(4,342)	(815)	(78)	994	(8,676)	995	10,464
MAY	3,164	6,873	6,412	995	7,970	(61)	1,537	277	1,595	727	99	2,590	(4,914)	2,222	6,231
JUN	2,866	6,724	5,364	1,105	5,711	(107)	1,231	162	407	421	55	1,512	(4,686)	4,426	5,281
JUL	4,804	8,617	8,742	2,942	5,883	(101)	1,208	(155)	(2,788)	(489)	(49)	154	(9,085)	5,185	9,532
AUG	4,670	8,545	8,706	3,326	4,644	(125)	1,249	(259)	(4,005)	(825)	(94)	(679)	(10,612)	4,008	11,338
SEP	4,094	7,939	8,336	2,579	6,417	(90)	1,416	(97)	(1,900)	(250)	(19)	679	(9,306)	901	10,772
1990															
OCT	3,285	7,270	6,851	2,317	4,621	(126)	1,443	(63)	(2,216)	(323)	(35)	101	(9,052)	730	10,547
NOV	3,156	7,053	6,703	2,020	5,302	(113)	1,355	(44)	(1,395)	(97)	(6)	625	(8,279)	426	9,703
DEC	3,699	7,601	7,675	2,362	5,950	(100)	1,430	(64)	(1,716)	(194)	(15)	646	(8,990)	589	10,461
JAN	4,826	8,421	9,908	2,516	9,423	(30)	1,310	(106)	(492)	116	35	2,024	(8,869)	(13)	10,296
FEB	3,652	7,524	7,915	2,519	5,916	(100)	1,573	(58)	(2,004)	(291)	(26)	515	(9,894)	(465)	11,704
MAR	2,703	6,540	5,808	1,947	3,917	(141)	1,631	72	(1,875)	(222)	(26)	72	(8,533)	602	10,235
APR	3,854	7,651	7,893	2,309	6,472	(90)	1,363	(69)	(1,394)	(108)	(3)	915	(8,643)	1,258	10,006
MAY	2,147	5,559	4,618	80	7,660	(68)	1,003	225	3,064	1,162	147	3,144	(2,375)	1,070	3,398
JUN	2,095	5,661	3,953	459	5,231	(117)	824	104	1,330	693	82	1,789	(3,149)	3,512	3,498
JUL	2,887	6,878	5,205	1,667	3,642	(147)	854	(75)	(1,494)	(97)	(13)	173	(6,190)	5,185	6,257
AUG	2,894	6,841	5,435	1,594	4,296	(134)	879	(65)	(1,079)	13	1	515	(6,184)	4,127	6,472
SEP	2,025	5,740	3,943	1,188	2,918	(162)	830	(46)	(984)	57	0	204	(5,578)	2,674	6,126
1991															
OCT	1,435	4,417	2,883	193	4,167	(137)	806	130	1,307	711	78	1,500	(2,795)	1,246	3,549
NOV	1,463	4,482	3,039	199	4,444	(131)	918	162	1,417	739	82	1,616	(2,949)	807	3,858
DEC	2,221	5,865	4,860	669	6,263	(95)	862	55	1,403	701	88	2,072	(4,264)	348	5,205
JAN	1,729	5,134	3,741	567	4,550	(129)	776	38	817	559	63	1,384	(4,061)	458	4,912
FEB	1,535	4,744	3,277	452	4,090	(138)	721	36	813	568	61	1,265	(3,734)	373	4,521
MAR	8,608	4,576	22,478	5,544	21,439	208	1,671	158	(1,059)	36	47	4,485	(7,692)	(1,642)	9,763
APR	2,239	5,874	4,844	1,241	4,392	(132)	1,141	13	(429)	190	22	812	(6,363)	932	7,499
MAY	1,401	4,207	2,738	(60)	4,701	(127)	777	160	1,995	902	101	1,935	(2,102)	1,712	2,686
JUN	1,712	4,929	3,287	39	5,373	(114)	405	30	2,126	931	109	2,165	(1,897)	2,737	1,925
JUL	1,751	5,225	2,860	552	2,944	(162)	401	(38)	154	394	38	706	(3,020)	5,157	2,574
AUG	1,773	5,300	3,122	777	2,716	(166)	439	(83)	(348)	250	20	429	(3,998)	3,999	3,817
SEP	1,930	5,487	3,757	725	4,046	(140)	512	(62)	330	425	46	1,055	(4,083)	2,693	4,235

Note: Negative values shown in parentheses.

Table B1–5. Simulated Historical Percentage Source Contributions at the CCWD Diversion and SWP and CVP Export Locations

Water Year	CCWD Pump #1 (RMA Node No. 206)						SWP Pump (RMA Node No. 193)						CVP Pump (RMA Node No. 181)					
	Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary	Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary	Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary
1968																		
OCT	53.9	15.8	0.0	21.3	9.0	0.00	11.4	81.4	0.0	3.9	3.3	0.00	3.3	92.2	0.0	1.2	3.3	0.00
NOV	7.7	85.1	0.0	3.8	3.5	0.00	0.2	99.3	0.0	0.1	0.4	0.00	0.0	98.8	0.0	0.0	1.2	0.00
DEC	0.5	97.7	0.0	0.2	0.1	0.00	0.0	99.3	0.0	0.0	0.0	0.00	0.0	99.4	0.0	0.0	0.0	0.00
JAN	1.1	79.8	0.0	0.2	17.6	0.00	0.0	95.3	0.0	0.0	4.4	0.00	0.0	88.2	0.0	0.0	11.4	0.00
FEB	2.2	50.3	0.0	1.7	43.7	0.00	0.0	87.3	0.0	0.0	11.4	0.00	0.0	82.4	0.0	0.0	17.1	0.00
MAR	37.3	20.9	0.0	28.4	12.9	0.00	22.5	39.7	0.0	25.5	11.9	0.00	10.2	70.1	0.0	11.5	8.0	0.00
APR	84.4	2.6	0.1	11.5	1.3	0.00	70.8	11.5	0.1	16.0	1.6	0.00	52.5	34.3	0.0	11.7	1.4	0.00
MAY	91.0	0.3	0.1	3.9	4.7	0.00	90.3	2.6	0.1	6.2	0.8	0.00	79.6	12.6	0.1	5.6	2.2	0.00
JUN	90.0	0.1	0.2	1.1	8.6	0.11	91.8	0.4	0.1	2.0	5.7	0.06	89.4	1.7	0.1	1.7	6.9	0.07
JUL	88.4	0.0	0.1	0.3	10.4	0.70	92.0	0.1	0.1	0.5	6.9	0.44	91.1	0.3	0.1	0.4	7.6	0.48
AUG	89.9	0.0	0.1	0.4	9.1	0.56	92.2	0.6	0.0	0.6	6.1	0.41	87.3	4.3	0.0	0.6	7.3	0.38
SEP	92.9	0.0	0.0	0.8	6.0	0.28	93.1	1.6	0.0	1.2	3.8	0.19	81.5	12.1	0.0	1.1	5.2	0.17
1969																		
OCT	96.1	0.0	0.0	1.2	2.6	0.15	93.4	3.3	0.0	1.8	1.5	0.10	71.0	25.5	0.0	1.3	2.1	0.07
NOV	95.6	0.3	0.0	2.7	0.3	0.03	85.0	10.0	0.0	3.0	0.9	0.02	49.5	47.4	0.0	1.7	0.5	0.01
DEC	49.7	9.7	0.0	5.4	31.6	0.00	24.5	48.4	0.0	2.6	22.0	0.00	5.3	63.1	0.0	0.6	29.7	0.00
JAN	0.1	39.0	0.0	0.2	58.4	0.00	0.0	94.1	0.0	0.0	5.6	0.00	0.0	83.0	0.0	0.0	16.5	0.00
FEB	0.0	69.8	0.0	0.0	29.3	0.00	0.0	97.9	0.0	0.0	1.9	0.00	0.0	91.1	0.0	0.0	8.8	0.00
MAR	0.0	99.6	0.0	0.0	0.4	0.00	0.0	99.9	0.0	0.0	0.1	0.00	0.0	99.8	0.0	0.0	0.2	0.00
APR	0.0	98.9	0.0	0.0	1.1	0.00	0.0	100.0	0.0	0.0	0.0	0.00	0.0	99.5	0.0	0.0	0.5	0.00
MAY	0.0	92.1	0.0	0.0	7.9	0.00	0.0	99.7	0.0	0.0	0.3	0.00	0.0	97.2	0.0	0.0	2.8	0.00
JUN	0.0	88.0	0.0	0.0	12.0	0.00	0.0	99.2	0.0	0.0	0.8	0.00	0.0	95.9	0.0	0.0	4.1	0.00
JUL	20.9	58.4	0.0	5.3	15.5	0.00	2.6	86.9	0.0	1.3	9.2	0.00	0.6	91.8	0.0	0.3	7.2	0.00
AUG	82.2	4.0	0.0	4.3	9.4	0.00	72.1	14.8	0.0	6.2	6.9	0.00	55.1	32.7	0.0	4.7	7.6	0.00
SEP	65.1	14.7	0.0	9.8	10.4	0.00	38.8	49.2	0.0	5.1	7.0	0.00	14.5	77.5	0.0	2.1	5.9	0.00
1970																		
OCT	20.0	70.2	0.0	4.7	5.2	0.00	0.1	99.6	0.0	0.0	0.3	0.00	0.0	99.1	0.0	0.0	0.9	0.00
NOV	0.5	97.8	0.0	0.2	1.5	0.00	0.0	99.8	0.0	0.0	0.2	0.00	0.0	98.7	0.0	0.0	1.3	0.00
DEC	0.9	83.5	0.0	0.5	12.5	0.00	0.0	94.5	0.0	0.0	4.6	0.00	0.0	90.6	0.0	0.0	6.4	0.00
JAN	0.0	38.2	0.0	0.1	59.5	0.00	0.0	88.4	0.0	0.0	10.7	0.00	0.0	64.0	0.0	0.0	35.1	0.00
FEB	0.0	94.9	0.0	0.0	5.0	0.00	0.0	99.2	0.0	0.0	0.8	0.00	0.0	98.6	0.0	0.0	1.4	0.00
MAR	0.1	97.4	0.0	0.2	2.3	0.00	0.0	99.7	0.0	0.0	0.3	0.00	0.0	99.5	0.0	0.0	0.5	0.00
APR	72.6	10.6	0.0	15.6	1.3	0.00	54.5	25.0	0.0	19.8	0.6	0.00	39.5	45.9	0.0	13.7	0.9	0.00
MAY	80.5	5.2	0.0	9.2	5.1	0.00	65.2	21.5	0.0	12.1	1.1	0.00	43.2	46.3	0.0	7.6	2.8	0.00
JUN	85.8	1.9	0.0	3.0	9.3	0.00	75.9	12.9	0.0	4.3	6.8	0.00	53.9	35.6	0.0	2.9	7.6	0.00
JUL	87.7	0.2	0.0	1.5	10.6	0.08	88.2	2.1	0.0	2.2	7.3	0.05	79.5	9.9	0.0	2.0	8.5	0.05
AUG	89.6	0.0	0.0	1.8	8.5	0.06	89.4	1.6	0.0	2.6	6.3	0.05	80.8	9.2	0.0	2.3	7.6	0.04
SEP	88.4	0.1	0.0	4.2	7.3	0.01	82.4	6.7	0.0	4.6	6.2	0.01	63.8	25.1	0.0	3.7	7.4	0.01

Table B1–5. Continued

Water Year	CCWD Pump #1 (RMA Node No. 206)						SWP Pump (RMA Node No. 193)						CVP Pump (RMA Node No. 181)					
	Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary	Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary	Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary
1971																		
OCT	87.1	1.5	0.0	7.5	4.0	0.00	71.2	18.0	0.0	7.0	3.8	0.00	45.9	45.8	0.0	4.7	3.6	0.00
NOV	63.8	8.4	0.0	10.7	13.8	0.00	24.8	60.2	0.0	4.0	8.8	0.00	7.0	71.1	0.0	1.1	19.0	0.00
DEC	0.5	30.7	0.0	0.2	66.0	0.00	0.0	80.0	0.0	0.0	19.3	0.00	1.0	54.1	0.0	0.2	40.3	0.00
JAN	0.4	82.7	0.0	0.5	16.0	0.00	0.0	97.2	0.0	0.0	2.7	0.00	0.0	92.3	0.0	0.0	7.5	0.00
FEB	11.9	64.9	0.0	14.8	8.0	0.00	0.8	94.2	0.0	2.1	2.8	0.00	0.2	98.6	0.0	0.5	0.7	0.00
MAR	51.6	20.0	0.0	24.4	3.9	0.00	34.4	36.2	0.0	24.5	4.8	0.00	20.2	61.7	0.0	14.4	3.7	0.00
APR	70.6	7.3	0.0	20.3	1.8	0.00	52.9	21.5	0.0	24.2	1.3	0.00	34.3	48.9	0.0	15.6	1.2	0.00
MAY	79.7	2.8	0.0	12.5	5.1	0.00	68.1	13.4	0.0	17.6	0.9	0.00	49.4	35.9	0.0	12.5	2.3	0.00
JUN	87.7	0.6	0.1	2.5	9.0	0.00	82.5	7.6	0.1	5.5	4.3	0.00	61.7	28.6	0.1	4.1	5.6	0.00
JUL	87.6	0.0	0.0	1.8	10.6	0.00	90.3	0.9	0.0	3.0	5.8	0.00	83.3	6.5	0.0	2.9	7.3	0.00
AUG	91.5	0.0	0.0	0.3	8.1	0.00	94.2	0.7	0.0	0.6	4.4	0.00	87.2	6.2	0.0	0.7	5.9	0.00
SEP	88.3	0.0	0.0	4.7	6.9	0.00	86.5	3.3	0.0	5.7	4.5	0.00	72.3	17.0	0.0	4.9	5.9	0.00
1972																		
OCT	80.0	2.3	0.0	13.5	4.2	0.00	64.8	17.5	0.0	14.6	3.2	0.00	37.5	50.8	0.0	8.7	3.1	0.00
NOV	80.2	5.6	0.0	12.7	1.5	0.00	59.7	24.6	0.0	14.4	1.2	0.00	37.0	53.1	0.0	8.7	1.2	0.00
DEC	61.8	15.2	0.0	11.6	8.4	0.00	32.1	54.7	0.0	6.5	4.2	0.00	11.2	79.0	0.0	2.3	6.2	0.00
JAN	32.3	50.0	0.0	8.5	7.6	0.00	0.2	98.7	0.0	0.0	1.1	0.00	0.0	98.8	0.0	0.0	1.2	0.00
FEB	53.3	29.7	0.0	14.0	2.6	0.00	32.2	52.3	0.0	12.0	3.0	0.00	17.4	74.1	0.0	6.5	1.8	0.00
MAR	89.1	2.2	0.1	6.9	1.6	0.00	81.0	8.4	0.1	10.0	0.5	0.00	60.5	31.0	0.1	7.5	0.9	0.00
APR	90.6	0.4	0.0	6.7	2.3	0.00	84.8	3.9	0.0	10.7	0.5	0.00	68.0	21.8	0.0	8.6	1.6	0.00
MAY	92.6	0.1	0.0	2.8	4.5	0.04	92.5	1.1	0.0	4.7	1.6	0.03	83.5	8.4	0.0	5.0	3.0	0.02
JUN	91.1	0.0	0.0	0.7	8.0	0.14	93.0	0.3	0.0	1.2	5.4	0.09	89.6	2.3	0.0	1.3	6.7	0.09
JUL	88.8	0.0	0.0	0.1	10.9	0.20	93.1	0.0	0.0	0.2	6.5	0.14	92.2	0.2	0.0	0.2	7.2	0.14
AUG	91.3	0.0	0.0	0.2	8.2	0.31	94.4	0.2	0.0	0.3	4.9	0.21	91.4	2.0	0.0	0.3	6.1	0.20
SEP	94.8	0.0	0.0	1.0	4.1	0.08	93.2	2.8	0.0	1.5	2.4	0.06	71.0	24.4	0.0	1.1	3.4	0.04
1973																		
OCT	97.2	0.3	0.0	1.8	0.8	0.01	88.6	8.3	0.0	2.2	0.9	0.01	55.0	42.8	0.0	1.4	0.8	0.01
NOV	70.8	7.4	0.0	3.3	15.5	0.00	32.0	51.9	0.0	1.4	12.5	0.00	20.6	58.1	0.0	0.5	16.9	0.00
DEC	59.3	14.6	0.0	3.6	20.2	0.00	21.0	60.5	0.0	1.5	15.8	0.00	8.7	65.3	0.0	0.3	22.6	0.00
JAN	5.8	14.7	0.0	2.0	74.0	0.00	0.1	82.6	0.0	0.0	16.4	0.00	0.0	68.5	0.0	0.0	30.7	0.00
FEB	0.1	69.7	0.0	0.1	29.2	0.00	0.0	94.9	0.0	0.0	4.7	0.00	0.0	81.4	0.0	0.0	18.3	0.00
MAR	0.0	72.8	0.0	0.1	26.4	0.00	0.0	95.6	0.0	0.0	4.2	0.00	0.0	82.7	0.0	0.0	17.0	0.00
APR	11.1	60.0	0.0	20.7	7.7	0.00	1.5	86.9	0.0	6.8	4.6	0.00	0.4	96.4	0.0	1.6	1.5	0.00
MAY	74.9	6.7	0.0	13.6	4.8	0.00	60.2	19.9	0.0	18.3	1.6	0.00	38.7	46.8	0.0	11.7	2.8	0.00
JUN	85.6	0.8	0.0	4.5	9.0	0.01	79.6	6.9	0.0	7.7	5.8	0.00	57.9	29.7	0.0	5.6	6.8	0.00
JUL	88.3	0.2	0.1	1.4	9.8	0.22	90.6	0.9	0.1	2.3	6.1	0.15	82.8	7.1	0.1	2.3	7.6	0.14
AUG	90.2	0.1	0.0	1.2	8.1	0.36	92.0	0.9	0.0	2.0	4.8	0.25	82.5	8.9	0.0	1.9	6.4	0.22
SEP	91.8	0.0	0.0	2.7	5.5	0.06	89.8	3.0	0.0	3.8	3.5	0.04	71.2	21.2	0.0	3.0	4.6	0.03

Table B1–5. Continued

Water Year	CCWD Pump #1 (RMA Node No. 206) Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary	SWP Pump (RMA Node No. 193) Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary	CVP Pump (RMA Node No. 181) Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary
1974																		
OCT	91.2	2.0	0.0	6.0	0.7	0.01	75.9	15.8	0.0	7.0	1.2	0.00	41.2	54.4	0.0	3.8	0.7	0.00
NOV	63.0	9.6	0.1	18.7	6.9	0.00	48.5	24.2	0.0	20.6	5.0	0.00	25.2	57.1	0.0	10.9	5.7	0.00
DEC	25.4	13.7	0.0	22.3	36.0	0.00	6.9	68.2	0.0	5.7	18.0	0.00	1.4	78.4	0.0	1.1	18.5	0.00
JAN	0.2	66.3	0.0	0.2	32.0	0.00	0.0	95.3	0.0	0.0	4.3	0.00	0.0	86.4	0.0	0.0	13.3	0.00
FEB	35.2	39.8	0.0	21.1	3.6	0.00	18.8	60.5	0.0	16.9	3.5	0.00	5.0	89.3	0.0	4.4	1.2	0.00
MAR	27.8	28.0	0.0	40.1	4.0	0.00	17.5	42.5	0.0	35.5	4.6	0.00	6.7	76.8	0.0	13.7	2.7	0.00
APR	17.4	39.3	0.0	39.3	4.0	0.00	4.1	81.5	0.0	11.6	2.8	0.00	0.7	96.2	0.0	2.0	1.1	0.00
MAY	64.8	12.9	0.0	18.1	4.3	0.00	48.9	29.4	0.0	20.8	0.9	0.00	24.4	63.4	0.0	10.4	1.8	0.00
JUN	81.5	3.2	0.0	7.9	7.4	0.00	69.9	14.4	0.0	12.0	3.7	0.00	39.1	49.5	0.0	6.7	4.7	0.00
JUL	89.5	0.1	0.1	1.5	8.9	0.01	91.4	1.4	0.0	2.8	4.4	0.01	73.5	17.7	0.0	2.6	6.2	0.00
AUG	90.7	0.0	0.0	1.5	7.7	0.01	91.9	1.5	0.0	2.7	3.9	0.00	74.3	17.9	0.0	2.3	5.5	0.00
SEP	83.4	1.7	0.0	7.0	7.8	0.00	71.6	14.4	0.0	9.0	5.0	0.00	41.7	47.7	0.0	5.3	5.3	0.00
1975																		
OCT	68.6	16.7	0.0	11.4	3.3	0.00	49.5	38.0	0.0	10.7	1.8	0.00	23.1	70.3	0.0	5.0	1.6	0.00
NOV	33.6	56.2	0.0	8.2	2.0	0.00	0.1	99.6	0.0	0.0	0.3	0.00	11.1	85.0	0.0	2.4	1.5	0.00
DEC	29.7	56.8	0.0	10.9	0.6	0.00	1.3	97.6	0.0	0.5	0.1	0.00	0.7	97.4	0.0	0.2	0.2	0.00
JAN	71.5	22.1	0.0	5.9	0.2	0.00	47.1	47.3	0.0	5.1	0.3	0.00	13.3	85.0	0.0	1.5	0.1	0.00
FEB	18.3	34.3	0.0	14.6	30.8	0.00	12.3	52.8	0.0	11.6	21.5	0.00	1.8	81.8	0.0	1.8	14.0	0.00
MAR	13.0	33.8	0.0	38.7	13.8	0.00	7.5	51.0	0.0	30.1	10.8	0.00	1.5	85.7	0.0	6.1	6.4	0.00
APR	44.9	19.7	0.1	34.4	0.9	0.00	29.2	36.0	0.0	33.7	1.0	0.00	13.8	69.7	0.0	15.9	0.5	0.00
MAY	50.1	17.2	0.0	27.2	5.5	0.00	35.5	34.7	0.0	28.7	1.1	0.00	17.5	66.1	0.0	14.1	2.3	0.00
JUN	39.2	32.5	0.0	17.3	11.0	0.00	24.2	52.0	0.0	16.7	7.1	0.00	9.3	78.6	0.0	6.1	6.0	0.00
JUL	84.3	1.3	0.0	3.6	10.8	0.00	80.7	6.4	0.0	5.9	7.0	0.00	69.8	17.3	0.0	4.8	8.2	0.00
AUG	90.1	0.2	0.0	2.3	7.5	0.01	90.2	2.2	0.0	3.8	3.8	0.00	71.1	20.6	0.0	3.0	5.2	0.00
SEP	88.7	0.4	0.0	4.6	6.3	0.00	80.8	7.9	0.0	7.8	3.5	0.00	49.1	41.8	0.0	4.7	4.4	0.00
1976																		
OCT	73.4	15.5	0.0	10.8	0.4	0.00	53.3	35.1	0.0	11.2	0.4	0.00	17.7	78.4	0.0	3.7	0.1	0.00
NOV	79.9	9.4	0.0	9.5	1.1	0.00	62.3	26.3	0.0	11.2	0.2	0.00	26.6	68.2	0.0	4.8	0.4	0.00
DEC	86.8	7.6	0.0	4.7	0.8	0.00	69.8	25.1	0.0	4.9	0.2	0.00	31.3	66.2	0.0	2.2	0.3	0.00
JAN	93.5	4.2	0.0	1.7	0.7	0.00	78.6	19.3	0.0	1.9	0.2	0.00	39.7	59.0	0.0	1.0	0.4	0.00
FEB	97.1	1.0	0.0	1.6	0.3	0.01	88.2	9.7	0.0	2.1	0.1	0.00	59.7	38.7	0.0	1.4	0.2	0.00
MAR	96.9	0.3	0.0	1.4	1.4	0.03	92.3	5.4	0.0	2.0	0.2	0.02	65.7	32.0	0.0	1.5	0.8	0.01
APR	95.9	0.5	0.0	2.2	1.4	0.01	90.5	6.3	0.0	2.8	0.4	0.01	72.8	23.9	0.0	2.3	1.0	0.01
MAY	94.7	0.1	0.0	0.8	4.3	0.05	95.2	2.2	0.0	1.4	1.1	0.03	84.8	11.5	0.0	1.2	2.4	0.03
JUN	90.8	0.0	0.0	0.2	8.7	0.24	92.6	0.8	0.0	0.4	6.0	0.13	87.8	4.2	0.0	0.3	7.5	0.14
JUL	89.0	0.0	0.0	0.0	10.4	0.52	91.8	0.2	0.0	0.1	7.6	0.36	89.7	1.2	0.0	0.1	8.7	0.36
AUG	91.7	0.0	0.0	0.1	7.5	0.79	93.5	1.1	0.0	0.2	4.7	0.54	83.5	9.8	0.0	0.1	6.0	0.48
SEP	92.8	0.0	0.0	1.6	4.6	1.09	92.9	1.3	0.0	2.7	2.4	0.71	78.7	14.7	0.0	2.3	3.6	0.60

Table B1–5. Continued

Water Year	CCWD Pump #1 (RMA Node No. 206)						SWP Pump (RMA Node No. 193)						CVP Pump (RMA Node No. 181)					
	Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary	Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary	Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary
1977																		
OCT	95.8	0.0	0.0	1.3	2.2	0.69	91.1	4.8	0.0	2.3	1.4	0.44	68.9	27.3	0.0	1.7	1.8	0.33
NOV	97.3	0.2	0.0	1.0	1.1	0.44	90.4	7.1	0.0	1.4	0.8	0.28	65.8	31.8	0.0	1.0	1.2	0.20
DEC	96.7	0.9	0.0	1.6	0.6	0.22	83.5	14.0	0.0	1.8	0.6	0.16	57.2	40.8	0.0	1.2	0.7	0.11
JAN	97.8	0.1	0.0	0.6	0.1	0.38	94.0	3.9	0.0	0.9	0.1	0.23	71.3	27.0	0.0	0.7	0.1	0.18
FEB	98.4	0.2	0.0	0.6	0.1	0.39	92.7	5.7	0.0	0.9	0.1	0.25	71.2	27.6	0.0	0.7	0.1	0.19
MAR	98.4	0.2	0.0	0.7	0.1	0.55	93.9	4.7	0.0	0.9	0.1	0.32	77.3	21.6	0.0	0.7	0.0	0.26
APR	94.5	0.2	0.0	0.8	3.9	0.53	95.4	2.5	0.0	1.1	0.6	0.35	91.8	4.8	0.0	1.0	1.9	0.34
MAY	95.3	0.1	0.0	0.3	3.9	0.48	96.2	2.2	0.0	0.4	0.8	0.31	88.0	8.9	0.0	0.4	2.4	0.28
JUN	89.6	0.0	0.0	0.2	9.7	0.55	91.1	0.1	0.0	0.3	8.2	0.34	88.3	0.1	0.0	0.3	11.0	0.33
JUL	85.1	0.0	0.0	0.0	14.1	0.81	87.4	0.0	0.0	0.1	12.0	0.53	84.8	0.0	0.0	0.1	14.6	0.52
AUG	86.5	0.0	0.0	0.0	12.4	1.16	89.1	0.0	0.0	0.0	10.2	0.75	87.9	0.0	0.0	0.0	11.4	0.76
SEP	90.2	0.0	0.0	0.0	8.6	1.28	91.9	0.0	0.0	0.0	7.3	0.88	91.2	0.1	0.0	0.0	7.9	0.86
1978																		
OCT	92.2	0.0	0.0	0.0	6.7	1.15	89.0	2.3	0.0	0.0	7.9	0.77	84.3	5.0	0.0	0.0	10.0	0.72
NOV	97.2	0.0	0.0	0.1	1.6	0.89	91.9	4.9	0.0	0.1	2.3	0.62	77.9	19.2	0.0	0.1	2.2	0.53
DEC	81.2	0.0	0.0	2.4	13.5	0.20	81.7	2.7	0.0	3.2	9.6	0.14	58.6	18.2	0.0	2.3	18.3	0.10
JAN	26.7	1.7	0.1	19.2	49.4	0.00	29.0	9.0	0.1	34.0	25.1	0.00	11.7	42.1	0.0	13.8	30.6	0.00
FEB	26.2	23.5	0.0	21.5	27.3	0.00	17.7	48.4	0.0	20.7	12.2	0.00	2.2	85.9	0.0	2.6	9.0	0.00
MAR	1.3	50.9	0.0	1.7	44.5	0.00	0.0	96.6	0.0	0.0	3.3	0.00	0.0	93.2	0.0	0.0	6.7	0.00
APR	0.0	95.9	0.0	0.0	4.1	0.00	0.0	99.6	0.0	0.0	0.4	0.00	0.0	99.2	0.0	0.0	0.8	0.00
MAY	0.0	95.5	0.0	0.0	4.4	0.00	0.0	99.8	0.0	0.0	0.2	0.00	0.0	98.5	0.0	0.0	1.5	0.00
JUN	48.6	34.1	0.0	7.2	10.1	0.00	32.1	56.3	0.0	6.8	4.8	0.00	7.0	87.4	0.0	1.5	4.2	0.00
JUL	84.8	3.2	0.0	1.2	10.6	0.12	86.9	5.3	0.0	1.5	6.2	0.08	70.0	21.2	0.0	1.2	7.5	0.06
AUG	87.4	0.9	0.0	2.5	8.9	0.33	88.4	2.3	0.0	4.2	4.9	0.22	73.3	16.3	0.0	3.7	6.5	0.18
SEP	85.6	0.8	0.0	7.3	6.3	0.04	75.7	9.3	0.0	11.7	3.3	0.03	46.0	42.8	0.0	7.1	4.1	0.02
1979																		
OCT	73.7	9.6	0.0	11.9	4.8	0.01	55.0	29.5	0.0	12.8	2.7	0.00	23.9	67.7	0.0	5.6	2.8	0.00
NOV	74.6	14.6	0.0	9.8	0.6	0.00	53.2	36.2	0.0	9.4	0.6	0.00	21.7	73.9	0.0	3.8	0.3	0.00
DEC	87.1	7.1	0.0	5.7	0.1	0.00	68.6	25.3	0.0	6.0	0.1	0.00	33.1	64.0	0.0	2.9	0.0	0.00
JAN	29.9	14.3	0.0	4.6	47.2	0.00	5.7	74.0	0.0	0.7	18.0	0.00	0.9	81.1	0.0	0.1	17.0	0.00
FEB	0.5	47.2	0.0	0.2	50.2	0.00	0.0	92.8	0.0	0.0	6.9	0.00	0.0	79.3	0.0	0.0	20.2	0.00
MAR	0.3	82.4	0.0	1.4	15.7	0.00	0.0	98.9	0.0	0.0	1.1	0.00	0.0	97.9	0.0	0.0	2.1	0.00
APR	47.2	24.8	0.0	26.4	1.5	0.00	29.7	43.3	0.0	25.5	1.4	0.00	11.9	77.3	0.0	10.1	0.6	0.00
MAY	74.1	4.6	0.0	16.4	4.9	0.00	59.4	17.0	0.0	22.5	1.1	0.00	33.3	51.1	0.0	12.6	3.0	0.00
JUN	83.9	0.7	0.0	6.4	9.0	0.01	76.0	7.4	0.0	10.6	6.0	0.00	51.0	34.4	0.0	7.1	7.5	0.00
JUL	89.4	0.1	0.0	1.8	8.4	0.31	90.9	1.2	0.0	2.9	4.8	0.21	77.2	13.1	0.0	3.0	6.5	0.18
AUG	88.9	0.1	0.0	1.3	8.4	1.35	91.1	1.1	0.0	2.4	4.5	0.90	75.1	15.5	0.0	2.4	6.2	0.73
SEP	90.7	0.0	0.0	2.2	6.1	1.00	90.0	2.1	0.0	4.1	3.2	0.63	66.6	25.7	0.0	3.0	4.2	0.46

Table B1–5. Continued

Water Year	CCWD Pump #1 (RMA Node No. 206)						SWP Pump (RMA Node No. 193)						CVP Pump (RMA Node No. 181)					
	Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary	Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary	Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary
1980																		
OCT	90.8	1.5	0.0	6.6	1.0	0.21	76.8	12.9	0.0	9.3	0.9	0.12	42.8	51.3	0.0	5.2	0.7	0.07
NOV	87.2	3.8	0.0	8.6	0.1	0.02	61.1	29.3	0.0	9.1	0.1	0.01	17.4	79.7	0.0	2.6	0.1	0.00
DEC	74.8	5.5	0.0	8.0	9.9	0.00	44.0	40.1	0.0	6.7	7.8	0.00	10.0	76.2	0.0	1.5	9.6	0.00
JAN	0.6	40.7	0.0	0.5	55.9	0.00	0.0	92.0	0.0	0.0	7.7	0.00	3.7	72.6	0.0	0.6	17.6	0.00
FEB	0.0	76.6	0.0	0.1	22.5	0.00	0.0	98.3	0.0	0.0	1.6	0.00	0.0	94.5	0.0	0.0	5.3	0.00
MAR	0.0	98.6	0.0	0.0	1.4	0.00	0.0	99.8	0.0	0.0	0.2	0.00	0.0	99.8	0.0	0.0	0.2	0.00
APR	0.2	98.6	0.0	1.0	0.3	0.00	0.0	100.0	0.0	0.0	0.0	0.00	0.0	100.0	0.0	0.0	0.0	0.00
MAY	0.3	90.8	0.0	1.1	7.7	0.00	0.0	99.4	0.0	0.0	0.6	0.00	0.0	97.9	0.0	0.0	2.1	0.00
JUN	49.8	25.4	0.0	15.1	9.7	0.00	32.2	47.7	0.0	14.7	5.4	0.00	7.6	83.6	0.0	3.5	5.4	0.00
JUL	81.5	3.2	0.0	5.2	10.1	0.00	71.5	14.2	0.0	7.7	6.6	0.00	47.0	40.9	0.0	5.0	7.1	0.00
AUG	89.5	0.3	0.0	1.5	8.5	0.09	89.9	2.8	0.0	2.5	4.8	0.06	68.9	23.1	0.0	1.9	6.0	0.05
SEP	85.6	4.0	0.0	4.2	6.2	0.03	71.7	18.9	0.0	5.4	4.0	0.02	33.3	59.9	0.0	2.5	4.3	0.01
1981																		
OCT	79.1	11.6	0.0	5.6	3.6	0.01	60.1	31.7	0.0	5.9	2.2	0.00	25.0	70.2	0.0	2.5	2.3	0.00
NOV	82.4	8.5	0.0	6.9	2.2	0.01	64.8	26.2	0.0	7.9	1.1	0.00	33.7	60.9	0.0	4.1	1.3	0.00
DEC	89.2	5.4	0.0	4.6	0.1	0.00	72.6	21.5	0.0	5.0	0.2	0.00	38.4	58.5	0.0	2.6	0.1	0.00
JAN	63.2	6.1	0.0	5.0	23.1	0.00	56.5	20.9	0.0	6.4	13.7	0.00	24.2	56.4	0.0	2.7	15.2	0.00
FEB	88.3	3.6	0.4	2.8	4.3	0.00	72.3	18.4	0.3	3.4	5.1	0.00	37.1	57.5	0.1	1.8	3.3	0.00
MAR	50.3	17.6	0.1	12.8	18.1	0.00	30.5	44.0	0.1	10.0	14.6	0.00	7.4	77.2	0.0	2.4	12.5	0.00
APR	90.7	1.9	0.0	6.3	1.0	0.00	77.2	13.1	0.0	8.2	1.4	0.00	42.6	52.0	0.0	4.5	0.8	0.00
MAY	89.8	2.2	0.0	4.6	3.5	0.00	77.7	15.5	0.0	5.8	1.0	0.00	52.3	41.3	0.0	3.8	2.6	0.00
JUN	90.1	0.5	0.0	1.4	7.9	0.01	85.9	6.1	0.0	2.5	5.5	0.00	72.2	18.9	0.0	1.9	7.1	0.00
JUL	89.8	0.0	0.0	0.3	9.6	0.25	92.0	1.1	0.0	0.4	6.2	0.17	82.1	9.6	0.0	0.4	7.7	0.15
AUG	89.7	0.0	0.0	0.2	8.7	1.36	92.9	1.1	0.0	0.3	4.8	0.92	78.8	13.5	0.0	0.3	6.6	0.77
SEP	92.3	0.0	0.0	0.6	6.2	0.97	92.8	2.0	0.0	0.9	3.6	0.63	75.3	18.4	0.0	0.7	5.1	0.51
1982																		
OCT	97.1	0.0	0.0	1.6	0.9	0.46	90.3	6.2	0.0	2.0	1.2	0.28	53.6	44.2	0.0	1.2	0.9	0.17
NOV	88.8	1.3	0.2	7.1	0.9	0.07	72.7	15.6	0.1	9.1	0.8	0.05	32.1	61.8	0.1	4.0	0.9	0.02
DEC	46.3	5.4	0.1	28.4	18.6	0.00	30.8	28.0	0.0	28.1	12.2	0.00	8.4	64.1	0.0	7.6	19.3	0.00
JAN	7.1	8.6	0.0	26.7	54.2	0.00	3.5	47.8	0.0	16.2	30.1	0.00	0.6	62.8	0.0	2.7	32.9	0.00
FEB	15.7	24.1	0.0	45.3	14.2	0.00	9.5	42.0	0.0	40.8	7.1	0.00	1.4	86.7	0.0	6.0	5.7	0.00
MAR	4.4	30.3	0.0	29.9	33.5	0.00	2.0	63.3	0.0	20.6	13.0	0.00	0.2	86.4	0.0	1.8	11.2	0.00
APR	0.0	74.7	0.0	0.2	24.6	0.00	0.0	98.6	0.0	0.0	1.4	0.00	0.0	95.6	0.0	0.0	4.4	0.00
MAY	0.0	95.1	0.0	0.0	4.9	0.00	0.0	99.8	0.0	0.0	0.2	0.00	0.0	98.8	0.0	0.0	1.2	0.00
JUN	6.8	66.9	0.0	13.6	12.7	0.00	0.0	97.2	0.0	0.1	2.7	0.00	0.0	95.8	0.0	0.0	4.2	0.00
JUL	28.8	42.6	0.0	14.7	13.9	0.00	10.7	70.4	0.0	9.5	9.4	0.00	2.2	89.2	0.0	1.9	6.7	0.00
AUG	81.9	4.7	0.0	4.6	8.8	0.00	70.2	17.9	0.0	6.4	5.5	0.00	39.3	51.3	0.0	3.6	5.8	0.00
SEP	44.0	44.0	0.0	8.6	3.4	0.00	17.4	77.3	0.0	3.9	1.3	0.00	2.8	95.3	0.0	0.6	1.2	0.00

Table B1–5. Continued

Water Year	GCWD Pump #1 (RMA Node No. 206) Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary	SWP Pump (RMA Node No. 193) Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary	CVP Pump (RMA Node No. 181) Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary
1983																		
OCT	24.6	63.0	0.0	10.6	1.9	0.00	3.0	95.7	0.0	1.1	0.3	0.00	0.3	99.1	0.0	0.1	0.4	0.00
NOV	10.4	49.1	0.0	24.8	13.2	0.00	4.2	74.9	0.0	12.1	7.3	0.00	0.6	91.9	0.0	1.7	5.3	0.00
DEC	0.1	49.2	0.0	0.6	48.1	0.00	0.0	96.7	0.0	0.0	3.1	0.00	0.0	90.3	0.0	0.0	9.5	0.00
JAN	0.0	44.2	0.0	0.4	53.2	0.00	0.0	97.0	0.0	0.0	2.8	0.00	0.0	91.1	0.0	0.0	8.6	0.00
FEB	0.0	76.5	0.0	0.0	22.8	0.00	0.0	98.6	0.0	0.0	1.3	0.00	0.0	94.8	0.0	0.0	5.1	0.00
MAR	0.0	71.5	0.0	0.0	27.6	0.00	0.0	97.8	0.0	0.0	1.9	0.00	0.0	90.6	0.0	0.0	9.2	0.00
APR	0.0	99.2	0.0	0.0	0.8	0.00	0.0	99.8	0.0	0.0	0.1	0.00	0.0	99.8	0.0	0.0	0.2	0.00
MAY	0.0	98.1	0.0	0.0	1.9	0.00	0.0	99.9	0.0	0.0	0.1	0.00	0.0	99.4	0.0	0.0	0.6	0.00
JUN	0.0	89.9	0.0	0.0	10.1	0.00	0.0	99.5	0.0	0.0	0.5	0.00	0.0	97.0	0.0	0.0	3.0	0.00
JUL	0.0	84.1	0.0	0.0	15.9	0.00	0.0	98.8	0.0	0.0	1.2	0.00	0.0	96.6	0.0	0.0	3.4	0.00
AUG	26.2	51.2	0.0	12.3	10.2	0.00	12.1	73.7	0.0	8.4	5.8	0.00	1.6	93.6	0.0	1.1	3.8	0.00
SEP	0.1	92.3	0.0	0.1	7.4	0.00	0.0	99.4	0.0	0.0	0.6	0.00	0.0	98.4	0.0	0.0	1.6	0.00
1984																		
OCT	0.0	96.0	0.0	0.0	4.0	0.00	0.0	99.8	0.0	0.0	0.2	0.00	0.0	98.9	0.0	0.0	1.1	0.00
NOV	0.0	68.7	0.0	0.0	29.1	0.00	0.0	96.1	0.0	0.0	3.2	0.00	0.0	80.3	0.0	0.0	19.0	0.00
DEC	0.0	64.6	0.0	0.0	34.1	0.00	0.0	96.3	0.0	0.0	3.1	0.00	0.0	85.1	0.0	0.0	14.6	0.00
JAN	0.0	98.5	0.0	0.0	1.5	0.00	0.0	99.8	0.0	0.0	0.2	0.00	0.0	99.7	0.0	0.0	0.3	0.00
FEB	0.2	91.2	0.0	1.0	7.6	0.00	0.0	99.4	0.0	0.0	0.6	0.00	0.0	99.3	0.0	0.0	0.7	0.00
MAR	18.7	58.9	0.0	21.9	0.5	0.00	8.7	75.5	0.0	15.4	0.4	0.00	1.2	96.5	0.0	2.2	0.1	0.00
APR	63.8	16.9	0.2	17.4	1.7	0.00	45.3	35.7	0.1	18.5	0.4	0.00	19.0	72.3	0.1	7.7	0.9	0.00
MAY	74.7	8.5	0.0	12.1	4.7	0.00	57.1	26.9	0.0	14.7	1.4	0.00	26.5	63.5	0.0	6.8	3.2	0.00
JUN	86.3	0.9	0.0	4.2	8.7	0.00	78.7	8.5	0.0	6.6	6.2	0.00	52.5	35.6	0.0	4.4	7.6	0.00
JUL	89.7	0.1	0.0	1.5	8.6	0.02	90.3	1.8	0.0	2.7	5.2	0.01	72.5	18.6	0.0	2.2	6.7	0.01
AUG	90.7	0.0	0.0	2.0	7.2	0.03	88.9	2.4	0.0	4.0	4.6	0.02	65.3	25.9	0.0	2.9	5.8	0.01
SEP	83.3	3.0	0.0	8.0	5.7	0.00	68.3	17.3	0.0	10.1	4.3	0.00	36.5	53.5	0.0	5.4	4.6	0.00
1985																		
OCT	67.4	19.5	0.0	11.9	1.3	0.00	47.2	40.6	0.0	11.2	1.0	0.00	19.4	75.3	0.0	4.6	0.7	0.00
NOV	77.1	4.9	0.0	10.7	5.6	0.00	63.8	17.3	0.0	14.3	3.0	0.00	32.6	54.9	0.0	7.3	4.1	0.00
DEC	55.4	15.0	0.1	11.9	16.5	0.00	41.5	34.1	0.0	13.4	10.0	0.00	12.5	74.8	0.0	4.0	8.2	0.00
JAN	59.3	21.2	0.1	11.0	8.0	0.00	39.1	43.0	0.1	9.8	7.7	0.00	16.2	74.9	0.0	4.0	4.6	0.00
FEB	74.7	8.8	0.1	11.3	5.0	0.00	57.3	24.1	0.1	13.2	5.2	0.00	29.0	60.6	0.0	6.7	3.6	0.00
MAR	80.5	3.0	0.0	9.6	6.7	0.00	66.5	14.2	0.0	13.1	6.1	0.00	34.9	52.4	0.0	6.9	5.7	0.00
APR	87.5	2.2	0.0	9.1	1.1	0.00	73.0	13.1	0.0	12.9	1.0	0.00	43.7	47.8	0.0	7.7	0.9	0.00
MAY	89.8	0.9	0.0	5.0	4.3	0.01	80.4	10.4	0.0	7.8	1.4	0.01	50.5	41.2	0.0	4.9	3.3	0.00
JUN	90.4	0.1	0.0	1.4	8.0	0.07	88.3	3.9	0.0	2.3	5.5	0.04	66.0	25.0	0.0	1.7	7.2	0.03
JUL	89.8	0.0	0.0	0.4	9.3	0.47	89.8	3.0	0.0	0.6	6.1	0.32	65.5	26.6	0.0	0.5	7.2	0.23
AUG	89.2	0.1	0.0	0.4	8.5	1.94	88.8	3.8	0.0	0.7	5.4	1.28	60.5	31.9	0.0	0.4	6.3	0.87
SEP	90.8	0.1	0.0	1.0	5.9	2.25	90.0	3.5	0.0	1.7	3.4	1.41	64.2	29.3	0.0	1.2	4.3	1.01

Table B1−5. Continued

Water Year	CCWD Pump #1 (RMA Node No. 206) Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary	SWP Pump (RMA Node No. 193) Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary	CVP Pump (RMA Node No. 181) Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary
1986																		
OCT	94.6	0.3	0.0	1.9	1.7	1.57	87.8	7.2	0.0	2.6	1.3	0.97	56.9	39.4	0.0	1.7	1.4	0.63
NOV	92.5	0.5	0.0	3.1	1.4	0.76	84.5	8.7	0.0	4.1	0.6	0.45	53.4	41.4	0.0	2.6	1.0	0.29
DEC	80.2	0.6	0.0	4.0	13.8	0.11	75.5	7.9	0.0	6.4	8.9	0.06	40.2	44.2	0.0	3.4	11.3	0.03
JAN	77.1	0.9	0.0	8.1	12.9	0.01	67.8	7.9	0.0	12.7	10.5	0.00	38.1	41.8	0.0	7.2	12.2	0.00
FEB	5.6	5.7	0.0	3.3	82.0	0.00	0.2	86.5	0.0	0.1	12.4	0.00	0.0	79.3	0.0	0.0	20.2	0.00
MAR	0.0	75.8	0.0	0.0	23.5	0.00	0.0	98.1	0.0	0.0	1.6	0.00	0.0	92.0	0.0	0.0	7.8	0.00
APR	0.0	99.9	0.0	0.0	0.1	0.00	0.0	100.0	0.0	0.0	0.0	0.00	0.0	99.9	0.0	0.0	0.1	0.00
MAY	7.7	71.5	0.0	16.6	4.2	0.00	1.0	93.9	0.0	4.4	0.7	0.00	0.1	97.6	0.0	0.5	1.8	0.00
JUN	43.6	34.3	0.0	13.4	8.7	0.00	23.8	59.9	0.0	11.2	5.1	0.00	4.4	88.7	0.0	2.1	4.8	0.00
JUL	85.9	1.7	0.0	2.8	9.5	0.02	82.0	7.6	0.0	4.1	6.2	0.01	56.8	33.0	0.0	2.9	7.2	0.01
AUG	88.5	0.8	0.1	2.4	8.1	0.14	83.2	7.5	0.0	4.0	5.2	0.09	52.1	39.4	0.0	2.5	5.9	0.06
SEP	88.1	3.7	0.0	4.6	3.6	0.04	74.6	17.2	0.0	6.5	1.8	0.02	32.3	62.6	0.0	2.8	2.3	0.01
1987																		
OCT	80.9	7.2	0.0	8.3	3.6	0.00	64.8	23.0	0.0	10.4	1.8	0.00	32.0	60.8	0.0	5.1	2.1	0.00
NOV	85.3	4.4	0.0	8.2	2.1	0.00	69.7	18.5	0.0	10.7	1.1	0.00	38.4	54.3	0.0	5.9	1.5	0.00
DEC	82.2	9.5	0.0	7.9	0.1	0.00	63.2	27.5	0.0	8.9	0.2	0.00	29.7	65.9	0.0	4.2	0.1	0.00
JAN	87.0	3.8	0.0	6.5	1.3	0.00	72.9	17.3	0.0	8.1	0.3	0.00	45.1	47.9	0.0	5.0	1.0	0.00
FEB	63.0	3.9	0.0	6.2	24.9	0.00	56.0	15.0	0.0	7.9	19.1	0.00	30.6	42.4	0.0	4.3	21.3	0.00
MAR	51.2	14.7	0.0	11.8	20.8	0.00	32.7	37.4	0.0	10.3	18.2	0.00	7.5	76.1	0.0	2.4	13.5	0.00
APR	84.6	4.4	0.0	7.8	3.0	0.00	68.5	18.6	0.0	9.6	3.0	0.00	40.8	51.2	0.0	5.7	2.2	0.00
MAY	88.7	2.0	0.0	4.8	4.5	0.02	77.2	14.5	0.0	6.1	2.1	0.01	48.9	43.4	0.0	3.9	3.8	0.01
JUN	88.0	0.5	0.1	2.4	8.8	0.18	82.6	6.9	0.0	3.5	6.8	0.10	60.5	28.7	0.0	2.5	8.2	0.07
JUL	87.6	0.1	0.1	1.0	9.8	1.54	89.8	1.4	0.1	1.6	6.1	1.05	74.5	15.6	0.1	1.4	7.6	0.87
AUG	88.0	0.0	0.1	0.9	8.2	2.85	90.0	1.4	0.1	1.8	4.9	1.94	72.5	18.1	0.1	1.5	6.3	1.56
SEP	89.3	0.0	0.1	1.0	5.9	3.92	90.1	2.0	0.1	1.9	3.5	2.63	69.3	22.7	0.1	1.4	4.6	2.02
1988																		
OCT	94.4	0.0	0.0	1.4	2.3	2.01	91.6	3.3	0.0	2.2	1.6	1.31	70.8	24.5	0.0	1.7	2.0	1.00
NOV	96.2	0.2	0.0	1.6	0.5	1.00	89.4	6.4	0.0	2.2	0.9	0.64	65.0	31.9	0.0	1.6	0.6	0.46
DEC	90.0	0.1	0.0	1.2	6.8	0.29	89.5	3.3	0.0	1.9	3.6	0.17	62.5	28.4	0.0	1.3	6.3	0.12
JAN	79.8	0.0	1.8	1.5	15.3	0.08	80.7	3.2	1.6	2.4	10.7	0.05	50.2	31.7	1.0	1.5	14.5	0.03
FEB	95.2	0.0	1.7	1.2	1.4	0.07	92.1	2.3	1.3	2.2	1.8	0.04	65.1	30.5	0.9	1.6	1.6	0.03
MAR	95.5	0.2	0.6	2.3	1.2	0.23	88.4	6.3	0.4	3.3	1.3	0.14	55.6	40.7	0.3	2.1	1.2	0.09
APR	95.4	0.3	0.1	2.4	1.7	0.08	89.1	6.8	0.1	3.4	0.5	0.05	58.1	38.3	0.1	2.2	1.3	0.03
MAY	94.1	0.4	0.1	1.9	3.5	0.05	88.7	7.8	0.0	2.7	0.8	0.03	59.1	36.5	0.0	1.8	2.6	0.02
JUN	90.8	0.1	0.1	1.1	7.6	0.26	88.5	4.6	0.1	1.7	4.9	0.16	66.2	25.8	0.0	1.3	6.6	0.12
JUL	88.6	0.0	0.1	0.4	9.6	1.33	91.1	1.1	0.1	0.8	6.1	0.91	79.8	11.0	0.1	0.7	7.7	0.80
AUG	88.7	0.0	0.1	0.4	8.1	2.86	90.7	1.5	0.1	0.8	5.2	1.90	74.6	16.7	0.1	0.6	6.5	1.56
SEP	90.4	0.0	0.1	0.5	5.9	3.34	91.6	1.8	0.1	0.9	3.6	2.18	74.0	18.9	0.1	0.7	4.7	1.76

Table B1–5. Continued

Water Year	CCWD Pump #1 (RMA Node No. 206) Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary	SWP Pump (RMA Node No. 193) Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary	CVP Pump (RMA Node No. 181) Sac. R.	SJR	Yolo Bypass	Eastside Streams	Ag. Drains	Benicia Boundary
1989																		
OCT	94.4	0.0	0.0	0.5	3.2	2.00	92.8	2.8	0.0	0.8	2.3	1.34	74.4	20.9	0.0	0.6	3.0	1.07
NOV	97.6	0.0	0.0	0.8	0.4	0.71	93.3	3.9	0.0	1.1	0.8	0.47	69.3	28.5	0.0	0.9	0.6	0.34
DEC	96.7	0.1	0.0	1.0	0.9	0.23	93.0	3.9	0.0	1.4	0.4	0.15	68.9	28.2	0.0	1.0	0.8	0.11
JAN	95.6	0.0	0.1	0.8	2.7	0.47	93.4	2.2	0.1	1.3	2.5	0.30	67.7	27.8	0.1	1.0	3.1	0.21
FEB	95.2	0.0	0.1	1.5	2.7	0.44	91.4	2.6	0.1	2.3	3.2	0.27	68.2	26.7	0.0	1.7	3.2	0.20
MAR	86.3	0.2	0.1	8.1	5.2	0.05	77.1	4.6	0.1	13.5	4.6	0.03	47.1	39.7	0.0	8.2	4.9	0.02
APR	95.0	0.1	0.3	3.4	1.2	0.02	88.4	3.8	0.3	6.8	0.7	0.01	56.2	38.4	0.2	4.3	0.9	0.01
MAY	90.8	0.3	0.0	4.3	4.6	0.00	84.0	7.0	0.0	7.3	1.6	0.00	55.6	36.0	0.0	4.8	3.5	0.00
JUN	90.4	0.1	0.0	1.1	8.4	0.02	88.1	3.8	0.0	2.0	6.1	0.01	70.1	20.6	0.0	1.5	7.7	0.01
JUL	90.6	0.0	0.1	0.2	8.9	0.28	93.3	0.8	0.0	0.4	5.3	0.19	82.4	9.9	0.0	0.4	7.1	0.17
AUG	91.6	0.0	0.1	0.2	7.2	0.98	94.2	0.7	0.1	0.5	3.9	0.65	81.9	11.3	0.0	0.4	5.9	0.55
SEP	97.1	0.0	0.1	0.7	1.6	0.67	96.0	1.6	0.0	1.2	0.7	0.41	72.8	24.7	0.0	0.9	1.3	0.31
1990																		
OCT	97.7	0.0	0.1	0.6	1.0	0.67	96.3	1.9	0.0	1.0	0.3	0.41	70.3	27.8	0.0	0.8	0.8	0.30
NOV	97.8	0.0	0.1	1.3	0.2	0.61	95.0	2.2	0.0	2.3	0.1	0.37	68.5	29.4	0.0	1.6	0.2	0.26
DEC	97.9	0.0	0.1	0.8	0.7	0.52	96.1	2.0	0.1	1.4	0.2	0.31	69.7	28.5	0.0	1.1	0.5	0.22
JAN	96.7	0.0	0.0	1.0	1.3	0.17	94.2	1.9	0.0	1.7	1.4	0.10	69.9	26.4	0.0	1.3	1.7	0.07
FEB	93.7	0.0	0.1	1.6	4.0	0.15	90.5	1.8	0.1	2.7	4.4	0.09	63.2	29.8	0.0	1.9	4.7	0.07
MAR	96.2	0.0	0.1	2.5	0.6	0.42	91.8	2.6	0.1	4.4	0.7	0.26	60.4	35.9	0.0	2.9	0.5	0.17
APR	95.7	0.0	0.1	1.8	1.9	0.45	94.1	1.8	0.1	3.3	0.4	0.28	71.6	23.9	0.0	2.8	1.4	0.21
MAY	93.5	0.1	0.0	4.6	1.7	0.11	86.0	7.5	0.0	5.6	0.8	0.10	64.4	29.5	0.0	4.3	1.7	0.07
JUN	89.8	0.1	0.0	2.7	7.3	0.04	88.0	3.4	0.0	4.3	4.2	0.03	77.4	13.0	0.0	3.6	5.9	0.03
JUL	89.3	0.0	0.0	0.6	9.7	0.38	91.5	0.8	0.0	0.9	6.5	0.25	84.3	6.5	0.0	0.8	8.1	0.23
AUG	90.3	0.0	0.0	0.6	8.4	0.69	91.8	1.2	0.0	0.9	5.6	0.48	80.7	10.6	0.0	0.8	7.5	0.42
SEP	92.3	0.0	0.0	0.8	5.8	1.04	92.4	1.5	0.0	1.3	4.0	0.69	80.3	12.4	0.0	1.1	5.5	0.60
1991																		
OCT	93.5	0.0	0.0	2.4	3.4	0.69	85.4	8.6	0.0	2.7	2.9	0.46	54.9	38.7	0.0	1.7	4.4	0.30
NOV	94.1	0.1	0.0	3.5	2.0	0.40	85.1	8.9	0.0	4.1	1.6	0.25	55.2	39.6	0.0	2.7	2.3	0.16
DEC	97.4	0.2	0.0	1.6	0.2	0.20	91.1	5.7	0.0	2.3	0.4	0.13	66.2	31.4	0.0	1.7	0.3	0.09
JAN	98.5	0.1	0.0	1.0	0.1	0.15	92.5	5.8	0.0	1.4	0.2	0.09	66.4	32.4	0.0	1.0	0.1	0.07
FEB	98.0	0.1	0.0	1.1	0.1	0.20	93.1	4.7	0.0	1.5	0.1	0.12	74.0	24.2	0.0	1.2	0.1	0.10
MAR	78.0	0.2	0.6	6.6	12.9	0.09	72.1	5.1	0.4	11.3	9.6	0.06	41.8	38.7	0.3	6.6	11.7	0.03
APR	92.3	0.1	0.6	4.9	1.9	0.03	85.6	3.8	0.4	8.1	1.7	0.02	59.7	32.4	0.3	5.7	1.7	0.01
MAY	87.2	0.2	0.2	7.0	5.1	0.05	77.8	10.1	0.2	9.8	1.9	0.02	55.7	32.5	0.2	7.0	4.5	0.02
JUN	86.3	0.3	0.1	6.2	7.1	0.06	81.2	4.1	0.1	9.4	5.3	0.03	73.1	10.6	0.1	8.4	7.8	0.03
JUL	86.0	0.0	0.1	1.7	12.0	0.20	87.9	0.3	0.0	2.8	8.8	0.11	86.1	0.7	0.0	2.7	10.3	0.11
AUG	88.0	0.0	0.1	0.9	10.2	0.80	90.4	0.5	0.1	1.3	7.2	0.52	86.5	2.6	0.0	1.3	9.0	0.49
SEP	90.7	0.0	0.0	1.3	7.1	0.88	91.3	1.3	0.0	1.8	5.0	0.59	82.8	8.0	0.0	1.7	6.9	0.53

Table B1-6. Impact Variables Selected for Assessment of
DW Project Operation Effects on Delta Hydrodynamics

Impact Variable	Method of Analysis and Assessment	Locations for Assessment	EIR/EIS Chapter
Tidal Hydraulics	RMA model for maximum diversion and discharge	Channels adjacent to DW islands	3B
Delta export	70-year simulation of export using DeltaSOS	CCWD Rock Slough SWP Banks CVP Tracy	3A
Delta outflow	70-year simulation of outflow using DeltaSOS	Chipps Island	3C and 3F
Delta channel flow	70-year simulations using DeltaSOS	San Joaquin River at Antioch Threemile Slough Old River at Bacon Island (represents Middle River at Bacon Island)	3B

Table B1–7. Summary of Typical Net Delta Channel Flows during Periods of Maximum DW Diversion of 9,000 cfs (4,500 cfs to Bacon Island and 4,500 cfs to Webb Tract)

		Diversion Conditions					
Delta Channel Location	RMA Model Number	Base Flow (cfs)	Flow with Diversions (cfs)	Changed Flow (cfs)	Base Velocity (ft/sec)	Velocity with Diversions (ft/sec)	Changed Velocity (ft/sec)
CVP Tracy pumping		4,199	4,199	(0)	1.07	1.07	0.00
SWP Banks pumping		8,344	8,345	0	1.00	1.00	0.00
CCWD pumping		150	149	(0)	0.14	0.14	0.00
North Bay Aqueduct	406	(50)	(50)	0	(0.05)	(0.05)	(0.00)
Eastside streams		1,000	1,000	0			
Channel depletion		0	0	0			
Sacramento R. at Freeport		79,999	80,000	0	3.21	3.21	0.00
SJR Vernalis	1	5,000	4,999	(0)	2.03	2.03	0.00
SJR at head of Old River	8	1,630	1,638	8	1.10	1.12	0.02
SJR above Turner Cut	25	1,961	1,975	14	0.10	0.10	0.00
SJR above Columbia Cut	31	1,010	806	(204)	0.04	0.04	(0.01)
SJR above mouth of Middle River	37	2,009	1,718	(291)	0.09	0.08	(0.01)
SJR below Mokelumne	45	3,324	(2,690)	(6,014)	0.07	(0.03)	(0.10)
SJR at Jersey Point	49	20,109	14,354	(5,755)	(0.44)	(0.33)	0.11
SJR at Antioch	50	20,541	14,465	(6,077)	0.39	0.30	(0.10)
Head of Old River	54	3,369	3,361	(8)	2.43	2.45	0.02
Old River south of Tracy	80	339	326	(13)	0.16	0.16	(0.00)
Old River north of Clifton Court	83	(7,434)	(7,449)	(15)	(1.55)	(1.56)	(0.02)
Old River at Woodward Canal	92	(6,106)	(6,118)	(12)	(0.80)	(0.81)	(0.01)
Old River at Rock Slough	106	(4,980)	(4,925)	55	(0.41)	(0.41)	0.00
Mouth of Old River	124	(5,687)	(6,978)	(1,290)	0.28	0.35	0.07
Middle River at Victoria Canal	135	(3,069)	(3,065)	4	(0.71)	(0.72)	(0.01)
Middle River at Columbia Cut	159	(4,888)	(7,197)	(2,309)	(0.23)	(0.35)	(0.12)
Empire–Turner Cut	175	951	1,169	218	0.18	0.22	0.05
Grant Line Canal	213	2,999	3,006	(7)	(0.68)	(0.69)	(0.01)
Mouth of Rock Slough	244	575	566	(10)	0.18	0.19	0.00
Connection Slough	248	2,025	2,232	207	0.29	0.33	0.03
E. Santa Fe Cut	258	701	750	49	0.15	0.17	0.02
W. Santa Fe Cut	259	701	749	48	(0.18)	(0.20)	(0.02)
Dutch Slough	274	432	110	(323)	0.13	0.05	(0.07)
False River	279	2,278	(556)	(2,834)	(0.16)	(0.02)	0.15
Fishermans Cut	280	508	294	(214)	0.11	0.07	(0.03)
Threemile Slough	309	15,015	17,894	2,879	0.97	1.18	0.21
Little Connection	319	2,463	2,773	310	(0.23)	(0.26)	(0.03)
White Slough	322	(870)	(919)	(49)	(0.09)	(0.10)	(0.01)
Little Potato	324	4,157	4,222	64	0.80	0.82	0.02
Potato	327	825	530	(294)	0.05	0.03	(0.02)
Mokelumne Mouth	349	8,782	8,763	(19)	(0.61)	(0.62)	(0.01)
DCC	365	0	0	0	0.00	0.00	0.00
Georgiana Slough	366	12,220	12,265	45	(2.47)	(2.49)	(0.01)
Cache Creek at Yolo Bypass	404	(50)	(50)	(0)	(0.00)	(0.00)	(0.00)
Sacramento R. at Rio Vista	430	67,729	67,684	(45)	1.14	1.15	0.00
Sacramento R. at Collinsville	435	52,403	49,454	(2,949)	0.78	0.74	(0.04)
Chipps Island	437	70,357	61,577	(8,780)	0.69	0.61	(0.08)
Roe Island	439	37,582	33,570	(4,012)	0.47	0.43	(0.04)
Benicia	441	73,252	64,255	(8,997)	0.47	0.42	(0.05)
Montezuma Slough	461	2,896	2,678	(218)	0.65	0.61	(0.04)

Notes: This table presents results for the analysis of the maximum diversion rate typical only of the first several days of filling an empty reservoir under maximum tidal conditions. Negative values shown in parentheses.

C-061549

Table B1–8. Summary of Typical Net Delta Channel Flows during Periods of Maximum DW Discharge of 6,000 cfs (4,000 cfs from Bacon Island and 2,000 cfs from Webb Tract)

		Discharge Conditions					
Delta Channel Location	RMA Model Number	Base Flow (cfs)	Flow with Discharges (cfs)	Changed Flow (cfs)	Base Velocity (ft/sec)	Velocity with Discharges (ft/sec)	Changed Velocity (ft/sec)
CVP Tracy pumping		2,500	4,600	2,100	1.07	2.11	1.04
SWP Banks pumping		2,502	6,402	3,900	1.00	2.84	1.83
CCWD pumping		150	150	0	0.14	0.14	0.00
North Bay Aqueduct	406	(50)	(50)	(0)	(0.05)	(0.05)	0.00
Eastside streams		250	250	0			
Channel depletion		3,000	3,000	0			
Sacramento R. at Freeport		19,998	19,998	(0)	1.49	1.49	(0.00)
SJR at Vernalis	1	999	999	0	0.77	0.80	0.03
SJR at head of Old River	8	1	(275)	(276)	0.01	(0.22)	(0.23)
SJR above Turner Cut	25	(85)	(355)	(270)	(0.00)	(0.02)	(0.02)
SJR above Columbia Cut	31	(587)	(904)	(317)	(0.02)	(0.03)	(0.01)
SJR above mouth of Middle River	37	635	449	(186)	0.03	0.02	(0.01)
SJR below Mokelumne	45	1,414	1,422	8	0.04	0.04	(0.00)
SJR at Jersey Point	49	3,896	3,961	65	(0.13)	(0.13)	(0.00)
SJR at Antioch	50	3,981	4,052	71	0.12	0.13	0.00
Head of Old River	54	813	1,089	276	0.78	1.05	0.27
Old River south of Tracy	80	(38)	(7)	31	0.00	0.01	0.01
Old River north of Clifton Court	83	(3,833)	(8,484)	(4,651)	(0.78)	(1.79)	(1.02)
Old River at Woodward Canal	92	(3,230)	(7,049)	(3,819)	(0.41)	(0.93)	(0.53)
Old River at Rock Slough	106	(2,814)	(4,174)	(1,359)	(0.22)	(0.34)	(0.12)
Mouth of Old River	124	(3,270)	(2,486)	785	0.16	0.12	(0.04)
Middle River at Victoria Canal	135	(1,701)	(3,605)	(1,904)	(0.38)	(0.86)	(0.48)
Middle River at Columbia Cut	159	(2,917)	(3,390)	(474)	(0.13)	(0.16)	(0.03)
Empire–Turner Cut	175	441	488	47	0.07	0.09	0.01
Grant Line Canal	213	421	678	257	(0.13)	(0.18)	(0.06)
Mouth of Rock Slough	244	454	630	176	0.15	0.21	0.06
Connection Slough	248	1,153	1,526	373	0.16	0.22	0.06
E. Santa Fe Cut	258	435	(1,521)	(1,956)	0.08	(0.43)	(0.51)
W. Santa Fe Cut	259	433	2,478	2,044	(0.10)	(0.75)	(0.66)
Dutch Slough	274	122	128	6	0.06	0.06	0.00
False River	279	1,026	1,071	45	(0.10)	(0.10)	0.00
Fishermans Cut	280	61	45	(17)	0.03	0.03	(0.00)
Threemile Slough	309	1,592	1,579	12	(0.02)	(0.02)	(0.00)
Little Connection	319	1,842	1,945	(102)	(0.17)	(0.18)	(0.01)
White Slough	322	(739)	(751)	(12)	(0.08)	(0.08)	(0.00)
Little Potato	324	3,060	3,079	19	0.59	0.60	0.00
Potato	327	470	378	(92)	0.03	0.02	(0.00)
Mokelumne Mouth	349	5,408	5,403	5	(0.38)	(0.38)	0.00
DCC	365	5,810	5,806	3	(1.19)	(1.19)	0.00
Georgiana Slough	366	2,836	2,837	(1)	(0.78)	(0.78)	0.00
Cache Creek at Yolo Bypass	404	(268)	(268)	0	(0.02)	(0.02)	0.00
Sac. R. at Rio Vista	430	10,266	10,268	2	0.19	0.19	0.00
Sac. R. at Collinsville	435	8,413	8,426	13	0.17	0.17	0.00
Chipps Island	437	12,433	12,515	82	0.18	0.18	0.00
Roe Island	439	10,764	10,794	30	0.19	0.19	(0.00)
Benicia	441	12,220	12,292	72	0.14	0.14	0.00
Montezuma Slough	461	47	48	1	0.10	0.10	(0.00)

Notes: This table presents results for the analysis of the maximum diversion rate typical only of the first several days of filling an empty reservoir under maximum tidal conditions. Negative values shown in parentheses.

Table B1–9. Simulated Stage Differences during Periods of Maximum DW Diversion (9,000 cfs) and Maximum DW Discharge (6,000 cfs) at Selected Nodes of the RMA Delta Hydrodynamic Model

	Simulated Stage Differences with Maximum DW Diversion (ft)										Simulated Stage Differences with Maximum DW Discharge (ft)								
Channel Location	RMA Model Node	Base Mean Stage	Diversion Mean Stage	Change	Base Min Stage	Diversion Min Stage	Change	Base Max Stage	Diversion Max Stage	Change	Base Mean Stage	Discharge Mean Stage	Change	Base Min Stage	Discharge Min Stage	Change	Base Max Stage	Discharge Max Stage	Change
SJR at Vernalis	1	7.07	7.05	−0.02	6.98	6.97	−0.01	7.21	7.18	−0.03	1.62	1.36	−0.25	0.99	0.88	−0.11	2.69	2.28	−0.40
Head of Old River	8	2.41	2.31	−0.09	1.84	1.77	−0.07	3.32	3.18	−0.13	0.66	0.33	−0.33	−0.52	−0.72	−0.20	2.19	1.67	−0.52
SJR at Stockton	15	0.96	0.81	−0.14	−0.73	−0.89	−0.16	3.06	2.92	−0.14	0.58	0.54	−0.04	−1.44	−1.50	−0.06	2.89	2.89	−0.00
SJR at Turner Cut	26	0.73	0.57	−0.15	−1.30	−1.48	−0.19	2.95	2.82	−0.14	0.54	0.53	−0.00	−1.68	−1.69	−0.00	2.87	2.89	0.02
SJR at Columbia Cut	31	0.72	0.57	−0.15	−1.22	−1.40	−0.17	2.87	2.74	−0.13	0.54	0.53	−0.00	−1.59	−1.59	−0.00	2.82	2.83	0.01
SJR at mouth of Middle River	35	0.72	0.57	−0.15	−1.14	−1.34	−0.20	2.76	2.64	−0.12	0.54	0.53	−0.00	−1.54	−1.54	−0.01	2.78	2.79	0.01
Mouth of Old River	38	0.72	0.57	−0.15	−1.12	−1.31	−0.19	2.70	2.56	−0.14	0.54	0.53	−0.00	−1.51	−1.52	−0.00	2.74	2.75	0.01
Mokelumne River mouth	40	0.72	0.57	−0.15	−1.10	−1.29	−0.19	2.69	2.55	−0.14	0.54	0.54	−0.00	−1.49	−1.49	−0.00	2.71	2.73	0.01
False River mouth	44	0.65	0.56	−0.09	−1.44	−1.55	−0.11	2.77	2.70	−0.06	0.46	0.46	−0.00	−1.91	−1.91	−0.00	2.75	2.75	−0.00
Head of Middle River	52	0.98	0.85	−0.14	−0.09	−0.20	−0.11	2.46	2.30	−0.15	0.38	−0.06	−0.44	−1.37	−1.63	−0.27	2.38	1.76	−0.62
Old River at Tracy	65	0.21	0.05	−0.16	−1.26	−1.40	−0.14	2.10	1.91	−0.19	0.19	−0.29	−0.48	−1.68	−1.96	−0.27	2.40	1.77	−0.63
Old River at DMC	70	−0.03	−0.20	−0.18	−1.78	−1.98	−0.20	1.95	1.77	−0.18	0.14	−0.36	−0.50	−1.92	−2.23	−0.31	2.34	1.66	−0.67
Clifton Court gates	73	0.06	−0.11	−0.17	−1.72	−1.91	−0.19	1.97	1.80	−0.17	0.19	−0.23	−0.42	−1.89	−2.14	−0.25	2.41	1.83	−0.59
Old River at Victoria	82	0.49	0.32	−0.17	−1.45	−1.65	−0.21	2.52	2.35	−0.17	0.42	0.31	−0.11	−1.67	−1.82	−0.15	2.68	2.58	−0.10
Old River at Rock Slough	93	0.65	0.49	−0.17	−1.31	−1.50	−0.18	2.79	2.64	−0.15	0.50	0.48	−0.02	−1.65	−1.68	−0.03	2.77	2.77	0.00
Mouth of Old River	103	0.71	0.56	−0.15	−1.13	−1.33	−0.20	2.70	2.55	−0.15	0.53	0.53	−0.00	−1.53	−1.53	−0.00	2.73	2.75	0.01
Mouth of Middle River	108	0.37	0.21	−0.16	−1.46	−1.63	−0.17	2.35	2.17	−0.18	0.24	0.02	−0.22	−1.84	−1.99	−0.14	2.59	2.29	−0.30
Middle River at Victoria Canal	113	0.32	0.15	−0.17	−1.54	−1.71	−0.18	2.33	2.17	−0.16	0.31	0.09	−0.22	−1.79	−1.93	−0.14	2.54	2.28	−0.26
Mouth of Columbia	133	0.72	0.56	−0.16	−1.21	−1.38	−0.17	2.84	2.71	−0.13	0.54	0.53	−0.00	−1.57	−1.58	−0.00	2.81	2.82	0.01
Turner Cut	142	0.71	0.56	−0.16	−1.33	−1.52	−0.19	2.97	2.83	−0.14	0.53	0.53	−0.00	−1.72	−1.73	−0.01	2.90	2.92	0.02
Tom Paine Slough	160	2.04	1.88	−0.16	2.04	1.88	−0.16	2.04	1.88	−0.16	0.45	−0.09	−0.53	0.03	−0.59	−0.61	0.91	0.41	−0.49
Grant Line Canal	175	0.16	−0.00	−0.17	−1.36	−1.52	−0.16	2.07	1.89	−0.18	0.20	−0.28	−0.48	−1.74	−2.01	−0.27	2.35	1.74	−0.61
Victoria Canal	185	0.18	0.01	−0.17	−1.69	−1.88	−0.19	2.13	1.96	−0.18	0.25	−0.08	−0.33	−1.89	−2.10	−0.21	2.52	2.09	−0.43
Connection Slough	208	0.69	0.53	−0.16	−1.21	−1.38	−0.17	2.79	2.66	−0.13	0.52	0.52	−0.01	−1.56	−1.57	−0.01	2.77	2.78	0.01
Dutch Slough	222	0.70	0.56	−0.14	−1.19	−1.35	−0.17	2.62	2.51	−0.11	0.53	0.53	−0.00	−1.57	−1.58	−0.00	2.61	2.62	0.01
False River	226	0.68	0.57	−0.12	−1.20	−1.35	−0.16	2.63	2.53	−0.10	0.50	0.50	−0.00	−1.64	−1.64	−0.00	2.60	2.60	0.00
Franks Tract	232	0.71	0.56	−0.15	−1.15	−1.34	−0.19	2.69	2.55	−0.14	0.53	0.53	−0.00	−1.54	−1.54	−0.00	2.73	2.74	0.01
S. Mokelumne River	268	0.85	0.71	−0.14	−1.06	−1.23	−0.17	2.93	2.80	−0.13	0.61	0.61	−0.00	−1.53	−1.53	−0.00	2.85	2.86	0.01
N. Mokelumne River	285	0.91	0.76	−0.14	−0.97	−1.14	−0.17	2.92	2.79	−0.13	0.73	0.73	−0.00	−1.32	−1.32	−0.00	2.88	2.89	0.01
Georgiana Slough	295	2.25	2.15	−0.10	0.92	0.82	−0.11	3.78	3.68	−0.10	0.72	0.72	−0.00	−1.30	−1.30	−0.00	2.87	2.88	0.01
Sacramento R. at DCC	342	7.88	7.86	−0.02	7.48	7.46	−0.02	8.39	8.38	−0.02	1.30	1.30	−0.00	−0.39	−0.39	−0.00	3.31	3.31	0.00
Sacramento R. at Threemile Slough	352	0.84	0.78	−0.06	−1.41	−1.49	−0.08	3.22	3.20	−0.01	0.46	0.46	0.00	−2.14	−2.15	−0.00	2.97	2.96	−0.01
Sacramento R. at Benicia	361	−0.11	−0.11	0.00	−3.69	−3.69	0.00	2.81	2.81	0.00	0.03	0.03	0.00	−3.74	−3.74	0.00	3.14	3.14	0.00

Table B1–10. Simulated Monthly Delta Channel Flows (cfs) and Exports (cfs) under the No–Project Alternative for 1968–1991

Water Year	Sac. R. at Freeport	Yolo Bypass	SJR at Vernalis	Eastside Streams	Channel Depletion	Total Exports	DCC & Georgiana	Sac. R. at Rio Vista	Threemile Slough	Head of Old R.	Final QWEST	SJR at Antioch	Old R. & Middle R.	Total Outflow
1968														
OCT	23,545	98	3,342	716	1,372	11,280	9,390	13,910	2,910	167	1,062	3,972	(11,876)	14,835
NOV	17,983	34	2,072	218	854	11,280	3,499	14,304	5,287	1,756	(6,229)	(942)	(10,048)	7,990
DEC	16,174	33	2,460	342	854	11,298	3,273	12,721	4,822	1,986	(5,923)	(1,102)	(9,799)	6,712
JAN	28,229	1,025	2,483	553	(985)	11,699	4,818	24,682	6,796	2,000	(3,326)	3,470	(9,427)	21,455
FEB	61,379	6,050	2,866	1,747	(286)	11,826	9,526	57,974	12,763	2,219	2,396	15,160	(9,595)	60,399
MAR	34,432	2,618	2,280	1,285	88	11,268	5,653	31,375	8,005	1,881	(2,206)	5,799	(9,521)	29,160
APR	12,159	134	3,669	622	1,483	4,666	2,773	9,150	1,718	183	1,324	3,042	(5,186)	10,325
MAY	10,609	211	3,580	439	2,354	3,869	2,578	7,653	1,734	179	161	1,895	(4,852)	7,579
JUN	14,457	303	1,827	336	3,878	5,923	7,019	6,771	1,435	1,606	457	1,892	(6,149)	6,841
JUL	21,061	455	1,675	342	4,211	11,280	8,773	11,690	3,834	1,510	(3,538)	296	(11,765)	7,731
AUG	13,673	504	1,021	309	2,373	7,537	6,787	6,797	1,992	1,055	(1,301)	691	(7,769)	5,259
SEP	11,372	303	1,091	269	1,928	6,685	6,046	5,147	1,449	1,109	(796)	653	(6,611)	4,158
1969														
OCT	13,932	146	1,527	114	1,274	9,074	6,864	6,895	2,112	76	(1,611)	501	(9,721)	5,157
NOV	12,473	101	2,213	319	703	8,545	2,812	9,586	3,438	1,841	(3,841)	(403)	(7,168)	5,675
DEC	22,663	488	1,823	732	382	11,190	4,093	18,963	5,967	1,604	(4,936)	1,032	(9,884)	13,989
JAN	72,606	38,886	4,380	8,799	(4,644)	12,325	11,224	101,429	18,951	3,058	14,975	33,926	(7,531)	116,869
FEB	67,092	44,061	18,427	9,543	(3,527)	12,700	10,385	101,649	14,969	10,853	27,845	42,814	(539)	129,847
MAR	43,846	9,091	8,065	3,236	511	11,700	6,966	45,844	8,764	5,058	6,135	14,899	(6,945)	51,928
APR	43,157	739	8,111	3,479	1,214	9,950	6,868	36,725	6,176	406	7,609	13,785	(10,140)	44,212
MAY	44,408	325	21,183	3,724	2,321	11,280	7,045	37,107	2,713	12,441	18,944	21,657	13	55,819
JUN	24,948	387	14,091	1,193	3,861	11,280	9,735	14,634	(20)	8,392	10,949	10,929	(4,713)	25,197
JUL	12,587	455	5,701	358	4,211	6,577	6,450	5,539	388	3,775	2,884	3,271	(4,797)	8,002
AUG	11,644	439	1,989	309	2,943	5,359	6,140	5,208	955	1,706	828	1,782	(5,168)	5,741
SEP	23,339	319	2,814	303	1,861	11,280	9,339	13,854	3,323	2,190	(298)	3,025	(10,099)	13,370
1970														
OCT	21,825	114	7,649	634	1,047	11,280	8,964	12,713	1,374	382	5,072	6,446	(11,530)	17,681
NOV	18,756	50	4,023	185	854	11,280	3,596	14,996	4,816	2,863	(4,214)	603	(8,942)	10,697
DEC	51,679	6,099	4,136	911	106	11,583	8,093	49,658	11,155	2,925	1,343	12,498	(8,846)	50,991
JAN	91,517	92,816	11,305	9,969	(4,384)	12,700	14,157	171,272	31,946	6,838	25,459	57,405	(4,230)	197,170
FEB	56,215	29,422	7,638	2,773	(106)	12,700	8,759	76,905	15,910	4,826	6,436	22,346	(7,935)	83,351
MAR	33,273	2,879	3,420	2,814	495	11,461	5,495	30,533	7,166	2,530	(153)	7,012	(9,228)	30,331
APR	13,131	101	5,343	655	1,550	5,991	2,894	9,950	1,761	267	1,784	3,544	(6,454)	11,579
MAY	10,290	472	5,220	618	2,484	5,086	2,538	7,603	1,702	261	224	1,926	(6,039)	7,579
JUN	14,734	504	2,297	370	3,777	6,267	7,099	7,195	1,438	1,891	763	2,201	(6,168)	7,580
JUL	22,569	537	1,721	342	4,211	11,280	9,149	12,905	3,985	1,540	(3,116)	868	(11,736)	9,367
AUG	12,891	472	1,674	309	2,943	6,324	6,546	6,081	1,432	1,510	(46)	1,386	(6,330)	5,741
SEP	10,674	319	1,294	269	1,894	6,526	5,799	4,721	1,307	1,256	(659)	648	(6,292)	3,872

C — 0 6 1 5 5 2

Table B1-10. Continued

Water Year	Sac. R. at Freeport	Yolo Bypass	SJR at Vernalis	Eastside Streams	Channel Depletion	Total Exports	DCC & Georgiana	Sac. R. at Rio Vista	Threemile Slough	Head of Old R.	Final QWEST	SJR at Antioch	Old R. & Middle R.	Total Outflow
1971														
OCT	13,625	98	1,737	114	1,242	9,055	6,772	6,640	2,003	87	(1,453)	550	(9,679)	5,063
NOV	22,080	908	2,676	1,042	(37)	11,280	4,018	18,979	5,585	2,111	(3,703)	1,882	(9,337)	15,280
DEC	59,077	8,636	2,794	3,773	(1,716)	11,355	9,183	58,959	12,062	2,178	5,365	17,428	(8,635)	64,496
JAN	47,425	6,001	2,114	1,415	(562)	11,578	7,477	46,089	10,846	1,782	(327)	10,519	(9,692)	45,818
FEB	28,709	450	2,281	864	398	9,028	4,882	24,178	6,063	1,881	(1,363)	4,700	(7,409)	22,775
MAR	50,628	1,431	2,280	1,236	430	11,268	7,940	44,011	10,319	1,881	(190)	10,129	(9,658)	43,778
APR	19,323	118	3,988	992	1,382	6,650	3,668	15,428	3,286	199	989	4,276	(7,113)	16,279
MAY	31,190	358	3,933	862	1,931	8,380	5,213	25,852	5,978	197	153	6,131	(9,176)	25,812
JUN	22,755	235	2,281	521	3,794	9,027	9,195	12,847	2,925	1,881	222	3,147	(8,945)	12,690
JUL	22,883	309	1,724	342	4,211	11,280	9,226	12,913	3,961	1,541	(3,036)	926	(11,734)	9,456
AUG	13,337	325	1,690	309	2,943	6,639	6,685	6,242	1,520	1,520	(206)	1,313	(6,634)	5,741
SEP	16,509	252	1,247	269	1,911	10,062	7,595	8,689	2,796	1,223	(2,458)	338	(9,867)	6,040
1972														
OCT	18,767	98	2,000	260	1,356	11,280	8,191	10,335	3,012	100	(1,924)	1,088	(11,936)	8,275
NOV	16,451	34	1,901	269	871	11,116	3,307	12,960	5,023	1,652	(6,388)	(1,365)	(9,995)	6,485
DEC	21,067	211	1,911	1,057	415	11,205	3,889	17,286	5,522	1,658	(4,763)	759	(9,858)	12,481
JAN	18,239	49	2,086	390	(204)	11,568	3,531	14,808	5,191	1,765	(5,550)	(358)	(9,843)	9,279
FEB	25,328	54	2,281	828	200	9,972	4,437	20,895	5,704	1,881	(2,659)	3,045	(8,274)	18,216
MAR	32,274	81	2,280	472	1,113	11,268	5,359	26,717	7,475	1,881	(3,979)	3,496	(9,931)	22,627
APR	11,474	118	3,669	790	1,550	4,580	2,687	8,518	1,532	183	1,448	2,980	(5,127)	9,811
MAY	10,598	358	2,763	602	2,598	3,924	2,577	7,730	1,768	138	109	1,877	(5,045)	7,579
JUN	14,216	387	1,812	353	3,777	5,869	6,948	6,710	1,405	1,597	509	1,913	(6,064)	6,841
JUL	20,984	634	1,674	358	4,211	11,280	8,754	11,811	3,863	1,510	(3,542)	321	(11,766)	7,848
AUG	19,341	748	989	309	2,943	11,280	8,338	11,015	3,788	1,030	(3,895)	(106)	(11,765)	6,826
SEP	10,516	420	1,787	235	1,609	7,294	5,741	4,793	1,381	1,581	(841)	540	(6,620)	3,791
1973														
OCT	14,964	163	1,508	98	786	10,115	7,165	7,765	2,459	75	(2,069)	390	(10,568)	5,618
NOV	22,305	723	2,560	538	(490)	11,280	4,047	19,104	5,707	2,044	(4,000)	1,707	(9,223)	15,153
DEC	27,226	651	1,831	439	(203)	11,191	4,686	23,242	6,749	1,609	(4,249)	2,501	(9,646)	19,014
JAN	46,559	26,119	1,979	4,147	(5,246)	11,533	7,353	66,637	13,893	1,700	5,235	19,128	(7,856)	72,396
FEB	71,663	17,016	4,197	6,464	(3,005)	12,265	11,080	78,350	14,714	2,958	11,326	26,041	(8,208)	89,977
MAR	45,792	10,734	6,685	4,001	(221)	11,700	7,243	49,338	9,535	4,308	6,274	15,809	(7,402)	55,634
APR	16,912	504	5,343	1,260	1,483	7,420	3,365	13,680	2,727	267	1,474	4,201	(7,856)	15,006
MAY	17,833	146	5,279	960	2,435	7,443	3,480	13,890	3,090	264	473	3,563	(8,374)	14,120
JUN	19,410	286	3,420	420	3,878	7,787	8,356	10,371	2,318	2,530	318	2,636	(7,089)	10,301
JUL	22,533	439	1,691	342	4,211	11,110	9,140	12,779	3,915	1,520	(2,985)	929	(11,585)	9,373
AUG	12,298	455	1,628	325	2,943	6,123	6,357	5,661	1,340	1,480	(64)	1,275	(6,158)	5,302
SEP	11,305	303	1,262	269	1,861	6,867	6,023	5,120	1,440	1,234	(786)	653	(6,642)	4,147

Table B1-10. Continued

Water Year	Sac. R. at Freeport	Yolo Bypass	SJR at Vernalis	Eastside Streams	Channel Depletion	Total Exports	DCC & Georgiana	Sac. R. at Rio Vista	Threemile Slough	Head of Old R.	Final QWEST	SJR at Antioch	Old R. & Middle R.	Total Outflow
1974														
OCT	14,977	49	1,500	1,106	900	10,863	7,169	7,632	2,383	75	(1,927)	456	(11,362)	5,615
NOV	57,052	9,445	2,459	1,697	131	11,280	8,883	57,582	12,956	1,986	1,491	14,446	(9,530)	59,059
DEC	60,493	9,482	2,441	3,269	(935)	11,295	9,394	60,815	12,838	1,975	4,272	17,109	(9,091)	65,180
JAN	78,775	49,164	3,390	5,123	(1,473)	11,999	12,172	116,135	24,088	2,514	9,523	33,610	(9,017)	125,805
FEB	42,016	5,096	3,422	864	326	12,009	6,706	40,324	9,817	2,531	(1,332)	8,486	(9,711)	38,960
MAR	97,768	8,847	3,423	4,147	(432)	11,462	15,142	91,581	17,766	2,532	11,431	29,197	(8,856)	103,056
APR	36,823	34,552	6,195	2,168	760	9,950	5,981	65,204	14,012	310	3,790	17,802	(10,054)	68,918
MAY	24,439	276	6,105	992	2,240	9,437	4,322	19,833	4,528	305	306	4,833	(10,248)	19,915
JUN	21,148	286	3,422	471	3,727	8,864	8,795	11,707	2,378	2,531	1,120	3,498	(8,105)	12,455
JUL	17,717	472	1,717	407	3,935	8,065	7,917	9,288	2,445	1,537	(892)	1,552	(8,413)	8,002
AUG	13,531	325	1,769	309	2,943	6,912	6,744	6,376	1,593	1,570	(341)	1,252	(6,857)	5,741
SEP	20,973	202	1,336	269	1,928	11,280	8,751	11,942	3,549	1,285	(2,441)	1,108	(11,030)	9,308
1975														
OCT	22,708	16	2,010	325	1,112	11,280	9,183	13,263	3,311	101	(699)	2,612	(11,838)	12,453
NOV	17,806	34	2,729	454	888	11,280	3,477	14,141	4,983	2,141	(5,380)	(398)	(9,677)	8,672
DEC	17,880	163	2,267	651	740	11,265	3,486	14,372	5,070	1,873	(5,487)	(417)	(9,833)	8,811
JAN	16,032	49	1,564	325	(107)	11,396	3,255	12,853	4,972	1,438	(6,303)	(1,332)	(10,036)	6,560
FEB	61,624	2,917	5,246	2,593	(1,402)	12,611	9,563	55,329	11,143	3,529	5,599	16,742	(8,625)	61,068
MAR	74,091	9,303	3,420	5,302	(1,148)	11,461	11,451	72,230	13,904	2,530	9,359	23,263	(8,571)	81,704
APR	21,535	1,109	6,195	1,546	1,147	9,203	3,948	18,409	3,780	310	1,631	5,411	(9,462)	19,925
MAY	32,215	228	6,105	1,578	2,289	9,950	5,351	26,519	5,750	305	1,377	7,127	(10,780)	27,667
JUN	24,875	387	3,422	1,143	3,861	10,439	9,717	14,579	3,069	2,531	1,052	4,121	(9,734)	15,246
JUL	19,683	569	1,747	374	4,130	9,669	8,426	10,794	3,180	1,556	(2,118)	1,062	(10,076)	8,263
AUG	12,690	325	1,792	276	2,764	6,240	6,483	5,841	1,306	1,584	176	1,483	(6,099)	5,741
SEP	18,106	168	1,850	269	1,928	11,280	8,019	9,773	3,111	1,621	(2,659)	453	(10,695)	6,921
1976														
OCT	22,960	114	2,000	569	835	11,280	9,245	13,620	3,245	100	(222)	3,022	(11,728)	13,314
NOV	20,504	0	2,796	252	938	11,280	3,817	16,452	5,467	2,180	(5,208)	260	(9,659)	11,151
DEC	15,624	65	2,186	195	984	10,586	3,204	12,239	4,666	1,825	(5,785)	(1,119)	(9,300)	6,355
JAN	13,398	16	1,007	114	72	8,477	2,927	10,469	3,881	1,045	(4,596)	(716)	(7,582)	5,865
FEB	19,051	18	1,088	252	452	9,184	3,633	15,323	5,016	1,107	(4,607)	408	(8,361)	10,670
MAR	15,023	179	1,740	309	1,272	6,038	3,130	11,754	3,330	1,552	(1,883)	1,447	(5,192)	9,744
APR	9,755	118	2,005	403	1,545	3,072	2,470	7,017	1,444	100	612	2,056	(3,769)	7,475
MAY	10,224	81	2,013	374	2,819	3,267	2,529	7,071	1,781	101	(423)	1,358	(4,534)	6,366
JUN	14,636	101	1,775	336	3,805	5,896	7,071	6,715	1,389	1,574	563	1,952	(6,094)	6,897
JUL	16,465	98	997	342	4,205	7,623	7,583	7,929	2,399	1,037	(1,759)	641	(8,592)	5,750
AUG	8,227	423	900	260	2,513	3,547	4,796	3,226	614	959	440	1,054	(3,867)	3,415
SEP	7,675	218	900	252	1,636	4,042	4,489	2,995	643	959	177	820	(4,017)	3,008

Table B1−10. Continued

Water Year	Sac. R. at Freeport	Yolo Bypass	SJR at Vernalis	Eastside Streams	Channel Depletion	Total Exports	DCC & Georgiana	Sac. R. at Rio Vista	Threemile Slough	Head of Old R.	Final QWEST	SJR at Antioch	Old R. & Middle R.	Total Outflow
1977														
OCT	8,134	49	1,558	163	1,237	5,434	4,752	3,122	730	78	(6)	724	(6,092)	2,992
NOV	11,087	17	1,549	67	883	6,432	2,638	8,245	2,845	1,429	(2,946)	(101)	(5,551)	5,211
DEC	18,098	33	1,091	98	899	11,058	3,514	14,393	5,585	1,109	(7,117)	(1,531)	(10,486)	7,186
JAN	8,254	49	1,029	98	(62)	4,844	2,276	6,042	1,892	1,062	(1,543)	349	(3,901)	4,505
FEB	13,432	36	1,310	72	538	6,067	2,932	10,402	3,135	1,267	(2,265)	870	(5,177)	8,083
MAR	10,289	114	1,562	179	852	4,198	2,538	7,652	1,994	1,437	(670)	1,324	(3,299)	6,897
APR	8,892	235	2,027	403	1,656	2,825	2,359	6,354	1,259	101	709	1,968	(3,565)	6,897
MAY	6,120	667	2,022	228	1,897	2,395	1,994	4,319	889	101	376	1,265	(3,293)	4,505
JUN	6,807	202	1,790	319	3,792	1,076	4,067	1,994	(283)	1,583	2,385	2,103	(1,260)	4,000
JUL	8,808	195	973	325	4,158	1,818	5,057	2,906	204	1,018	1,511	1,715	(2,787)	4,001
AUG	6,218	98	911	293	2,890	941	3,717	1,877	(135)	968	1,827	1,692	(1,403)	3,415
SEP	7,128	50	1,045	235	1,591	3,580	3,833	2,947	618	1,074	220	838	(3,421)	3,008
1978														
OCT	7,130	49	1,633	146	1,311	4,414	3,898	2,953	635	82	170	805	(5,098)	2,992
NOV	6,109	151	1,360	151	714	3,326	1,992	4,089	1,104	1,302	(481)	623	(2,504)	3,537
DEC	15,370	732	1,418	455	153	10,813	3,173	12,891	4,899	1,341	(6,044)	(1,145)	(9,710)	6,832
JAN	44,069	14,361	2,880	3,220	(4,986)	11,830	6,997	52,679	10,912	2,227	4,365	15,277	(7,752)	57,543
FEB	50,420	6,896	4,668	2,197	(1,777)	12,420	7,910	49,850	10,571	3,215	3,348	13,919	(8,657)	53,376
MAR	47,850	16,816	3,580	2,732	(1,766)	11,489	7,538	57,569	12,351	2,619	3,411	15,762	(8,262)	61,156
APR	37,669	1,042	6,195	2,588	559	9,950	6,098	32,473	6,173	310	4,458	10,631	(9,974)	36,875
MAY	19,632	49	6,105	976	2,207	8,527	3,707	15,423	3,405	305	606	4,011	(9,284)	15,808
JUN	14,216	134	4,591	605	3,878	6,613	6,948	6,432	644	3,173	2,730	3,374	(5,272)	8,774
JUL	12,930	325	1,766	342	4,211	2,839	6,558	5,644	445	1,568	2,779	3,224	(3,266)	8,002
AUG	10,740	130	1,877	309	2,943	4,473	5,823	4,312	602	1,637	1,285	1,887	(4,351)	5,302
SEP	13,677	101	1,558	218	1,844	8,219	6,788	6,529	1,872	1,435	(1,118)	755	(7,786)	5,227
1979														
OCT	18,420	49	3,367	163	1,404	11,280	8,101	10,017	2,578	168	(776)	1,803	(11,887)	9,101
NOV	15,857	67	2,612	168	720	11,280	3,233	12,511	4,771	2,074	(5,918)	(1,147)	(9,677)	6,521
DEC	10,622	16	1,642	130	951	6,330	2,580	7,821	2,682	1,489	(2,741)	(59)	(5,366)	4,984
JAN	25,053	732	2,935	1,415	(2,140)	11,849	4,401	21,919	5,682	2,259	(1,827)	3,855	(8,855)	20,305
FEB	40,292	630	5,623	3,475	(2,375)	12,700	6,464	35,052	6,822	3,733	4,303	11,125	(8,120)	39,592
MAR	30,623	195	4,506	2,700	170	11,646	5,137	25,638	5,824	3,127	488	6,311	(8,687)	26,109
APR	16,639	50	5,343	958	1,248	7,240	3,331	13,046	2,580	267	1,471	4,051	(7,582)	14,392
MAY	15,506	65	5,279	1,057	2,272	7,039	3,190	11,813	2,506	264	790	3,296	(7,904)	12,376
JUN	20,505	67	3,420	437	3,878	8,099	8,634	10,969	2,463	2,530	301	2,764	(7,401)	10,882
JUL	17,624	195	1,682	342	4,162	8,865	7,893	8,886	2,687	1,515	(1,965)	723	(9,326)	6,505
AUG	11,156	49	1,621	309	2,943	5,186	5,971	4,498	903	1,476	464	1,367	(5,226)	4,668
SEP	9,951	50	1,437	269	1,928	6,118	5,527	3,992	1,057	1,354	(403)	654	(5,799)	3,397

Table B1–10. Continued

Water Year	Sac. R. at Freeport	Yolo Bypass	SJR at Vernalis	Eastside Streams	Channel Depletion	Total Exports	DCC & Georgiana	Sac. R. at Rio Vista	Threemile Slough	Head of Old R.	Final QWEST	SJR at Antioch	Old R. & Middle R.	Total Outflow
1980														
OCT	10,574	49	2,256	98	933	7,829	5,762	4,628	1,246	113	(533)	713	(8,303)	4,001
NOV	18,058	67	3,447	303	804	11,280	3,509	14,415	4,842	2,545	(4,727)	115	(9,239)	9,608
DEC	19,749	1,057	2,321	472	8	11,275	3,721	17,083	5,521	1,905	(4,910)	611	(9,518)	12,171
JAN	69,421	31,519	9,413	7,286	(2,627)	12,700	10,739	90,858	16,064	5,795	16,324	32,388	(5,975)	107,445
FEB	69,057	43,736	17,275	6,914	(3,527)	12,700	10,683	102,991	16,373	10,195	24,362	40,735	(1,198)	127,706
MAR	35,876	15,125	21,300	3,676	283	11,700	5,851	45,080	4,603	12,509	18,844	23,447	597	63,895
APR	16,641	50	6,195	992	1,214	8,064	3,331	13,056	2,556	310	1,555	4,111	(7,794)	14,490
MAY	13,874	390	6,105	764	2,142	6,516	2,987	10,742	1,963	305	1,727	3,690	(7,288)	12,255
JUN	12,244	403	4,184	555	3,844	5,682	6,339	5,347	426	2,951	2,617	3,043	(4,550)	7,579
JUL	12,732	309	2,163	358	4,016	3,233	6,496	5,541	395	1,811	2,863	3,257	(3,339)	8,002
AUG	10,987	228	1,932	309	2,943	4,873	5,911	4,568	742	1,671	1,028	1,771	(4,717)	5,302
SEP	14,383	50	3,371	269	1,928	10,445	6,997	6,954	2,036	2,503	(1,325)	711	(8,977)	5,436
1981														
OCT	17,237	49	4,023	455	1,388	11,280	7,790	9,149	2,173	201	(128)	2,045	(11,848)	8,882
NOV	14,220	34	3,656	403	938	11,130	3,030	10,990	4,077	2,661	(4,834)	(757)	(9,027)	6,062
DEC	16,221	98	3,051	244	821	11,399	3,279	12,835	4,717	2,324	(5,504)	(787)	(9,548)	7,249
JAN	25,220	455	2,876	667	(790)	11,829	4,423	21,449	6,088	2,225	(3,470)	2,617	(9,409)	18,058
FEB	28,023	576	3,225	342	200	11,258	4,791	23,758	6,520	2,422	(3,133)	3,387	(9,020)	20,605
MAR	32,372	146	2,704	1,496	(286)	11,340	5,373	27,217	6,871	2,127	(1,680)	5,191	(9,197)	25,565
APR	14,636	50	3,669	437	1,432	5,027	3,081	11,247	2,271	183	1,120	3,390	(5,526)	12,223
MAY	10,824	65	3,580	390	2,370	3,873	2,605	7,691	1,754	179	125	1,879	(4,862)	7,579
JUN	13,587	67	1,820	336	3,878	5,534	6,761	5,924	1,199	1,602	582	1,780	(5,764)	6,118
JUL	20,715	163	1,680	342	4,211	11,280	8,686	11,139	3,731	1,513	(3,620)	111	(11,762)	7,098
AUG	14,156	65	1,132	309	2,943	7,550	6,931	6,554	1,976	1,140	(1,429)	547	(7,926)	4,831
SEP	10,095	50	1,141	269	1,793	6,006	5,582	4,115	1,098	1,146	(443)	655	(5,841)	3,492
1982														
OCT	12,785	16	1,500	81	949	8,382	6,513	6,051	1,775	75	(1,163)	612	(8,901)	4,793
NOV	32,339	3,311	1,631	1,008	199	11,280	5,368	30,232	8,171	1,482	(3,585)	4,586	(10,061)	26,627
DEC	71,377	23,306	1,628	2,618	(415)	11,157	11,036	83,750	18,191	1,480	4,250	22,441	(9,656)	88,042
JAN	53,073	20,801	3,306	8,490	(4,303)	11,971	8,297	66,653	12,153	2,467	10,798	22,951	(7,904)	77,881
FEB	70,537	22,183	5,999	8,265	(664)	12,700	10,908	81,978	15,098	3,936	12,801	27,899	(8,601)	94,845
MAR	62,008	5,172	12,944	8,018	(2,758)	11,700	9,620	58,249	7,130	7,749	20,576	27,706	(2,946)	79,101
APR	78,803	36,502	23,396	12,806	172	11,280	12,176	103,086	12,473	13,728	36,876	49,350	2,269	139,945
MAY	35,743	374	19,251	5,042	2,207	11,280	5,832	29,733	1,543	11,326	17,191	18,734	(1,057)	46,703
JUN	22,539	67	7,492	2,235	3,777	11,280	9,141	12,520	1,398	4,746	4,852	6,250	(8,326)	16,995
JUL	15,018	146	4,614	1,334	4,211	8,588	7,181	6,931	1,148	3,185	1,492	2,640	(7,398)	8,002
AUG	13,802	49	2,508	846	2,943	8,123	6,826	6,290	1,527	2,014	(194)	1,333	(7,624)	5,801
SEP	23,119	17	5,180	588	1,272	11,280	9,285	13,533	2,314	3,493	2,682	4,996	(8,560)	16,088

C-061557

Table B1–10. Continued

Water Year	Sac. R. at Freeport	Yolo Bypass	SJR at Vernalis	Eastside Streams	Channel Depletion	Total Exports	DCC & Georgiana	Sac. R. at Rio Vista	Threemile Slough	Head of Old R.	Final QWEST	SJR at Antioch	Old R. & Middle R.	Total Outflow
1983														
OCT	29,962	98	12,173	1,285	884	11,280	5,049	24,790	3,761	7,319	6,438	10,199	(4,528)	31,140
NOV	40,150	1,647	8,422	4,302	(726)	11,280	6,444	35,534	5,721	5,253	8,177	13,898	(5,920)	43,784
DEC	58,262	10,620	18,514	9,921	(740)	11,700	9,062	60,005	5,798	10,903	26,133	31,931	(646)	86,212
JAN	57,238	20,882	21,391	10,165	(4,514)	12,700	8,910	70,338	6,813	12,562	30,579	37,392	1,546	101,369
FEB	82,605	58,627	35,143	14,045	(3,401)	12,700	12,765	129,317	14,049	20,705	51,361	65,409	9,262	181,018
MAR	87,187	113,503	42,741	19,923	(4,482)	11,700	13,478	188,332	22,824	25,321	67,257	90,080	15,315	256,037
APR	64,475	15,360	30,300	7,126	122	11,280	9,991	69,814	5,008	17,802	35,947	40,956	6,363	105,749
MAY	56,196	3,253	27,493	5,025	2,061	11,280	8,756	50,178	2,785	16,135	28,435	31,220	3,811	78,406
JUN	51,139	958	30,126	4,134	3,844	11,280	8,015	43,121	1,209	17,698	28,215	29,424	4,599	70,952
JUL	23,363	49	18,015	2,927	4,211	11,280	9,345	13,014	(1,968)	10,617	15,959	13,991	(2,658)	28,552
AUG	15,542	49	6,171	1,382	2,910	11,280	7,328	7,535	1,327	4,030	1,372	2,698	(8,752)	8,616
SEP	24,376	34	10,520	1,328	1,575	11,280	9,595	14,422	580	6,404	8,875	9,455	(5,770)	23,139
1984														
OCT	27,488	33	16,954	1,496	1,274	11,280	4,720	22,482	1,841	10,012	10,848	12,689	(1,992)	33,203
NOV	64,593	5,395	11,669	6,974	148	11,280	10,008	59,943	8,617	7,039	17,092	25,709	(4,483)	77,020
DEC	85,103	46,595	19,380	11,580	(1,895)	11,700	13,153	119,018	17,245	11,400	33,500	50,745	313	152,708
JAN	45,529	15,011	23,241	4,847	(155)	12,700	7,205	53,373	5,367	13,638	22,573	27,941	879	75,962
FEB	38,969	918	10,761	3,187	(124)	12,700	6,279	33,639	5,490	6,537	7,505	12,994	(6,217)	41,156
MAR	33,026	537	6,953	2,667	592	11,700	5,461	27,954	5,608	4,454	2,897	8,506	(7,582)	30,792
APR	14,102	118	5,343	1,378	1,466	6,881	3,015	10,839	1,965	267	1,792	3,757	(7,172)	12,484
MAY	12,536	81	5,220	960	2,451	6,484	2,820	9,184	2,307	261	(529)	1,778	(6,888)	8,411
JUN	15,378	67	2,819	773	3,861	6,663	7,282	7,197	1,232	2,193	1,421	2,653	(6,296)	8,232
JUL	21,356	81	1,768	667	4,211	10,505	8,847	11,537	3,401	1,569	(2,271)	1,130	(10,931)	8,845
AUG	12,137	49	1,960	716	2,926	5,857	6,304	5,150	924	1,688	883	1,807	(5,677)	5,741
SEP	15,062	50	2,221	723	1,911	10,243	7,193	7,441	2,240	1,846	(1,612)	628	(9,426)	5,638
1985														
OCT	17,217	1,382	2,765	634	965	11,280	7,785	10,573	2,758	138	(937)	1,821	(11,742)	9,539
NOV	34,863	1,059	3,636	941	(221)	11,280	5,712	30,266	7,378	2,650	(1,031)	6,347	(8,725)	29,257
DEC	26,254	33	4,576	1,106	122	11,658	4,558	21,698	5,573	3,165	(1,642)	3,931	(8,687)	20,044
JAN	14,297	146	3,332	374	(399)	11,797	3,039	11,504	4,221	2,481	(4,913)	(692)	(9,277)	6,630
FEB	19,640	198	2,692	1,008	(106)	8,238	3,708	16,157	4,037	2,120	(865)	3,173	(6,179)	15,303
MAR	17,774	16	2,349	1,025	(465)	7,407	3,473	14,433	3,476	1,921	(357)	3,119	(5,399)	14,123
APR	9,809	50	3,641	790	1,466	4,018	2,477	7,016	1,324	182	994	2,318	(4,532)	7,863
MAY	13,703	81	2,763	504	2,402	4,417	2,965	10,218	2,371	138	34	2,405	(5,460)	10,012
JUN	13,422	67	1,813	353	3,777	5,479	6,711	5,834	1,153	1,597	661	1,814	(5,674)	6,118
JUL	20,916	49	1,667	342	4,211	11,280	8,737	11,175	3,728	1,505	(3,582)	146	(11,770)	7,172
AUG	17,852	49	1,137	309	2,943	10,259	7,953	9,212	3,123	1,143	(3,111)	11	(10,631)	5,807
SEP	10,656	50	1,313	235	1,793	6,439	5,792	4,466	1,207	1,269	(528)	678	(6,151)	3,758

C — 0 6 1 5 5 7

Table B1−10. Continued

Water Year	Sac. R. at Freeport	Yolo Bypass	SJR at Vernalis	Eastside Streams	Channel Depletion	Total Exports	DCC & Georgiana	Sac. R. at Rio Vista	Threemile Slough	Head of Old R.	Final QWEST	SJR at Antioch	Old R. & Middle R.	Total Outflow
1986														
OCT	12,678	33	2,000	130	1,225	8,727	6,479	5,926	1,735	100	(1,128)	607	(9,331)	4,675
NOV	10,779	218	2,473	353	535	7,911	2,599	8,264	2,872	1,994	(3,016)	(145)	(6,314)	5,194
DEC	15,273	667	2,248	569	203	11,262	3,161	12,729	4,710	1,862	(5,561)	(851)	(9,627)	7,147
JAN	18,731	33	1,491	1,073	(1,408)	11,372	3,593	15,523	5,004	1,390	(4,421)	583	(9,539)	11,243
FEB	108,473	89,634	10,998	17,700	(5,886)	12,700	16,843	182,736	31,138	6,668	36,564	67,702	(3,781)	219,888
MAR	67,672	55,263	24,532	11,986	(1,587)	11,700	10,473	112,858	14,956	14,392	36,224	51,180	3,228	149,241
APR	19,089	1,143	17,338	3,260	1,130	11,280	3,638	16,311	7	10,230	12,112	12,118	(1,612)	28,310
MAY	11,015	179	7,523	1,838	2,175	6,810	2,629	8,021	758	376	3,546	4,305	(7,524)	11,350
JUN	12,412	67	4,538	1,042	3,878	6,321	6,394	5,116	299	3,144	2,851	3,150	(5,009)	7,579
JUL	16,305	49	2,080	520	4,195	6,446	7,539	7,766	1,605	1,761	655	2,260	(6,674)	8,002
AUG	11,377	49	2,062	585	2,943	5,051	6,048	4,642	645	1,750	1,393	2,039	(4,816)	5,741
SEP	10,851	50	2,613	521	1,659	8,075	5,863	4,624	1,210	2,075	(421)	789	(6,928)	4,037
1987														
OCT	10,589	49	5,921	748	1,388	11,250	5,768	4,523	1,032	296	71	1,103	(11,723)	4,455
NOV	12,099	34	2,922	571	955	8,934	2,765	9,129	3,219	2,251	(3,480)	(261)	(7,248)	5,554
DEC	9,414	81	3,463	455	886	7,784	2,426	6,847	2,273	2,554	(2,161)	113	(5,729)	4,598
JAN	12,797	114	1,679	358	(139)	9,199	2,852	10,093	3,713	1,513	(4,340)	(627)	(7,752)	5,767
FEB	19,140	216	1,663	666	(520)	9,758	3,645	15,841	4,805	1,503	(3,550)	1,256	(8,151)	12,344
MAR	31,898	374	2,005	943	(204)	11,221	5,309	27,014	7,216	1,716	(2,931)	4,285	(9,522)	24,104
APR	13,323	134	2,435	319	1,617	3,800	2,918	10,135	2,206	122	500	2,706	(4,435)	10,473
MAY	11,414	81	2,005	325	2,516	3,455	2,679	8,187	2,020	100	(356)	1,664	(4,581)	7,579
JUN	13,589	67	1,835	319	3,878	5,534	6,761	5,925	1,199	1,611	580	1,780	(5,754)	6,118
JUL	21,212	49	1,428	325	4,211	11,280	8,811	11,397	3,836	1,348	(3,764)	72	(11,927)	7,212
AUG	16,093	49	1,010	293	2,943	8,755	7,481	7,925	2,544	1,047	(2,222)	322	(9,223)	5,409
SEP	10,204	50	1,204	269	1,928	6,020	5,624	4,148	1,105	1,192	(440)	665	(5,863)	3,515
1988														
OCT	10,336	33	1,480	163	1,209	6,588	5,674	4,393	1,109	74	(271)	838	(7,212)	4,001
NOV	9,844	67	1,559	336	770	6,113	2,481	7,238	2,446	1,435	(2,421)	25	(5,169)	4,740
DEC	15,966	439	1,378	732	317	11,114	3,247	13,079	4,963	1,314	(6,108)	(1,145)	(10,072)	6,939
JAN	25,075	1,236	1,078	488	(1,440)	11,236	4,404	22,267	6,585	1,099	(4,450)	2,135	(9,682)	17,960
FEB	17,056	90	900	180	326	6,370	3,383	13,681	3,894	959	(2,249)	1,645	(5,645)	11,400
MAR	11,941	65	1,359	130	869	4,723	2,745	9,043	2,469	1,301	(1,152)	1,317	(3,868)	7,804
APR	9,123	84	2,005	420	1,242	2,965	2,389	6,508	1,230	100	916	2,146	(3,472)	7,300
MAY	9,509	65	2,005	358	2,052	3,114	2,438	6,623	1,519	100	78	1,598	(4,055)	6,496
JUN	14,268	50	1,840	319	3,533	5,766	6,964	6,471	1,264	1,614	779	2,044	(5,846)	6,897
JUL	15,721	49	1,212	325	4,185	7,320	7,378	7,345	2,162	1,198	(1,436)	726	(8,107)	5,491
AUG	10,209	49	1,004	293	2,916	4,886	5,626	3,903	972	1,042	(197)	775	(5,348)	3,415
SEP	7,239	50	1,114	269	1,903	3,497	3,866	2,947	608	1,126	251	859	(3,396)	3,008

C-061558

Table B1–10. Continued

Water Year	Sac. R. at Freeport	Yolo Bypass	SJR at Vernalis	Eastside Streams	Channel Depletion	Total Exports	DCC & Georgiana	Sac. R. at Rio Vista	Threemile Slough	Head of Old R.	Final QWEST	SJR at Antioch	Old R. & Middle R.	Total Outflow
1989														
OCT	7,130	49	1,826	163	1,333	4,629	3,893	2,953	634	91	172	807	(5,285)	2,992
NOV	9,396	50	1,235	303	750	5,403	2,424	6,835	2,255	1,214	(2,112)	143	(4,672)	4,648
DEC	11,596	163	1,082	472	674	6,929	2,702	8,888	3,092	1,102	(3,256)	(164)	(6,241)	5,565
JAN	12,906	65	937	163	(155)	8,317	2,866	10,144	3,735	989	(4,371)	(637)	(7,387)	5,788
FEB	13,896	90	917	288	76	6,836	2,989	10,978	3,435	973	(2,794)	641	(5,997)	8,176
MAR	39,162	455	1,472	1,480	(82)	11,130	6,306	33,332	8,371	1,378	(1,918)	6,453	(9,819)	31,422
APR	22,181	202	2,435	756	1,623	6,052	4,031	17,946	4,186	122	(8)	4,178	(6,690)	17,776
MAY	14,571	65	2,435	472	2,521	4,049	3,073	10,932	2,678	122	(412)	2,265	(5,156)	10,268
JUN	13,397	67	1,896	353	3,815	5,500	6,703	5,807	1,137	1,649	692	1,829	(5,658)	6,117
JUL	21,621	49	1,049	342	4,198	11,280	8,913	11,707	3,988	1,077	(4,016)	(28)	(12,193)	7,272
AUG	19,234	49	1,018	309	2,865	11,280	8,311	10,256	3,595	1,053	(3,842)	(247)	(11,711)	6,127
SEP	10,466	17	900	252	1,042	6,500	5,722	4,500	1,230	959	(578)	652	(6,222)	3,818
1990														
OCT	9,151	0	1,456	114	1,036	5,470	4,908	3,984	891	73	121	1,012	(6,026)	4,001
NOV	8,058	34	1,114	202	794	3,927	2,251	5,643	1,647	1,126	(1,059)	588	(3,301)	4,504
DEC	14,230	33	1,018	65	943	7,842	3,031	10,996	3,969	1,053	(4,486)	(517)	(7,311)	6,416
JAN	17,203	260	1,026	293	(456)	11,219	3,401	14,176	5,286	1,059	(6,323)	(1,037)	(10,098)	7,898
FEB	15,179	756	1,007	414	(222)	6,075	3,149	12,842	3,452	1,045	(1,463)	1,989	(5,044)	11,400
MAR	11,050	33	1,311	374	792	4,469	2,634	8,251	2,194	1,268	(862)	1,332	(3,715)	7,310
APR	12,816	286	2,005	538	1,579	3,621	2,855	9,852	2,122	100	556	2,679	(4,331)	10,251
MAY	10,420	33	1,281	285	5,039	217	2,222	2,775	407	3,398	772	2,707	362	3,069
JUN	10,537	33	1,118	233	5,181	215	7,054	2,992	293	3,498	3,416	814	791	1,605
JUL	13,530	33	1,011	163	6,058	238	7,463	3,667	2,353	6,257	4,360	(1,857)	2,051	194
AUG	13,416	25	1,001	171	5,957	223	5,672	2,940	3,311	6,472	3,669	(1,729)	2,046	318
SEP	10,381	37	907	170	5,206	234	4,138	3,307	2,587	6,126	2,685	(1,590)	1,537	(52)
1991														
OCT	7,620	15	993	234	4,323	185	3,887	1,107	2,258	3,549	1,816	821	403	1,224
NOV	7,723	26	1,115	201	4,353	149	2,206	1,588	2,121	3,858	650	1,390	313	1,703
DEC	10,818	25	918	64	5,260	148	2,413	2,277	2,780	5,205	196	910	991	1,901
JAN	8,984	25	816	68	4,722	146	2,563	1,883	2,883	4,912	969	66	910	976
FEB	8,133	16	758	87	4,473	137	2,984	2,606	1,778	4,521	(2,948)	2,712	174	2,886
MAR	25,755	893	1,779	1,226	5,184	111	4,861	3,722	5,929	9,763	(4,737)	1,504	4,743	6,247
APR	10,879	46	1,168	510	4,747	100	3,010	2,882	4,518	7,499	1,316	(1,930)	1,944	14
MAY	7,332	43	1,049	471	3,515	130	2,242	1,277	1,281	2,686	2,212	912	478	1,390
JUN	8,930	43	568	269	3,935	155	6,809	894	878	1,925	3,716	431	811	1,242
JUL	9,514	43	594	181	4,878	173	6,387	1,633	770	2,574	4,279	297	738	1,035
AUG	9,515	34	537	166	4,878	167	5,340	1,659	1,993	3,817	3,739	(666)	1,066	400
SEP	9,948	36	574	192	5,005	161	4,816	1,852	2,224	4,235	2,632	(174)	1,048	874

Note: Negative values shown in parentheses.

Table B1–11. Simulated No–Project Channel Flows (cfs) and Changes in Flows (cfs) Resulting from Operations of the DW Project Alternatives for 1968–1991

Water Year	No–Project Alternative Flows				Alternative 1 Changes in Flows				Alternative 2 Changes in Flows				Alternative 3 Changes in Flows			
	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.
1968																
OCT	14,835	2,910	3972	(11,876)	(180)	56	(123)	0	(180)	56	(123)	0	(1,949)	611	(1,338)	0
NOV	7,990	5,287	−942	(10,048)	(37)	12	(25)	0	(37)	12	(25)	0	(20)	6	(14)	0
DEC	6,712	4,822	−1102	(9,799)	(34)	11	(23)	0	(34)	11	(23)	0	(11)	4	(8)	0
JAN	21,455	6,796	3470	(9,427)	0	(0)	0	0	0	(0)	0	0	(11)	4	(8)	0
FEB	60,399	12,763	15160	(9,595)	(7)	2	(5)	0	(7)	2	(5)	0	(19)	6	(13)	0
MAR	29,160	8,005	5799	(9,521)	25	(8)	17	0	25	(8)	17	0	(42)	13	(29)	0
APR	10,325	1,718	3042	(5,186)	0	0	0	(687)	0	0	0	(464)	0	(0)	0	(464)
MAY	7,579	1,734	1895	(4,852)	0	0	0	(1,305)	0	0	0	(940)	0	0	0	(940)
JUN	6,841	1,435	1892	(6,149)	69	(22)	47	0	69	(22)	47	0	131	(41)	90	0
JUL	7,731	3,834	296	(11,765)	(7)	2	(5)	0	(7)	2	(5)	0	(7)	2	(5)	0
AUG	5,259	1,992	691	(7,769)	0	0	(0)	(1,623)	0	0	(0)	(2,204)	0	(0)	0	(3,743)
SEP	4,158	1,449	653	(6,611)	0	0	0	(25)	0	0	0	(25)	0	0	0	(774)
1969																
OCT	5,157	2,112	501	(9,721)	0	0	0	10	0	0	0	10	0	0	0	(41)
NOV	5,675	3,438	−403	(7,168)	0	(0)	0	12	0	(0)	0	12	0	(0)	0	(30)
DEC	13,989	5,967	1032	(9,884)	(3,892)	1,220	(2,672)	0	(3,892)	1,220	(2,672)	0	(5,504)	1,725	(3,779)	0
JAN	116,869	18,951	33926	(7,531)	0	(0)	0	0	0	(0)	0	0	(1,095)	343	(752)	0
FEB	129,847	14,969	42814	(539)	(7)	2	(5)	0	(7)	2	(5)	0	(20)	6	(14)	0
MAR	51,928	8,764	14899	(6,945)	25	(8)	17	0	25	(8)	17	0	(42)	13	(29)	0
APR	44,212	6,176	13785	(10,140)	(25)	8	(17)	0	(25)	8	(17)	0	(77)	24	(53)	0
MAY	55,819	2,713	21657	13	(39)	12	(27)	0	(39)	12	(27)	0	(97)	31	(67)	0
JUN	25,197	(20)	10929	(4,713)	(49)	15	(33)	0	(49)	15	(33)	0	(104)	33	(71)	0
JUL	8,002	388	3271	(4,797)	0	0	0	(3,819)	0	0	0	(3,819)	0	0	0	(4,703)
AUG	5,741	955	1782	(5,168)	0	0	0	(60)	0	0	0	(60)	0	0	0	(1,674)
SEP	13,370	3,323	3025	(10,099)	(3,974)	1,246	(2,729)	0	(3,974)	1,246	(2,729)	0	(5,931)	1,859	(4,072)	0
1970																
OCT	17,681	1,374	6446	(11,530)	(63)	20	(43)	0	(63)	20	(43)	0	(861)	270	(591)	0
NOV	10,697	4,816	603	(8,942)	(37)	12	(25)	0	(37)	12	(25)	0	(20)	6	(14)	0
DEC	50,991	11,155	12498	(8,846)	(34)	11	(23)	0	(34)	11	(23)	0	(11)	4	(8)	0
JAN	197,170	31,946	57405	(4,230)	0	(0)	0	0	0	(0)	0	0	(11)	4	(8)	0
FEB	83,351	15,910	22346	(7,935)	(7)	2	(5)	0	(7)	2	(5)	0	(20)	6	(14)	0
MAR	30,331	7,166	7012	(9,228)	25	(8)	17	0	25	(8)	17	0	(42)	13	(29)	0
APR	11,579	1,761	3544	(6,454)	0	0	0	(207)	0	0	0	(591)	0	0	(0)	(591)
MAY	7,579	1,702	1926	(6,039)	0	0	(0)	(112)	0	0	(0)	(724)	7	(2)	5	(724)
JUN	7,580	1,438	2201	(6,168)	69	(22)	47	0	69	(22)	47	0	131	(41)	90	0
JUL	9,367	3,985	868	(11,736)	(9)	3	(6)	0	(9)	3	(6)	0	(9)	3	(6)	0
AUG	5,741	1,432	1386	(6,330)	0	0	(0)	(3,282)	0	0	(0)	(2,300)	0	(0)	0	(4,684)
SEP	3,872	1,307	648	(6,292)	0	0	0	(25)	0	0	0	(25)	0	(0)	0	(69)

Table B1-11. Continued

Water Year	No-Project Alternative Flows: Outflow	No-Project: Threemile Slough	No-Project: SJR at Antioch	No-Project: Old R. & Middle R.	Alternative 1 Changes in Flows: Outflow	Alt 1: Threemile Slough	Alt 1: SJR at Antioch	Alt 1: Old R. & Middle R.	Alternative 2 Changes in Flows: Outflow	Alt 2: Threemile Slough	Alt 2: SJR at Antioch	Alt 2: Old R. & Middle R.	Alternative 3 Changes in Flows: Outflow	Alt 3: Threemile Slough	Alt 3: SJR at Antioch	Alt 3: Old R. & Middle R.
1971																
OCT	5,063	2,003	550	(9,679)	0	(0)	0	10	0	(0)	0	10	0	(0)	0	(41)
NOV	15,280	5,585	1882	(9,337)	(4,011)	1,257	(2,754)	0	(4,011)	1,257	(2,754)	0	(5,970)	1,871	(4,099)	0
DEC	64,496	12,062	17428	(8,635)	(34)	11	(23)	0	(34)	11	(23)	0	(808)	253	(555)	0
JAN	45,818	10,846	10519	(9,692)	0	(0)	0	0	0	(0)	0	0	(11)	4	(8)	0
FEB	22,775	6,063	4700	(7,409)	0	0	0	(3,493)	0	0	0	(2,605)	0	(0)	0	(2,605)
MAR	43,778	10,319	10129	(9,658)	(3,137)	983	(2,154)	0	(2,335)	732	(1,603)	0	(2,413)	756	(1,657)	0
APR	16,279	3,286	4276	(7,113)	0	0	0	(131)	0	0	0	(103)	0	0	(0)	(103)
MAY	25,812	5,978	6131	(9,176)	(190)	59	(130)	0	(163)	51	(112)	0	(271)	85	(186)	0
JUN	12,690	2,925	3147	(8,945)	69	(22)	47	0	69	(22)	47	0	131	(41)	90	0
JUL	9,456	3,961	926	(11,734)	(7)	2	(5)	0	(7)	2	(5)	0	(7)	2	(5)	0
AUG	5,741	1,520	1313	(6,634)	0	0	(0)	(3,657)	0	0	(0)	(3,657)	0	0	0	(4,641)
SEP	6,040	2,796	335	(9,867)	0	0	0	(25)	0	0	0	(25)	0	(0)	0	(1,218)
1972																
OCT	8,275	3,012	1088	(11,936)	(2,461)	771	(1,690)	0	(2,461)	771	(1,690)	0	(2,411)	755	(1,655)	0
NOV	6,485	5,023	−1365	(9,995)	0	0	0	(164)	0	0	0	(164)	0	0	0	(164)
DEC	12,481	5,522	759	(9,858)	(1,648)	517	(1,132)	(215)	(1,648)	517	(1,132)	(75)	(4,212)	1,320	(2,892)	(75)
JAN	9,279	5,191	−358	(9,843)	(215)	67	(147)	0	(75)	24	(52)	0	(86)	27	(59)	0
FEB	18,216	5,704	3045	(8,274)	23	(7)	16	0	23	(7)	16	(1,661)	40	(13)	27	(1,661)
MAR	22,627	7,475	3496	(9,931)	(3)	1	(2)	0	(947)	297	(650)	0	(964)	302	(662)	0
APR	9,811	1,532	2980	(5,127)	0	0	0	(676)	0	0	0	(457)	0	0	(0)	(457)
MAY	7,579	1,768	1877	(5,045)	0	0	(0)	(540)	0	0	(0)	(372)	0	0	0	(372)
JUN	6,841	1,405	1913	(6,064)	69	(22)	47	0	69	(22)	47	0	131	(41)	90	0
JUL	7,848	3,863	321	(11,766)	(8)	3	(5)	0	(8)	3	(5)	0	(8)	3	(5)	0
AUG	6,826	3,788	−106	(11,765)	(6)	2	(4)	0	(6)	2	(4)	0	(6)	2	(4)	0
SEP	3,791	1,381	540	(6,620)	0	0	0	(2,424)	0	0	0	(2,186)	0	0	0	(3,986)
1973																
OCT	5,618	2,459	390	(10,568)	0	0	0	10	0	0	0	10	0	0	0	(465)
NOV	15,153	5,707	1707	(9,223)	(4,011)	1,257	(2,754)	0	(4,011)	1,257	(2,754)	0	(5,672)	1,777	(3,894)	0
DEC	19,014	6,749	2501	(9,646)	(34)	11	(23)	(254)	(34)	11	(23)	(89)	(1,096)	344	(753)	(89)
JAN	72,396	13,893	19128	(7,856)	(253)	79	(174)	0	(89)	28	(61)	0	(100)	31	(69)	0
FEB	89,977	14,714	26041	(8,208)	(7)	2	(5)	0	(7)	2	(5)	0	(20)	6	(14)	0
MAR	55,634	9,535	15809	(7,402)	25	(8)	17	0	25	(8)	17	0	(42)	13	(29)	0
APR	15,006	2,727	4201	(7,856)	51	(16)	35	0	51	(16)	35	0	74	(23)	51	0
MAY	14,120	3,090	3563	(8,374)	60	(19)	41	0	60	(19)	41	0	101	(32)	69	0
JUN	10,301	2,318	2636	(7,089)	0	(0)	0	(656)	0	(0)	0	(3,493)	0	(0)	0	(3,493)
JUL	9,373	3,915	929	(11,585)	0	0	0	(170)	0	0	0	(170)	0	0	0	(170)
AUG	5,302	1,340	1275	(6,158)	0	0	(0)	(2,739)	0	0	(0)	(60)	0	(0)	0	(2,382)
SEP	4,147	1,440	653	(6,642)	0	0	0	(25)	0	0	0	(25)	0	0	0	(69)

Table B1-11. Continued

Water Year	No-Project Alternative Flows: Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Alternative 1 Changes in Flows: Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Alternative 2 Changes in Flows: Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Alternative 3 Changes in Flows: Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.
1974																
OCT	5,615	2,383	456	(11,362)	0	0	0	10	0	0	0	10	0	0	0	(41)
NOV	59,059	12,956	14446	(9,530)	(4,011)	1,257	(2,754)	0	(4,011)	1,257	(2,754)	0	(5,970)	1,871	(4,099)	0
DEC	65,180	12,838	17109	(9,091)	(34)	11	(23)	0	(34)	11	(23)	0	(808)	253	(555)	0
JAN	125,805	24,088	33610	(9,017)	0	(0)	0	0	0	(0)	0	0	(11)	4	(8)	0
FEB	38,960	9,817	8486	(9,711)	(7)	2	(5)	0	(7)	2	(5)	0	(20)	6	(14)	0
MAR	103,056	17,766	29197	(8,856)	25	(8)	17	0	25	(8)	17	0	(42)	13	(29)	0
APR	68,918	14,012	17802	(10,054)	(25)	8	(17)	0	(25)	8	(17)	0	(77)	24	(53)	0
MAY	19,915	4,528	4833	(10,248)	60	(19)	41	0	60	(19)	41	0	101	(32)	69	0
JUN	12,455	2,378	3498	(8,105)	69	(22)	47	0	69	(22)	47	(2,416)	131	(41)	90	(2,416)
JUL	8,002	2,445	1552	(8,413)	0	0	0	(3,215)	0	0	0	(1,268)	0	0	(0)	(3,215)
AUG	5,741	1,593	1252	(6,857)	0	0	(0)	(335)	0	0	(0)	(60)	0	0	0	(399)
SEP	9,308	3,549	1108	(11,030)	(2,975)	932	(2,043)	0	(2,975)	932	(2,043)	0	(2,975)	932	(2,043)	0
1975																
OCT	12,453	3,311	2612	(11,838)	(1,030)	323	(707)	0	(1,030)	323	(707)	0	(3,722)	1,166	(2,556)	0
NOV	8,672	4,983	−398	(9,677)	(37)	12	(25)	0	(37)	12	(25)	0	(20)	6	(14)	0
DEC	8,811	5,070	−417	(9,833)	(34)	11	(23)	0	(34)	11	(23)	0	(11)	4	(8)	0
JAN	6,560	4,972	−1332	(10,036)	0	(0)	0	0	0	(0)	0	0	(11)	4	(8)	0
FEB	61,068	11,143	16742	(8,625)	(7)	2	(5)	0	(7)	2	(5)	0	(20)	6	(14)	0
MAR	81,704	13,904	23263	(8,571)	25	(8)	17	0	25	(8)	17	0	(42)	13	(29)	0
APR	19,925	3,780	5411	(9,462)	51	(16)	35	0	51	(16)	35	0	74	(23)	51	0
MAY	27,667	5,750	7127	(10,780)	(112)	35	(77)	0	(112)	35	(77)	0	(244)	76	(167)	0
JUN	15,246	3,069	4121	(9,734)	69	(22)	47	0	69	(22)	47	(841)	131	(41)	90	(841)
JUL	8,263	3,180	1062	(10,076)	0	0	0	(1,611)	0	0	0	(1,611)	0	0	(0)	(1,611)
AUG	5,741	1,306	1483	(6,099)	0	0	0	(2,039)	0	0	0	(1,225)	0	(0)	0	(3,725)
SEP	6,921	3,111	453	(10,695)	(709)	222	(487)	0	(709)	222	(487)	0	(709)	222	(487)	0
1976																
OCT	13,314	3,245	3022	(11,728)	(3,223)	1,010	(2,213)	0	(3,223)	1,010	(2,213)	0	(5,347)	1,676	(3,671)	0
NOV	11,151	5,467	260	(9,659)	(37)	12	(25)	0	(37)	12	(25)	0	(607)	190	(417)	0
DEC	6,355	4,666	−1119	(9,300)	0	0	0	(1,114)	0	0	0	(694)	0	0	0	(666)
JAN	5,865	3,881	−716	(7,582)	0	0	0	(2,722)	0	0	0	(2,735)	0	0	0	(2,735)
FEB	10,670	5,016	408	(8,361)	23	(7)	16	0	23	(7)	16	(406)	40	(13)	27	(2,055)
MAR	9,744	3,330	1447	(5,192)	73	(23)	50	0	73	(23)	50	0	55	(17)	38	(1,104)
APR	7,475	1,444	2056	(3,769)	0	0	0	(51)	0	0	0	(51)	0	0	0	(74)
MAY	6,366	1,781	1358	(4,534)	0	0	0	(60)	0	0	0	(60)	0	0	0	(101)
JUN	6,897	1,389	1952	(6,094)	68	(21)	47	(1)	68	(21)	47	(1)	131	(41)	90	(1)
JUL	5,750	2,399	641	(8,592)	0	0	0	(78)	0	0	0	(78)	0	0	(0)	(150)
AUG	3,415	614	1054	(3,867)	0	0	0	(60)	0	0	0	(60)	0	0	0	(116)
SEP	3,008	643	820	(4,017)	0	0	0	(25)	0	0	0	(25)	0	0	0	(69)

C—061562

Table B1–11. Continued

Water Year	No–Project Alternative Flows				Alternative 1 Changes in Flows				Alternative 2 Changes in Flows				Alternative 3 Changes in Flows			
	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.
1977																
OCT	2,992	730	724	(6,092)	0	0	0	10	0	0	0	10	0	0	0	(41)
NOV	5,211	2,845	−101	(5,551)	0	0	0	12	0	0	0	12	0	0	(0)	(30)
DEC	7,186	5,585	−1531	(10,486)	0	0	0	21	0	0	0	21	0	0	0	(7)
JAN	4,505	1,892	349	(3,901)	0	0	0	(15)	0	0	0	(15)	0	0	0	(18)
FEB	8,083	3,135	870	(5,177)	0	0	0	(23)	0	0	0	(23)	0	0	(0)	(41)
MAR	6,897	1,994	1324	(3,299)	21	(7)	14	(52)	21	(7)	14	(52)	3	(1)	2	(52)
APR	6,897	1,259	1968	(3,565)	0	0	0	(51)	0	0	0	(51)	0	0	(0)	(74)
MAY	4,505	889	1265	(3,293)	0	0	(0)	(60)	0	0	(0)	(60)	0	0	0	(101)
JUN	4,000	(283)	2103	(1,260)	0	0	0	(69)	0	0	0	(69)	0	0	0	(131)
JUL	4,001	204	1715	(2,787)	0	(0)	0	(78)	0	(0)	0	(78)	0	(0)	0	(150)
AUG	3,415	(135)	1692	(1,403)	0	0	(0)	(60)	0	0	(0)	(60)	0	0	0	(116)
SEP	3,008	618	838	(3,421)	0	0	0	(25)	0	0	0	(25)	0	0	0	(69)
1978																
OCT	2,992	635	805	(5,098)	0	(0)	0	10	0	(0)	0	10	0	(0)	0	(41)
NOV	3,537	1,104	623	(2,504)	0	0	0	12	0	0	0	12	0	0	0	(30)
DEC	6,832	4,899	−1145	(9,710)	0	0	0	21	0	0	0	21	0	0	0	(15)
JAN	57,543	10,912	15277	(7,752)	(3,856)	1,208	(2,648)	0	(3,856)	1,208	(2,648)	0	(5,982)	1,875	(4,107)	0
FEB	53,376	10,571	13919	(8,657)	(7)	2	(5)	0	(7)	2	(5)	0	(687)	215	(472)	0
MAR	61,156	12,351	15762	(8,262)	25	(8)	17	0	25	(8)	17	0	(42)	13	(29)	0
APR	36,875	6,173	10631	(9,974)	(25)	8	(17)	0	(25)	8	(17)	0	(77)	24	(53)	0
MAY	15,849	3,392	4039	(9,284)	60	(19)	41	0	60	(19)	41	(67)	101	(32)	69	(67)
JUN	8,774	644	3374	(5,272)	0	(0)	0	(314)	0	(0)	0	(3,780)	0	(0)	0	(4,667)
JUL	8,002	445	3224	(3,266)	0	0	0	(3,369)	0	0	0	(78)	0	0	0	(1,610)
AUG	5,302	602	1887	(4,351)	0	0	0	(60)	0	0	0	(60)	0	0	0	(116)
SEP	5,227	1,872	755	(7,786)	0	0	0	(25)	0	0	0	(25)	0	(0)	0	(69)
1979																
OCT	9,101	2,578	1803	(11,887)	(3,029)	949	(2,080)	0	(3,029)	949	(2,080)	0	(2,979)	934	(2,045)	0
NOV	6,521	4,771	−1147	(9,677)	(205)	64	(141)	0	(205)	64	(141)	0	(205)	64	(141)	0
DEC	4,984	2,682	−59	(5,366)	0	0	0	(3,148)	0	0	0	(3,148)	0	0	0	(3,187)
JAN	20,305	5,682	3855	(8,855)	(3,856)	1,208	(2,648)	0	(3,856)	1,208	(2,648)	0	(5,982)	1,875	(4,107)	0
FEB	39,592	6,822	11125	(8,120)	(7)	2	(5)	0	(7)	2	(5)	0	(687)	215	(472)	0
MAR	26,109	5,824	6311	(8,687)	25	(8)	17	0	25	(8)	17	0	(42)	13	(29)	0
APR	14,392	2,580	4051	(7,582)	51	(16)	35	0	51	(16)	35	0	74	(23)	51	0
MAY	12,376	2,506	3296	(7,904)	60	(19)	41	0	60	(19)	41	0	101	(32)	69	0
JUN	10,882	2,463	2764	(7,401)	0	0	0	(657)	0	0	0	(3,181)	0	0	0	(3,181)
JUL	6,505	2,687	723	(9,326)	0	(0)	(0)	(2,415)	0	(0)	(0)	(521)	0	0	0	(2,415)
AUG	4,668	903	1367	(5,226)	0	0	(0)	(493)	0	0	(0)	(60)	0	0	0	(438)
SEP	3,397	1,057	654	(5,799)	0	0	0	(25)	0	0	0	(25)	0	(0)	0	(69)

C — 0 6 1 5 6 3

C-061564

Table B1-11. Continued

Water Year	No-Project Alternative Flows				Alternative 1 Changes in Flows				Alternative 2 Changes in Flows				Alternative 3 Changes in Flows			
	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.
1980																
OCT	4,001	1,246	713	(8,303)	0	0	0	10	0	0	0	10	0	0	0	(41)
NOV	9,608	4,842	115	(9,239)	(2,951)	925	(2,026)	0	(2,951)	925	(2,026)	0	(2,908)	912	(1,997)	0
DEC	12,171	5,521	611	(9,518)	(1,061)	332	(728)	(16)	(1,061)	332	(728)	(5)	(3,770)	1,182	(2,589)	(5)
JAN	107,445	16,064	32388	(5,975)	(15)	5	(11)	0	(5)	2	(4)	0	(17)	5	(12)	0
FEB	127,706	16,373	40735	(1,198)	(7)	2	(5)	0	(7)	2	(5)	0	(19)	6	(13)	0
MAR	63,895	4,603	23447	597	25	(8)	17	0	25	(8)	17	0	(42)	13	(29)	0
APR	15,045	2,382	4493	(7,794)	51	(16)	35	0	51	(16)	35	(556)	74	(23)	51	(556)
MAY	12,255	1,963	3690	(7,288)	60	(19)	41	0	60	(19)	41	(1,548)	101	(32)	69	(1,548)
JUN	7,579	426	3043	(4,550)	0	0	0	(583)	0	0	0	(1,618)	0	0	0	(4,207)
JUL	8,002	395	3257	(3,339)	0	0	0	(3,035)	0	0	0	(78)	0	0	0	(150)
AUG	5,302	742	1771	(4,717)	0	0	0	(60)	0	0	0	(60)	0	0	0	(116)
SEP	5,436	2,036	711	(8,977)	0	0	0	(25)	0	0	0	(25)	0	0	0	(69)
1981																
OCT	8,882	2,173	2045	(11,848)	(2,876)	901	(1,975)	0	(2,876)	901	(1,975)	0	(2,826)	886	(1,940)	0
NOV	6,062	4,077	−757	(9,027)	0	0	0	(150)	0	0	0	(150)	0	0	0	(150)
DEC	7,249	4,717	−787	(9,548)	(1,219)	382	(837)	0	(1,219)	382	(837)	0	(1,336)	419	(917)	0
JAN	18,058	6,088	2617	(9,409)	0	(0)	0	0	0	(0)	0	0	(2,588)	811	(1,777)	0
FEB	20,605	6,520	3387	(9,020)	23	(7)	16	0	23	(7)	16	(686)	41	(13)	28	(686)
MAR	25,565	6,871	5191	(9,197)	(3)	1	(2)	0	(623)	195	(428)	0	(717)	225	(492)	0
APR	12,223	2,271	3390	(5,526)	0	0	0	(726)	0	0	0	(490)	0	(0)	0	(490)
MAY	7,579	1,754	1879	(4,862)	0	0	0	(1,310)	0	0	0	(940)	0	0	0	(940)
JUN	6,118	1,199	1780	(5,764)	69	(22)	47	0	69	(22)	47	0	131	(41)	90	0
JUL	7,098	3,731	111	(11,762)	(8)	3	(5)	0	(8)	3	(5)	0	(8)	3	(5)	0
AUG	4,831	1,976	547	(7,926)	0	0	0	(1,582)	0	0	0	(2,181)	0	0	0	(3,730)
SEP	3,492	1,098	655	(5,841)	0	0	0	(25)	0	0	0	(25)	0	0	0	(764)
1982																
OCT	4,793	1,775	612	(8,901)	0	0	0	10	0	0	0	10	0	0	0	(41)
NOV	26,627	8,171	4586	(10,061)	(4,011)	1,257	(2,754)	0	(4,011)	1,257	(2,754)	0	(5,970)	1,871	(4,099)	0
DEC	88,042	18,191	22441	(9,656)	(34)	11	(23)	(352)	(34)	11	(23)	(123)	(808)	253	(555)	(123)
JAN	77,881	12,153	22951	(7,904)	(352)	110	(242)	0	(123)	39	(85)	0	(135)	42	(92)	0
FEB	94,845	15,098	27899	(8,601)	(7)	2	(5)	0	(7)	2	(5)	0	(20)	6	(14)	0
MAR	79,101	7,130	27706	(2,946)	25	(8)	17	0	25	(8)	17	0	(42)	13	(29)	0
APR	139,945	12,473	49350	2,269	(25)	8	(17)	0	(25)	8	(17)	0	(77)	24	(53)	0
MAY	46,703	1,543	18734	(1,057)	(39)	12	(27)	0	(39)	12	(27)	0	(97)	31	(67)	0
JUN	16,995	1,398	6250	(8,326)	32	(10)	22	0	32	(10)	22	0	95	(30)	65	0
JUL	8,002	1,148	2640	(7,398)	0	0	0	(2,692)	0	0	0	(2,692)	0	0	0	(2,692)
AUG	5,801	1,527	1333	(7,624)	0	0	(0)	(993)	0	0	(0)	(993)	0	0	0	(3,157)
SEP	16,088	2,314	4996	(8,560)	(3,974)	1,246	(2,729)	0	(3,974)	1,246	(2,729)	0	(5,931)	1,859	(4,072)	0

C—061564

C-061565

Table B1−11. Continued

Water Year	No-Project Alternative Flows				Alternative 1 Changes in Flows				Alternative 2 Changes in Flows				Alternative 3 Changes in Flows			
	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.
1983																
OCT	31,140	3,761	10199	(4,528)	(63)	20	(43)	0	(63)	20	(43)	0	(695)	218	(477)	0
NOV	43,784	5,721	13898	(5,920)	(37)	12	(25)	0	(37)	12	(25)	0	(20)	6	(14)	0
DEC	86,212	5,798	31931	(646)	(34)	11	(23)	0	(34)	11	(23)	0	(11)	4	(8)	0
JAN	101,369	6,813	37392	1,546	0	(0)	0	0	0	(0)	0	0	(11)	4	(8)	0
FEB	181,018	14,049	65409	9,262	(7)	2	(5)	0	(7)	2	(5)	0	(20)	6	(14)	0
MAR	256,037	22,824	90080	15,315	25	(8)	17	0	25	(8)	17	0	(42)	13	(29)	0
APR	105,749	5,008	40956	6,363	(25)	8	(17)	0	(25)	8	(17)	0	(77)	24	(53)	0
MAY	78,406	2,785	31220	3,811	(39)	12	(27)	0	(39)	12	(27)	0	(97)	31	(67)	0
JUN	70,952	1,209	29424	4,599	(49)	15	(33)	0	(49)	15	(33)	0	(104)	33	(71)	0
JUL	28,552	(1,968)	13991	(2,658)	(52)	16	(36)	0	(52)	16	(36)	0	(110)	35	(76)	0
AUG	8,616	1,327	2698	(8,752)	(55)	17	(38)	0	(55)	17	(38)	0	(115)	36	(79)	0
SEP	23,139	580	9455	(5,770)	(62)	19	(43)	0	(62)	19	(43)	0	(106)	33	(73)	0
1984																
OCT	33,203	1,841	12689	(1,992)	(63)	20	(43)	0	(63)	20	(43)	0	(65)	20	(45)	0
NOV	77,020	8,617	25709	(4,483)	(37)	12	(25)	0	(37)	12	(25)	0	(20)	6	(14)	0
DEC	152,708	17,245	50745	313	(34)	11	(23)	0	(34)	11	(23)	0	(11)	4	(8)	0
JAN	75,962	5,367	27941	879	0	(0)	0	0	0	(0)	0	0	(11)	4	(8)	0
FEB	41,156	5,490	12994	(6,217)	(7)	2	(5)	0	(7)	2	(5)	0	(19)	6	(13)	0
MAR	30,792	5,608	8506	(7,582)	25	(8)	17	0	25	(8)	17	0	(42)	13	(29)	0
APR	12,623	1,922	3852	(7,172)	51	(16)	35	0	51	(16)	35	(139)	74	(23)	51	(139)
MAY	8,946	2,139	2146	(6,888)	60	(19)	41	0	60	(19)	41	(536)	101	(32)	69	(536)
JUN	8,232	1,232	2653	(6,296)	69	(22)	47	0	69	(22)	47	0	131	(41)	90	0
JUL	8,845	3,401	1130	(10,931)	0	0	0	(775)	0	0	0	(775)	0	0	0	(775)
AUG	5,741	924	1807	(5,677)	0	0	(0)	(2,702)	0	0	(0)	(2,032)	0	(0)	0	(4,360)
SEP	5,638	2,240	628	(9,426)	0	0	0	(25)	0	0	0	(25)	0	0	0	(69)
1985																
OCT	9,539	2,758	1821	(11,742)	(3,028)	949	(2,079)	0	(3,028)	949	(2,079)	0	(2,978)	933	(2,045)	0
NOV	29,257	7,378	6347	(8,725)	(917)	287	(630)	0	(917)	287	(630)	0	(3,724)	1,167	(2,557)	0
DEC	20,044	5,573	3931	(8,687)	(34)	11	(23)	0	(34)	11	(23)	0	(11)	4	(8)	0
JAN	6,630	4,221	−692	(9,277)	15	(5)	10	0	15	(5)	10	(183)	18	(6)	12	(183)
FEB	15,303	4,037	3173	(6,179)	23	(7)	16	0	23	(7)	16	(3,530)	41	(13)	28	(3,530)
MAR	14,123	3,476	3119	(5,399)	73	(23)	50	0	73	(23)	50	(408)	55	(17)	38	(3,050)
APR	7,863	1,324	2318	(4,532)	0	0	0	(819)	0	0	0	(51)	0	0	(0)	(74)
MAY	10,012	2,371	2405	(5,460)	0	0	(0)	(517)	0	0	(0)	(60)	0	0	0	(101)
JUN	6,118	1,153	1814	(5,674)	69	(22)	47	0	69	(22)	47	0	131	(41)	90	0
JUL	7,172	3,728	146	(11,770)	(8)	3	(5)	0	(8)	3	(5)	0	(8)	3	(5)	0
AUG	5,807	3,123	11	(10,631)	0	0	0	(1,021)	0	0	0	(60)	0	(0)	0	(116)
SEP	3,758	1,207	678	(6,151)	0	0	0	(1,150)	0	0	0	(25)	0	(0)	0	(69)

C-061565

C-061566

Table B1-11. Continued

Water Year	No-Project Alternative Flows				Alternative 1 Changes in Flows				Alternative 2 Changes in Flows				Alternative 3 Changes in Flows			
	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.
1986																
OCT	4,675	1,735	607	(9,331)	0	(0)	0	10	0	(0)	0	10	0	(0)	0	(41)
NOV	5,194	2,872	−145	(6,314)	0	0	0	12	0	0	0	12	0	0	0	(30)
DEC	7,147	4,710	(851)	(9,627)	(405)	127	(278)	0	(405)	127	(278)	0	(405)	127	(278)	0
JAN	11,243	5,004	583	(9,539)	(2,477)	776	(1,700)	0	(2,477)	776	(1,700)	0	(2,473)	775	(1,698)	0
FEB	219,888	31,138	67,702	(3,781)	(1,126)	353	(773)	0	(1,126)	353	(773)	0	(4,140)	1,297	(2,842)	0
MAR	149,241	14,956	51,180	3,228	25	(8)	17	0	25	(8)	17	0	(42)	13	(29)	0
APR	28,310	7	12,118	(1,612)	(25)	8	(17)	0	(25)	8	(17)	0	(77)	24	(53)	0
MAY	11,350	758	4,305	(7,524)	60	(19)	41	0	60	(19)	41	(3,771)	101	(32)	69	(3,000)
JUN	7,579	299	3,150	(5,009)	69	(22)	47	0	69	(22)	47	0	131	(41)	90	(3,283)
JUL	8,002	1,605	2,260	(6,674)	0	0	0	(3,606)	0	0	0	(78)	0	0	0	(150)
AUG	5,741	645	2,039	(4,816)	0	0	0	(60)	0	0	0	(60)	0	(0)	0	(116)
SEP	4,037	1,210	789	(6,928)	0	0	0	(25)	0	0	0	(25)	0	0	0	(69)
1987																
OCT	4,455	1,032	1,103	(11,723)	(10)	3	(7)	0	(10)	3	(7)	0	41	(13)	28	0
NOV	5,554	3,219	(261)	(7,248)	0	0	0	12	0	0	0	12	0	0	0	(30)
DEC	4,598	2,273	113	(5,729)	0	0	(0)	21	0	0	(0)	21	0	0	0	(15)
JAN	5,767	3,713	(627)	(7,752)	0	0	0	(15)	0	0	0	(15)	0	0	0	(18)
FEB	12,344	4,805	1,256	(8,151)	23	(7)	16	0	23	(7)	16	0	41	(13)	28	0
MAR	24,104	7,216	4,285	(9,522)	(1,033)	324	(709)	0	(1,033)	324	(709)	0	(1,051)	329	(721)	0
APR	10,473	2,206	2,706	(4,435)	0	0	0	(917)	0	0	0	(614)	0	0	0	(614)
MAY	7,579	2,020	1,664	(4,581)	0	0	(0)	(156)	0	0	(0)	(326)	0	0	0	(326)
JUN	6,118	1,199	1,780	(5,754)	69	(22)	47	0	69	(22)	47	0	131	(41)	90	0
JUL	7,212	3,836	72	(11,927)	(7)	2	(5)	0	(7)	2	(5)	0	(7)	2	(5)	0
AUG	5,409	2,544	322	(9,223)	0	0	0	(60)	0	0	0	(60)	0	0	0	(116)
SEP	3,515	1,105	665	(5,863)	0	0	0	(25)	0	0	0	(25)	0	(0)	0	(69)
1988																
OCT	4,001	1,109	838	(7,212)	0	(0)	0	10	0	(0)	0	10	0	0	0	(41)
NOV	4,740	2,446	25	(5,169)	0	0	0	12	0	0	0	12	0	0	0	(30)
DEC	6,939	4,963	(1,145)	(10,072)	(62)	19	(42)	0	(62)	19	(42)	0	(62)	19	(42)	0
JAN	17,960	6,585	2,135	(9,682)	(3,830)	1,200	(2,630)	(26)	(3,830)	1,200	(2,630)	(26)	(5,982)	1,875	(4,107)	(44)
FEB	11,400	3,894	1,645	(5,645)	14	(4)	9	(9)	14	(4)	9	(4,009)	31	(10)	21	(4,510)
MAR	7,804	2,469	1,317	(3,868)	73	(23)	50	(0)	73	(23)	50	(27)	55	(17)	38	(1,640)
APR	7,300	1,230	2,146	(3,472)	0	0	0	(638)	0	0	0	(51)	0	0	0	(74)
MAY	6,496	1,519	1,598	(4,055)	0	0	(0)	(485)	0	0	(0)	(60)	0	0	0	(101)
JUN	6,897	1,264	2,044	(5,846)	68	(21)	47	(1)	68	(21)	47	(1)	130	(41)	89	(1)
JUL	5,491	2,162	726	(8,107)	0	0	0	(2,437)	0	0	0	(78)	0	0	(0)	(150)
AUG	3,415	972	775	(5,348)	0	0	0	(60)	0	0	0	(60)	0	0	0	(116)
SEP	3,008	608	859	(3,396)	0	0	0	(25)	0	0	0	(25)	0	0	0	(69)

C — 0 6 1 5 6 6

Table B1-11. Continued

Water Year	No-Project Alternative Flows				Alternative 1 Changes in Flows				Alternative 2 Changes in Flows				Alternative 3 Changes in Flows			
	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.	Outflow	Threemile Slough	SJR at Antioch	Old R. & Middle R.
1989																
OCT	2,992	634	807	(5,285)	0	(0)	0	10	0	(0)	0	10	0	(0)	0	(41)
NOV	4,648	2,255	143	(4,672)	0	0	0	12	0	0	0	12	0	0	0	(30)
DEC	5,565	3,092	(164)	(6,241)	0	0	0	21	0	0	0	21	0	0	0	(15)
JAN	5,788	3,735	(637)	(7,387)	0	0	0	(15)	0	0	0	(15)	0	0	0	(18)
FEB	8,176	3,435	641	(5,997)	23	(7)	16	0	23	(7)	16	0	41	(13)	28	0
MAR	31,422	8,371	6,453	(9,819)	(3,696)	1,158	(2,537)	0	(3,696)	1,158	(2,537)	0	(3,714)	1,164	(2,550)	0
APR	17,776	4,186	4,178	(6,690)	51	(16)	35	0	51	(16)	35	0	74	(23)	51	0
MAY	10,268	2,678	2,265	(5,156)	0	0	0	(887)	0	0	0	(598)	0	0	0	(598)
JUN	6,117	1,137	1,829	(5,658)	69	(22)	47	0	69	(22)	47	0	131	(41)	90	0
JUL	7,272	3,988	(28)	(12,193)	(8)	3	(5)	0	(8)	3	(5)	0	(8)	3	(5)	0
AUG	6,127	3,595	(247)	(11,711)	(7)	2	(5)	0	(7)	2	(5)	0	(7)	2	(5)	0
SEP	3,818	1,230	652	(6,222)	0	0	0	(2,587)	0	0	0	(2,886)	0	0	0	(2,466)
1990																
OCT	4,001	891	1,012	(6,026)	0	(0)	0	10	0	(0)	0	10	0	(0)	0	(41)
NOV	4,504	1,647	588	(3,301)	0	0	0	12	0	0	0	12	0	0	0	(30)
DEC	6,416	3,969	(517)	(7,311)	0	0	0	21	0	0	0	21	0	0	0	(15)
JAN	7,898	5,286	(1,037)	(10,098)	(975)	306	(669)	0	(975)	306	(669)	0	(972)	305	(667)	0
FEB	11,400	3,452	1,989	(5,044)	23	(7)	16	0	23	(7)	16	(1,065)	41	(13)	28	(1,035)
MAR	7,310	2,194	1,332	(3,715)	73	(23)	50	0	73	(23)	50	0	55	(17)	38	0
APR	10,251	2,122	2,679	(4,331)	0	0	0	(709)	0	0	0	(51)	0	0	(0)	(74)
MAY	5,910	1,040	1,709	(3,426)	0	0	0	(164)	0	0	0	(60)	0	0	0	(101)
JUN	6,897	1,376	1,955	(6,053)	68	(21)	47	(1)	68	(21)	47	(1)	131	(41)	90	(1)
JUL	5,584	2,258	686	(8,281)	0	0	0	(78)	0	0	0	(78)	0	0	(0)	(150)
AUG	3,447	1,006	759	(5,441)	0	(0)	0	(60)	0	(0)	0	(60)	0	(0)	0	(116)
SEP	3,008	618	849	(3,713)	0	0	0	(25)	0	0	0	(25)	0	0	0	(69)
1991																
OCT	2,992	637	801	(5,320)	0	(0)	0	10	0	(0)	0	10	0	(0)	0	(41)
NOV	4,187	1,550	537	(3,151)	0	(0)	0	12	0	(0)	0	12	0	0	(0)	(30)
DEC	4,532	2,237	113	(4,461)	0	0	(0)	21	0	0	(0)	21	0	0	0	(15)
JAN	5,025	2,769	(152)	(5,372)	0	0	0	(15)	0	0	0	(15)	0	0	0	(18)
FEB	8,258	3,326	779	(5,649)	0	0	(0)	(23)	0	0	(0)	(23)	0	0	(0)	(41)
MAR	21,327	6,766	3,450	(9,803)	9	(3)	6	0	9	(3)	6	0	(9)	3	(6)	0
APR	11,259	2,296	2,959	(4,425)	0	0	0	(51)	0	0	0	(51)	0	0	0	(74)
MAY	5,362	1,150	1,421	(3,841)	0	0	(0)	(60)	0	0	(0)	(60)	0	0	0	(101)
JUN	7,037	1,106	2,216	(5,449)	0	(0)	0	(69)	0	(0)	0	(69)	47	(15)	32	(85)
JUL	4,215	1,288	907	(5,991)	0	(0)	(0)	(78)	0	(0)	(0)	(78)	0	0	(0)	(150)
AUG	3,415	743	961.	(4,639)	0	0	0	(60)	0	0	0	(60)	0	0	0	(116)
SEP	3,008	656	820	(4,428)	0	0	0	(25)	0	0	0	(25)	0	(0)	0	(69)

Note: Negative values shown in parentheses.

Table B1–12. Simulated Historical Percentage Source Contributions to Total Combined SWP and CVP Delta Exports and CCWD Diversions from Selected Delta Locations under the No–Project Alternative and the DW Project Alternatives

	DW Project				Agricultural Drains				SJR Inflow				Eastside Streams				Sacramento Inflow				Benicia Boundary			
Water Year	No–Proj.	Alt. 1	Alt. 2	Alt. 3	No–Proj.	Alt. 1	Alt. 2	Alt. 3	No–Proj.	Alt. 1	Alt. 2	Alt. 3	No–Proj.	Alt. 1	Alt. 2	Alt. 3	No–Proj.	Alt. 1	Alt. 2	Alt. 3	No–Proj.	Alt. 1	Alt. 2	Alt. 3
1968																								
OCT	0.0	0.0	0.0	0.0	1.3	1.2	1.2	1.1	24.8	24.4	24.4	21.3	4.3	4.2	4.2	3.9	69.6	70.1	70.1	73.7	0.0	0.0	0.0	0.1
NOV	0.0	0.1	0.1	0.1	0.3	0.3	0.3	0.3	16.1	16.0	16.0	16.0	1.5	1.5	1.5	1.5	81.9	81.9	81.9	81.9	0.2	0.2	0.2	0.2
DEC	0.0	0.2	0.2	0.2	0.0	0.0	0.0	0.0	19.3	19.3	19.3	19.2	2.3	2.3	2.3	2.3	77.9	77.8	77.8	77.8	0.4	0.4	0.4	0.4
JAN	0.0	0.3	0.3	0.3	3.4	3.3	3.3	3.3	18.9	18.8	18.8	18.8	3.7	3.7	3.7	3.7	74.0	73.9	73.9	74.0	0.0	0.0	0.0	0.0
FEB	0.0	0.5	0.5	0.5	8.9	8.5	8.5	8.5	21.6	21.5	21.5	21.5	11.1	11.1	11.1	11.1	58.3	58.4	58.4	58.5	0.0	0.0	0.0	0.0
MAR	0.0	0.3	0.3	0.3	3.9	3.7	3.7	3.7	18.1	17.9	17.9	17.8	9.0	9.0	9.0	9.0	69.0	69.0	69.0	69.2	0.0	0.0	0.0	0.0
APR	0.0	12.1	8.5	8.1	0.3	0.3	0.3	0.3	68.2	59.4	61.9	61.9	3.1	3.8	3.6	3.6	28.3	24.3	25.5	26.0	0.1	0.1	0.1	0.1
MAY	0.0	19.6	14.8	14.1	4.5	3.5	3.8	3.8	64.1	50.8	53.9	53.9	2.5	3.0	2.9	2.9	28.6	22.8	24.4	25.1	0.3	0.3	0.3	0.3
JUN	0.0	0.1	0.1	0.1	8.1	7.9	7.9	7.9	17.6	17.8	17.8	17.8	2.9	2.9	2.9	2.9	71.0	70.9	70.9	70.9	0.4	0.4	0.4	0.4
JUL	0.0	0.0	0.0	0.0	5.9	5.8	5.8	5.7	9.8	9.8	9.8	9.8	2.0	2.0	2.0	2.0	81.9	82.1	82.1	82.2	0.3	0.3	0.3	0.3
AUG	0.0	12.2	16.0	24.2	6.4	[illegible]	5.2	4.7	8.5	7.5	7.1	6.4	2.6	2.3	2.2	2.0	81.6	71.8	68.7	62.0	0.8	0.8	0.8	0.8
SEP	0.0	0.0	0.0	7.1	4.5	4.4	4.4	4.1	11.5	11.5	11.5	10.6	2.7	2.7	2.7	2.6	79.9	80.0	80.0	74.3	1.4	1.4	1.4	1.4
1969																								
OCT	0.0	0.0	0.0	0.0	1.1	1.1	1.1	1.1	14.1	14.1	14.1	14.0	1.0	1.0	1.0	1.0	82.6	82.6	82.6	82.7	1.2	1.2	1.2	1.2
NOV	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	22.8	22.8	22.8	22.7	2.7	2.7	2.7	2.7	73.4	73.3	73.3	73.5	1.0	1.0	1.0	1.0
DEC	0.0	0.2	0.2	0.2	13.2	9.5	9.5	8.5	14.5	10.8	10.8	9.7	5.4	4.2	4.2	3.9	66.8	75.1	75.1	77.3	0.1	0.3	0.3	0.4
JAN	0.0	0.4	0.4	0.4	16.6	16.0	16.0	16.0	23.7	23.8	23.8	23.8	39.0	39.1	39.1	39.1	20.7	20.7	20.7	20.7	0.0	0.0	0.0	0.0
FEB	0.0	0.2	0.2	0.2	5.8	5.6	5.6	5.6	55.0	55.0	55.0	55.0	12.3	12.3	12.3	12.3	26.9	26.9	26.9	26.9	0.0	0.0	0.0	0.0
MAR	0.0	0.2	0.2	0.2	0.4	0.3	0.3	0.3	61.5	61.0	61.0	60.8	8.7	8.8	8.8	8.8	29.4	29.6	29.6	29.8	0.0	0.0	0.0	0.0
APR	0.0	0.4	0.4	0.4	0.2	0.2	0.2	0.2	62.8	62.6	62.6	62.6	9.0	9.1	9.1	9.1	27.9	27.7	27.7	27.7	0.0	0.0	0.0	0.0
MAY	0.0	0.0	0.0	0.0	0.9	0.9	0.9	0.9	75.7	75.6	75.6	75.6	2.4	2.4	2.4	2.4	21.1	21.1	21.1	21.1	0.0	0.0	0.0	0.0
JUN	0.0	0.0	0.0	0.0	4.3	4.2	4.2	4.2	78.5	78.6	78.6	78.6	0.9	0.9	0.9	0.9	16.2	16.2	16.2	16.2	0.0	0.0	0.0	0.0
JUL	0.0	22.6	22.6	26.1	8.6	6.2	6.2	5.8	47.9	35.6	35.6	33.6	1.6	1.5	1.5	1.5	41.7	33.9	33.9	32.8	0.2	0.2	0.2	0.2
AUG	0.0	0.0	0.0	14.0	8.1	7.9	7.9	6.6	20.8	20.9	20.9	17.6	2.8	2.8	2.8	2.4	67.7	67.8	67.8	58.7	0.6	0.6	0.6	0.6
SEP	0.0	0.0	0.0	0.0	2.6	1.9	1.9	1.7	19.6	15.0	15.0	13.4	1.8	1.5	1.5	1.4	75.9	81.4	81.4	83.1	0.1	0.2	0.2	0.4
1970																								
OCT	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	59.1	58.7	58.7	54.7	1.9	1.9	1.9	2.0	38.7	39.1	39.1	43.0	0.0	0.0	0.0	0.0
NOV	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.2	31.4	31.2	31.2	31.2	1.0	1.0	1.0	1.0	67.4	67.4	67.4	67.5	0.1	0.1	0.1	0.1
DEC	0.0	0.2	0.2	0.2	2.2	2.1	2.1	2.1	31.7	31.6	31.6	31.6	5.0	5.0	5.0	5.0	61.1	61.1	61.1	61.1	0.0	0.0	0.0	0.0
JAN	0.0	0.2	0.2	0.2	12.0	11.5	11.5	11.5	40.7	40.8	40.8	40.8	21.8	21.9	21.9	21.9	25.5	25.6	25.6	25.6	0.0	0.0	0.0	0.0
FEB	0.0	0.3	0.3	0.3	1.9	1.8	1.8	1.8	53.7	53.4	53.4	53.3	8.7	8.8	8.8	8.8	35.7	35.8	35.8	35.9	0.0	0.0	0.0	0.0
MAR	0.0	0.3	0.3	0.3	0.9	0.8	0.8	0.8	26.6	26.4	26.4	26.3	17.1	17.1	17.1	17.0	55.4	55.4	55.4	55.6	0.0	0.0	0.0	0.0
APR	0.0	3.1	8.4	8.0	0.6	0.6	0.6	0.6	76.7	74.0	69.8	69.8	1.5	1.8	2.1	2.1	21.1	20.5	19.0	19.3	0.0	0.0	0.0	0.0
MAY	0.0	1.0	9.5	9.0	3.8	3.7	3.4	3.4	74.7	73.2	66.8	66.8	1.7	1.8	2.3	2.3	19.7	20.0	17.8	18.3	0.3	0.3	0.3	0.3
JUN	0.0	0.1	0.1	0.1	7.6	7.4	7.4	7.4	21.6	21.8	21.8	21.8	2.9	3.0	3.0	3.0	67.6	67.4	67.4	67.5	0.3	0.3	0.3	0.3
JUL	0.0	0.0	0.0	0.0	5.9	5.8	5.8	5.7	10.1	10.1	10.1	10.0	2.0	2.0	2.0	2.0	81.9	82.0	82.0	82.1	0.2	0.2	0.2	0.2
AUG	0.0	23.8	17.8	30.6	7.3	5.3	5.7	4.8	15.8	11.8	12.8	10.6	2.7	2.1	2.3	1.9	73.7	56.4	60.8	51.5	0.6	0.6	0.6	0.6
SEP	0.0	0.0	0.0	0.0	4.6	4.5	4.5	4.5	13.9	13.9	13.9	13.8	2.7	2.7	2.7	2.7	77.4	77.5	77.5	77.6	1.4	1.4	1.4	1.4

Table B1–12. Continued

Water Year	DW Project No–Proj.	DW Project Alt. 1	DW Project Alt. 2	DW Project Alt. 3	Agricultural Drains No–Proj.	Agricultural Drains Alt. 1	Agricultural Drains Alt. 2	Agricultural Drains Alt. 3	SJR Inflow No–Proj.	SJR Inflow Alt. 1	SJR Inflow Alt. 2	SJR Inflow Alt. 3	Eastside Streams No–Proj.	Eastside Streams Alt. 1	Eastside Streams Alt. 2	Eastside Streams Alt. 3	Sacramento Inflow No–Proj.	Sacramento Inflow Alt. 1	Sacramento Inflow Alt. 2	Sacramento Inflow Alt. 3	Benicia Boundary No–Proj.	Benicia Boundary Alt. 1	Benicia Boundary Alt. 2	Benicia Boundary Alt. 3
1971																								
OCT	0.0	0.0	0.0	0.0	0.7	0.7	0.7	0.7	16.4	16.4	16.4	16.3	1.0	1.0	1.0	1.0	80.7	80.7	80.7	80.8	1.3	1.3	1.3	1.3
NOV	0.0	0.1	0.1	0.1	3.1	2.2	2.2	2.0	21.0	15.6	15.6	13.8	7.0	5.6	5.6	5.0	68.9	76.3	76.3	78.7	0.1	0.2	0.2	0.4
DEC	0.0	0.3	0.3	0.3	21.2	20.4	20.4	19.0	21.9	21.8	21.8	20.3	24.8	24.8	24.8	23.6	32.1	32.8	32.8	36.7	0.0	0.0	0.0	0.0
JAN	0.0	0.2	0.2	0.2	3.3	3.2	3.2	3.1	16.3	16.2	16.2	16.1	9.9	9.9	9.9	9.9	70.5	70.6	70.6	70.6	0.0	0.0	0.0	0.0
FEB	0.0	25.7	20.5	20.4	0.0	0.0	0.0	0.0	22.5	16.2	17.4	17.4	7.1	5.6	5.9	5.9	70.4	52.5	56.2	56.3	0.0	0.0	0.0	0.0
MAR	0.0	0.2	0.2	0.2	2.2	1.6	1.7	1.7	18.1	14.0	14.9	14.8	8.7	7.1	7.5	7.4	71.1	77.0	75.7	75.8	0.0	0.0	0.0	0.0
APR	0.0	1.8	1.4	1.1	0.4	0.4	0.4	0.4	52.2	51.1	51.3	51.3	6.1	6.1	6.1	6.1	41.3	40.6	40.8	41.1	0.0	0.0	0.0	0.0
MAY	0.0	0.2	0.2	0.2	1.9	1.8	1.9	1.8	37.9	36.9	37.0	36.4	5.3	5.3	5.3	5.3	54.9	55.8	55.7	56.3	0.0	0.0	0.0	0.0
JUN	0.0	0.1	0.1	0.1	5.0	4.9	4.9	4.9	17.5	17.6	17.6	17.6	3.6	3.6	3.6	3.6	73.9	73.9	73.9	73.9	0.0	0.0	0.0	0.0
JUL	0.0	0.0	0.0	0.0	5.9	5.8	5.8	5.7	10.1	10.1	10.1	10.0	2.0	2.0	2.0	2.0	81.9	82.1	82.1	82.1	0.1	0.1	0.1	0.1
AUG	0.0	25.2	25.2	29.7	7.0	5.0	5.0	4.7	15.4	11.3	11.3	10.5	2.6	2.0	2.0	1.9	74.4	55.8	55.8	52.6	0.6	0.6	0.6	0.6
SEP	0.0	0.0	0.0	8.4	3.2	3.2	3.2	2.9	9.4	9.4	9.4	8.6	2.0	2.0	2.0	1.9	84.7	84.7	84.7	77.7	0.7	0.7	0.7	0.7
1972																								
OCT	0.0	0.0	0.0	0.0	1.0	0.8	0.8	0.8	15.0	12.4	12.4	12.4	1.8	1.5	1.5	1.5	81.8	84.4	84.4	84.4	0.3	0.8	0.8	0.8
NOV	0.0	1.5	1.5	1.2	0.2	0.2	0.2	0.2	15.0	14.8	14.8	14.8	2.0	1.9	1.9	1.9	82.3	81.0	81.0	81.3	0.5	0.6	0.6	0.6
DEC	0.0	1.7	0.7	0.6	2.1	1.7	1.8	1.5	15.2	13.0	13.1	11.0	7.7	6.8	6.9	5.9	75.0	76.6	77.3	80.7	0.1	0.1	0.1	0.3
JAN	0.0	0.2	0.2	0.2	1.2	1.1	1.1	1.1	16.1	15.7	15.9	15.8	2.7	2.7	2.7	2.7	79.9	80.2	79.9	79.9	0.1	0.2	0.1	0.2
FEB	0.0	0.4	13.3	13.3	0.5	0.5	0.4	0.4	20.4	20.3	17.4	17.4	6.4	6.3	5.7	5.7	72.7	72.5	63.2	63.2	0.0	0.0	0.0	0.0
MAR	0.0	0.3	0.3	0.3	0.4	0.4	0.4	0.4	17.7	17.5	16.2	16.2	3.3	3.2	3.1	3.1	78.6	78.5	80.1	80.1	0.0	0.0	0.0	0.0
APR	0.0	11.4	8.0	7.6	2.0	1.8	1.9	1.9	64.4	56.7	58.9	58.9	4.4	5.0	4.9	4.9	29.1	25.0	26.3	26.7	0.1	0.1	0.1	0.1
MAY	0.0	8.2	5.6	4.9	5.7	5.1	5.3	5.3	45.7	41.6	42.8	42.8	5.4	5.4	5.4	5.4	42.9	39.4	40.6	41.3	0.3	0.3	0.3	0.3
JUN	0.0	0.1	0.1	0.1	7.9	7.7	7.7	7.7	17.8	18.0	18.0	18.0	3.1	3.1	3.1	3.1	70.8	70.7	70.7	70.7	0.4	0.4	0.4	0.4
JUL	0.0	0.0	0.0	0.0	5.9	5.8	5.8	5.7	9.8	9.8	9.8	9.8	2.1	2.1	2.1	2.1	81.9	82.0	82.0	82.1	0.3	0.3	0.3	0.3
AUG	0.0	0.0	0.0	0.0	4.8	4.6	4.6	4.6	6.1	6.1	6.1	6.1	2.0	2.0	2.0	2.0	86.7	86.8	86.8	86.8	0.4	0.4	0.4	0.4
SEP	0.0	20.2	18.5	29.1	3.0	2.3	2.4	2.0	18.6	14.6	14.9	12.8	2.2	1.8	1.8	1.6	74.9	59.8	61.1	53.1	1.4	1.4	1.4	1.4
1973																								
OCT	0.0	0.0	0.0	3.9	0.2	0.2	0.2	0.2	13.0	13.0	13.0	12.5	0.8	0.8	0.8	0.8	84.9	84.9	84.9	81.6	1.1	1.1	1.1	1.1
NOV	0.0	0.1	0.1	0.1	5.8	4.2	4.2	3.7	20.1	14.9	14.9	13.4	3.6	2.9	2.9	2.7	70.4	77.8	77.8	79.8	0.1	0.2	0.2	0.3
DEC	0.0	2.2	0.9	0.8	7.2	6.7	6.8	6.2	14.5	14.2	14.4	13.1	3.2	3.2	3.2	3.0	75.0	73.7	74.7	76.8	0.0	0.0	0.0	0.0
JAN	0.0	0.5	0.5	0.5	21.1	19.8	20.1	20.1	15.3	14.9	15.1	15.1	29.5	28.9	29.2	29.2	34.1	35.9	35.1	35.2	0.0	0.0	0.0	0.0
FEB	0.0	0.4	0.4	0.4	8.5	8.1	8.1	8.1	30.5	30.4	30.4	30.3	34.5	34.4	34.4	34.4	26.5	26.6	26.6	26.8	0.0	0.0	0.0	0.0
MAR	0.0	0.3	0.3	0.3	8.5	8.2	8.2	8.2	50.3	50.3	50.3	50.3	14.8	14.8	14.8	14.8	26.4	26.4	26.4	26.4	0.0	0.0	0.0	0.0
APR	0.0	0.6	0.6	0.6	0.3	0.3	0.3	0.3	63.1	62.9	62.9	62.9	4.9	5.0	5.0	5.0	31.7	31.3	31.3	31.3	0.0	0.0	0.0	0.0
MAY	0.0	0.2	0.2	0.2	3.0	3.0	3.0	3.0	54.3	54.3	54.3	54.3	4.4	4.4	4.4	4.4	38.3	38.2	38.2	38.2	0.0	0.0	0.0	0.0
JUN	0.0	4.5	21.5	21.1	6.7	6.2	5.0	5.0	27.5	26.2	21.1	21.1	2.6	2.5	2.2	2.2	63.1	60.5	50.2	50.6	0.1	0.1	0.1	0.1
JUL	0.0	0.6	0.6	0.1	6.0	5.8	5.8	5.8	10.0	10.0	10.0	10.0	2.0	2.0	2.0	2.0	81.9	81.6	81.6	82.0	0.1	0.1	0.1	0.1
AUG	0.0	20.9	0.0	18.2	7.4	5.6	7.2	5.8	15.7	12.2	15.7	12.6	2.9	2.3	2.9	2.4	73.4	58.2	73.5	60.3	0.7	0.7	0.7	0.7
SEP	0.0	0.0	0.0	0.0	4.1	4.0	4.0	3.9	13.2	13.3	13.3	13.2	2.7	2.7	2.7	2.7	78.7	78.8	78.8	78.9	1.3	1.3	1.3	1.3

Table B1-12. Continued

Water Year	DW Project No-Proj.	DW Project Alt. 1	DW Project Alt. 2	DW Project Alt. 3	Agricultural Drains No-Proj.	Agricultural Drains Alt. 1	Agricultural Drains Alt. 2	Agricultural Drains Alt. 3	SJR Inflow No-Proj.	SJR Inflow Alt. 1	SJR Inflow Alt. 2	SJR Inflow Alt. 3	Eastside Streams No-Proj.	Eastside Streams Alt. 1	Eastside Streams Alt. 2	Eastside Streams Alt. 3	Sacramento Inflow No-Proj.	Sacramento Inflow Alt. 1	Sacramento Inflow Alt. 2	Sacramento Inflow Alt. 3	Benicia Boundary No-Proj.	Benicia Boundary Alt. 1	Benicia Boundary Alt. 2	Benicia Boundary Alt. 3
1974																								
OCT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.2	12.2	12.2	12.1	8.6	8.6	8.6	8.6	78.1	78.1	78.1	78.2	1.1	1.1	1.1	1.1
NOV	0.0	0.1	0.1	0.1	3.0	2.2	2.2	1.9	19.3	14.3	14.3	12.7	11.6	9.2	9.2	8.3	66.0	74.2	74.2	77.0	0.0	0.0	0.0	0.0
DEC	0.0	0.2	0.2	0.2	11.3	10.8	10.8	10.1	19.2	19.1	19.1	17.9	22.5	22.4	22.4	21.3	47.0	47.4	47.4	50.5	0.0	0.0	0.0	0.0
JAN	0.0	0.3	0.3	0.3	9.6	9.2	9.2	9.2	25.2	25.0	25.0	25.0	30.4	30.3	30.3	30.3	34.8	35.1	35.1	35.2	0.0	0.0	0.0	0.0
FEB	0.0	0.3	0.3	0.3	0.4	0.4	0.4	0.4	25.4	25.3	25.3	25.2	5.1	5.1	5.1	5.1	69.0	68.9	68.9	69.0	0.0	0.0	0.0	0.0
MAR	0.0	0.3	0.3	0.3	2.6	2.5	2.5	2.4	26.6	26.5	26.5	26.3	25.3	25.1	25.1	25.1	45.5	45.7	45.7	45.8	0.0	0.0	0.0	0.0
APR	0.0	0.5	0.5	0.5	1.5	1.4	1.4	1.4	55.4	54.9	54.9	54.5	8.3	8.3	8.3	8.4	34.8	34.9	34.9	35.3	0.0	0.0	0.0	0.0
MAY	0.0	0.1	0.1	0.1	1.5	1.5	1.5	1.5	53.2	53.2	53.2	53.2	3.9	3.9	3.9	3.9	41.3	41.2	41.2	41.2	0.0	0.0	0.0	0.0
JUN	0.0	0.1	15.9	15.9	4.9	4.8	3.9	3.9	26.8	27.0	22.3	22.3	2.9	2.9	2.6	2.6	65.4	65.3	55.3	55.3	0.0	0.0	0.0	0.0
JUL	0.0	19.9	8.6	19.5	7.0	5.4	6.2	5.4	13.1	10.3	11.9	10.3	2.9	2.4	2.7	2.4	76.8	61.7	70.4	62.2	0.2	0.2	0.2	0.2
AUG	0.0	2.4	0.0	2.5	6.8	6.5	6.7	6.4	15.7	15.3	15.7	15.2	2.5	2.5	2.5	2.5	74.3	72.7	74.5	72.8	0.6	0.6	0.6	0.6
SEP	0.0	0.0	0.0	0.0	2.9	2.3	2.3	2.3	9.1	7.5	7.5	7.4	1.8	1.5	1.5	1.5	85.8	88.0	88.0	88.1	0.2	0.6	0.6	0.6
1975																								
OCT	0.0	0.0	0.0	0.0	0.6	0.5	0.5	0.5	15.3	14.1	14.1	11.6	2.3	2.1	2.1	1.8	81.7	83.1	83.1	85.8	0.0	0.1	0.1	0.3
NOV	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	21.3	21.2	21.2	21.2	3.0	3.0	3.0	3.0	75.4	75.4	75.4	75.4	0.2	0.2	0.2	0.2
DEC	0.0	0.2	0.2	0.2	0.0	0.0	0.0	0.0	17.9	17.8	17.8	17.8	4.6	4.6	4.6	4.6	77.4	77.3	77.3	77.3	0.2	0.2	0.2	0.2
JAN	0.0	0.2	0.2	0.2	0.1	0.1	0.1	0.1	12.2	12.1	12.1	12.1	2.4	2.4	2.4	2.4	84.8	84.6	84.6	84.7	0.4	0.4	0.4	0.4
FEB	0.0	0.5	0.5	0.5	12.7	12.1	12.1	12.1	37.1	36.9	36.9	36.9	12.0	12.0	12.0	12.0	38.2	38.5	38.5	38.6	0.0	0.0	0.0	0.0
MAR	0.0	0.3	0.3	0.3	6.2	5.9	5.9	5.9	26.6	26.4	26.4	26.3	32.3	32.2	32.2	32.1	34.9	35.2	35.2	35.4	0.0	0.0	0.0	0.0
APR	0.0	0.5	0.5	0.5	0.0	0.0	0.0	0.0	59.9	59.7	59.7	59.7	5.6	5.6	5.6	5.6	34.6	34.2	34.2	34.2	0.0	0.0	0.0	0.0
MAY	0.0	0.1	0.1	0.1	1.8	1.8	1.8	1.7	50.0	49.2	49.2	48.4	6.4	6.4	6.4	6.4	41.8	42.5	42.5	43.3	0.0	0.0	0.0	0.0
JUN	0.0	0.1	5.4	5.4	4.9	4.8	4.5	4.5	22.8	23.0	21.6	21.6	6.3	6.3	6.1	6.1	65.9	65.8	62.3	62.3	0.0	0.0	0.0	0.0
JUL	0.0	9.6	9.6	9.1	6.5	5.7	5.7	5.7	11.5	10.3	10.3	10.3	2.4	2.2	2.2	2.2	79.4	72.0	72.0	72.5	0.2	0.2	0.2	0.2
AUG	0.0	16.7	10.6	26.7	6.5	5.2	5.6	4.5	17.9	14.7	15.9	12.7	2.5	2.1	2.2	1.9	72.6	60.7	65.2	53.6	0.6	0.6	0.6	0.6
SEP	0.0	0.0	0.0	0.0	2.9	2.7	2.7	2.7	12.7	12.0	12.0	12.0	1.8	1.7	1.7	1.7	82.1	82.9	82.9	83.0	0.5	0.6	0.6	0.6
1976																								
OCT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.7	12.2	12.2	10.6	4.1	3.3	3.3	3.0	80.2	84.3	84.3	86.0	0.1	0.2	0.2	0.4
NOV	0.0	0.1	0.1	0.1	0.3	0.3	0.3	0.2	21.7	21.6	21.6	20.5	1.7	1.6	1.6	1.6	76.3	76.3	76.3	77.4	0.1	0.1	0.1	0.1
DEC	0.0	8.9	5.8	5.3	0.2	0.2	0.2	0.2	18.2	16.4	17.0	17.1	1.4	1.3	1.4	1.4	79.8	72.7	75.2	75.6	0.4	0.4	0.4	0.5
JAN	0.0	22.8	22.8	22.8	0.3	0.2	0.2	0.2	10.4	7.9	7.9	7.9	1.2	0.9	0.9	0.9	87.5	67.6	67.5	67.5	0.7	0.7	0.7	0.7
FEB	0.0	0.4	4.3	17.5	0.1	0.1	0.1	0.1	10.5	10.4	10.0	8.6	2.4	2.4	2.3	2.0	86.8	86.5	83.1	71.7	0.2	0.2	0.2	0.2
MAR	0.0	0.5	0.5	13.4	0.9	0.9	0.9	0.8	24.1	24.0	24.0	20.5	3.5	3.5	3.5	3.1	71.3	71.0	71.0	62.0	0.1	0.1	0.1	0.1
APR	0.0	1.3	1.3	1.3	1.8	1.8	1.8	1.8	51.3	50.4	50.4	50.0	4.9	5.0	5.0	5.0	41.6	41.3	41.3	41.6	0.3	0.3	0.3	0.3
MAY	0.0	0.3	0.3	0.3	5.8	5.7	5.7	5.6	39.2	38.7	38.7	38.3	4.6	4.6	4.6	4.5	49.9	50.3	50.3	50.7	0.5	0.5	0.5	0.5
JUN	0.0	0.1	0.1	0.1	8.1	7.9	7.9	7.9	17.3	17.4	17.4	17.4	2.9	3.0	3.0	3.0	71.3	71.2	71.2	71.2	0.5	0.5	0.5	0.5
JUL	0.0	0.0	0.0	0.0	7.8	7.6	7.6	7.5	7.6	7.7	7.7	7.6	2.7	2.7	2.7	2.7	81.2	81.4	81.4	81.5	0.7	0.7	0.7	0.7
AUG	0.0	0.0	0.0	0.0	9.2	8.9	8.9	8.8	13.1	13.1	13.1	13.0	3.6	3.6	3.6	3.6	72.5	72.7	72.7	72.9	1.7	1.7	1.7	1.7
SEP	0.0	0.0	0.0	0.0	4.7	4.6	4.6	4.6	15.1	15.0	15.0	14.9	3.9	3.9	3.9	3.9	73.9	74.0	74.0	74.2	2.4	2.4	2.4	2.4

Table B1-12. Continued

Water Year	DW Project No-Proj.	DW Project Alt. 1	DW Project Alt. 2	DW Project Alt. 3	Agricultural Drains No-Proj.	Agricultural Drains Alt. 1	Agricultural Drains Alt. 2	Agricultural Drains Alt. 3	SJR Inflow No-Proj.	SJR Inflow Alt. 1	SJR Inflow Alt. 2	SJR Inflow Alt. 3	Eastside Streams No-Proj.	Eastside Streams Alt. 1	Eastside Streams Alt. 2	Eastside Streams Alt. 3	Sacramento Inflow No-Proj.	Sacramento Inflow Alt. 1	Sacramento Inflow Alt. 2	Sacramento Inflow Alt. 3	Benicia Boundary No-Proj.	Benicia Boundary Alt. 1	Benicia Boundary Alt. 2	Benicia Boundary Alt. 3
1977																								
OCT	0.0	0.0	0.0	0.0	1.1	1.1	1.1	1.1	23.6	23.6	23.6	23.4	2.0	2.0	2.0	2.0	70.5	70.6	70.6	70.8	2.8	2.8	2.8	2.8
NOV	0.0	0.1	0.1	0.1	0.5	0.5	0.5	0.5	20.6	20.6	20.6	20.5	0.8	0.8	0.8	0.8	76.3	76.2	76.2	76.3	1.9	1.9	1.9	1.9
DEC	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	8.7	8.7	8.7	8.7	0.8	0.8	0.8	0.8	89.5	89.4	89.4	89.4	0.9	0.9	0.9	0.9
JAN	0.0	0.6	0.6	0.6	0.0	0.0	0.0	0.0	18.6	18.3	18.3	18.3	1.6	1.5	1.5	1.5	78.6	78.3	78.3	78.3	1.3	1.3	1.3	1.3
FEB	0.0	0.6	0.6	0.6	0.0	0.0	0.0	0.0	18.9	18.8	18.8	18.7	0.9	0.9	0.9	0.9	79.6	79.2	79.2	79.3	0.5	0.5	0.5	0.5
MAR	0.0	0.7	0.7	0.7	0.0	0.0	0.0	0.0	32.0	31.3	31.3	31.3	2.6	2.6	2.6	2.6	64.9	64.9	64.9	64.9	0.5	0.5	0.5	0.5
APR	0.0	1.3	1.3	1.3	3.8	3.8	3.8	3.7	51.0	49.9	49.9	49.6	4.9	4.9	4.9	4.9	39.8	39.7	39.7	40.0	0.5	0.5	0.5	0.5
MAY	0.0	0.4	0.4	0.4	4.4	4.3	4.3	4.3	56.3	55.1	55.1	54.5	2.6	2.7	2.7	2.7	35.5	36.3	36.3	37.0	1.1	1.1	1.1	1.1
JUN	0.0	0.2	0.2	0.2	16.3	15.9	15.9	15.7	38.8	38.9	38.9	38.3	4.4	4.4	4.4	4.4	38.9	39.1	39.1	40.0	1.6	1.6	1.6	1.6
JUL	0.0	0.0	0.0	0.0	15.4	15.0	15.0	14.8	14.7	14.8	14.8	14.6	4.6	4.6	4.6	4.5	63.6	63.8	63.8	64.2	1.8	1.8	1.8	1.8
AUG	0.0	0.0	0.0	0.0	16.9	16.5	16.5	16.3	20.0	20.1	20.1	19.8	5.5	5.6	5.6	5.5	55.4	55.6	55.6	56.2	2.2	2.2	2.2	2.2
SEP	0.0	0.0	0.0	0.0	6.2	6.0	6.0	6.0	18.1	18.1	18.1	18.0	3.6	3.6	3.6	3.6	69.4	69.5	69.5	69.8	2.7	2.7	2.7	2.7
1978																								
OCT	0.0	0.0	0.0	0.0	3.3	3.2	3.2	3.2	27.2	27.2	27.2	27.0	1.9	1.9	1.9	1.9	64.6	64.7	64.7	65.0	3.0	3.0	3.0	3.0
NOV	0.0	0.2	0.2	0.2	0.0	0.0	0.0	0.0	34.8	34.7	34.7	34.3	2.6	2.6	2.6	2.6	59.8	59.7	59.7	60.1	2.8	2.8	2.8	2.8
DEC	0.0	0.3	0.3	0.3	7.2	7.0	7.0	6.9	11.6	11.6	11.6	11.6	3.6	3.6	3.6	3.6	76.3	76.3	76.3	76.3	-1.3	1.3	1.3	1.3
JAN	0.0	0.4	0.4	0.4	24.3	17.6	17.6	15.5	21.6	16.3	16.3	14.4	20.4	16.6	16.6	15.0	33.7	49.1	49.1	54.7	0.0	0.0	0.0	0.0
FEB	0.0	0.4	0.4	0.4	9.4	9.0	9.0	8.5	33.4	33.2	33.2	31.5	11.0	11.0	11.0	10.7	46.2	46.4	46.4	48.9	0.0	0.0	0.0	0.0
MAR	0.0	0.4	0.4	0.4	11.4	10.9	10.9	10.9	27.8	27.6	27.6	27.5	16.3	16.2	16.2	16.2	44.5	44.8	44.8	45.0	0.0	0.0	0.0	0.0
APR	0.0	0.5	0.5	0.5	3.2	3.0	3.0	3.0	55.4	55.0	55.0	54.6	9.9	9.9	9.9	10.0	31.5	31.6	31.6	32.0	0.0	0.0	0.0	0.0
MAY	0.0	0.2	0.9	0.9	1.2	1.2	1.2	1.2	60.1	60.0	59.5	59.5	3.5	3.6	3.6	3.6	35.2	35.2	34.9	34.9	0.0	0.0	0.0	0.0
JUN	0.0	2.2	25.0	28.8	6.3	6.0	4.4	4.1	44.1	43.0	31.6	29.6	3.3	3.3	3.0	2.9	46.1	45.4	35.9	34.4	0.1	0.1	0.1	0.1
JUL	0.0	29.7	0.0	15.7	13.2	8.7	12.8	10.5	22.8	15.6	22.9	18.8	3.7	2.8	3.7	3.2	60.1	43.0	60.3	51.6	0.2	0.2	0.2	0.2
AUG	0.0	0.0	0.0	0.0	9.0	8.8	8.8	8.7	21.9	22.0	22.0	21.8	3.0	3.0	3.0	3.0	65.3	65.5	65.5	65.7	0.7	0.7	0.7	0.7
SEP	0.0	0.0	0.0	0.0	3.4	3.4	3.4	3.3	14.2	14.2	14.2	14.1	1.9	1.9	1.9	1.9	79.6	79.7	79.7	79.7	0.9	0.9	0.9	0.9
1979																								
OCT	0.0	0.0	0.0	0.0	1.5	1.2	1.2	1.2	24.7	19.8	19.8	19.8	1.0	0.8	0.8	0.8	72.5	77.4	77.4	77.4	0.3	0.8	0.8	0.8
NOV	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	20.5	20.1	20.1	20.1	1.1	1.1	1.1	1.1	77.9	78.0	78.0	78.0	0.5	0.7	0.7	0.7
DEC	0.0	30.4	30.4	30.3	0.0	0.0	0.0	0.0	22.8	15.3	15.3	15.2	1.5	1.1	1.1	1.1	74.8	52.2	52.2	52.3	0.9	1.0	1.0	1.0
JAN	0.0	0.4	0.4	0.3	14.2	10.3	10.3	9.1	22.1	16.6	16.6	14.7	8.9	7.3	7.3	6.6	54.8	65.4	65.4	69.3	0.0	0.0	0.0	0.1
FEB	0.0	0.5	0.5	0.5	12.0	11.5	11.5	10.9	39.5	39.3	39.3	37.3	15.2	15.2	15.2	15.0	33.3	33.5	33.5	36.4	0.0	0.0	0.0	0.0
MAR	0.0	0.3	0.3	0.3	3.1	3.0	3.0	3.0	34.5	34.3	34.3	34.1	14.2	14.1	14.1	14.1	48.2	48.3	48.3	48.5	0.0	0.0	0.0	0.0
APR	0.0	0.6	0.6	0.6	0.0	0.0	0.0	0.0	65.3	65.1	65.1	65.1	3.6	3.6	3.6	3.6	31.0	30.6	30.6	30.6	0.0	0.0	0.0	0.0
MAY	0.0	0.2	0.2	0.2	2.8	2.8	2.8	2.8	57.9	57.8	57.8	57.8	4.6	4.6	4.6	4.6	34.7	34.6	34.6	34.6	0.0	0.0	0.0	0.0
JUN	0.0	4.4	19.6	19.2	6.4	5.9	4.9	4.9	26.9	25.6	21.2	21.2	2.7	2.6	2.3	2.3	63.9	61.3	52.0	52.4	0.1	0.1	0.1	0.1
JUL	0.0	15.2	3.3	14.7	6.1	5.0	5.7	5.0	12.3	10.4	11.9	10.4	2.4	2.1	2.3	2.1	78.8	67.0	76.4	67.5	0.4	0.4	0.4	0.4
AUG	0.0	4.5	0.0	3.4	8.3	7.6	8.0	7.7	17.3	16.5	17.4	16.6	3.0	2.9	3.0	2.9	70.5	67.5	70.6	68.4	1.0	1.0	1.0	1.0
SEP	0.0	0.0	0.0	0.0	4.9	4.7	4.7	4.7	16.2	16.2	16.2	16.1	2.8	2.8	2.8	2.8	74.4	74.5	74.5	74.6	1.8	1.8	1.8	1.8

Table B1-12. Continued

Water	DW Project				Agricultural Drains				SJR Inflow				Eastside Streams				Sacramento Inflow				Benicia Boundary			
Year	No-Proj.	Alt. 1	Alt. 2	Alt. 3	No-Proj.	Alt. 1	Alt. 2	Alt. 3	No-Proj.	Alt. 1	Alt. 2	Alt. 3	No-Proj.	Alt. 1	Alt. 2	Alt. 3	No-Proj.	Alt. 1	Alt. 2	Alt. 3	No-Proj.	Alt. 1	Alt. 2	Alt. 3
1980																								
OCT	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	25.0	25.0	25.0	24.8	0.9	0.9	0.9	0.9	72.0	72.0	72.0	72.2	1.9	1.9	1.9	1.9
NOV	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	27.1	21.5	21.5	21.5	1.8	1.6	1.6	1.6	70.6	75.8	75.8	75.8	0.5	1.0	1.0	1.0
DEC	0.0	0.3	0.2	0.2	4.9	4.3	4.3	3.5	18.3	16.7	16.7	13.7	3.3	3.1	3.1	2.6	73.4	75.4	75.5	79.5	0.1	0.2	0.2	0.4
JAN	0.0	0.3	0.3	0.3	11.2	10.8	10.8	10.8	43.6	43.7	43.7	43.7	19.3	19.3	19.3	19.3	25.8	25.9	25.9	25.9	0.0	0.0	0.0	0.0
FEB	0.0	0.2	0.2	0.2	3.7	3.5	3.5	3.5	61.3	61.3	61.3	61.3	8.7	8.7	8.7	8.7	26.3	26.3	26.3	26.3	0.0	0.0	0.0	0.0
MAR	0.0	0.1	0.1	0.1	0.6	0.6	0.6	0.6	76.2	76.1	76.1	76.1	2.2	2.3	2.3	2.3	21.0	21.0	21.0	21.0	0.0	0.0	0.0	0.0
APR	0.0	0.6	7.2	7.2	0.0	0.0	0.0	0.0	73.2	73.0	68.0	68.0	2.4	2.5	3.0	3.0	24.4	23.9	21.8	21.8	0.0	0.0	0.0	0.0
MAY	0.0	0.2	16.9	16.9	2.5	2.5	2.1	2.1	72.9	72.8	60.4	60.4	1.9	1.9	2.8	2.8	22.6	22.5	17.8	17.8	0.0	0.0	0.0	0.0
JUN	0.0	4.8	13.2	28.5	7.2	6.6	5.9	4.7	44.2	41.7	37.4	29.7	3.3	3.3	3.2	2.9	45.0	43.4	40.0	33.9	0.2	0.2	0.2	0.2
JUL	0.0	27.3	0.0	0.0	11.7	7.9	11.4	11.2	28.2	19.8	28.3	28.0	3.6	2.8	3.6	3.5	56.3	41.8	56.5	56.9	0.3	0.3	0.3	0.3
AUG	0.0	0.0	0.0	0.0	8.6	8.3	8.3	8.3	21.5	21.5	21.5	21.4	2.9	2.9	2.9	2.9	66.3	66.5	66.5	66.7	0.7	0.7	0.7	0.7
SEP	0.0	0.0	0.0	0.0	3.1	3.1	3.1	3.1	24.6	24.6	24.6	24.6	1.6	1.6	1.6	1.6	69.8	69.8	69.8	69.9	0.9	0.9	0.9	0.9
1981																								
OCT	0.0	0.0	0.0	0.0	1.5	1.2	1.2	1.2	29.6	24.0	24.0	24.0	2.5	2.2	2.2	2.2	66.1	71.9	71.9	71.9	0.3	0.8	0.8	0.8
NOV	0.0	1.3	1.3	1.0	0.7	0.7	0.7	0.7	28.3	27.9	27.9	27.9	2.4	2.4	2.4	2.4	68.1	67.1	67.1	67.4	0.6	0.8	0.8	0.7
DEC	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	23.8	21.5	21.5	21.2	1.6	1.5	1.5	1.4	74.2	76.2	76.2	76.4	0.5	0.7	0.7	0.8
JAN	0.0	0.4	0.4	0.4	10.6	10.2	10.2	8.4	21.7	21.5	21.5	17.7	4.2	4.2	4.2	3.7	63.5	63.6	63.6	69.8	0.0	0.0	0.0	0.0
FEB	0.0	0.3	5.4	5.4	1.4	1.3	1.2	1.2	25.5	25.5	24.0	24.0	2.2	2.2	2.1	2.1	70.9	70.8	67.3	67.3	0.0	0.0	0.0	0.0
MAR	0.0	0.4	0.4	0.4	8.1	7.7	7.3	7.2	21.3	21.1	20.0	19.9	10.0	9.9	9.6	9.5	60.7	61.0	62.8	63.0	0.0	0.0	0.0	0.0
APR	0.0	12.1	8.5	8.1	0.0	0.0	0.0	0.0	64.3	56.1	58.5	58.5	2.4	2.8	2.7	2.7	33.3	28.9	30.3	30.7	0.0	0.0	0.0	0.0
MAY	0.0	20.1	15.1	14.4	3.8	3.0	3.2	3.2	66.2	52.0	55.3	55.3	2.1	2.7	2.6	2.6	27.6	21.9	23.5	24.2	0.2	0.2	0.2	0.2
JUN	0.0	0.1	0.1	0.1	7.6	7.4	7.4	7.4	19.3	19.4	19.4	19.4	3.1	3.1	3.1	3.1	69.5	69.4	69.4	69.4	0.5	0.5	0.5	0.5
JUL	0.0	0.0	0.0	0.0	5.9	5.8	5.8	5.7	9.8	9.8	9.8	9.8	2.0	2.0	2.0	2.0	81.8	81.9	81.9	82.0	0.5	0.5	0.5	0.5
AUG	0.0	11.8	15.7	24.1	6.4	5.5	5.2	4.7	9.4	8.3	7.9	7.1	2.6	2.3	2.2	2.0	80.6	71.2	68.0	61.3	1.0	1.0	1.0	1.0
SEP	0.0	0.0	0.0	7.5	4.9	4.8	4.8	4.4	13.0	13.0	13.0	11.9	2.9	2.9	2.9	2.7	77.4	77.5	77.5	71.7	1.8	1.8	1.8	1.8
1982																								
OCT	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	15.7	15.6	15.6	15.5	0.8	0.8	0.8	0.8	81.9	82.0	82.0	82.1	1.5	1.5	1.5	1.5
NOV	0.0	0.1	0.1	0.1	0.2	0.1	0.1	0.1	12.8	9.5	9.5	8.4	7.5	5.8	5.8	5.2	79.5	84.5	84.5	86.2	0.0	0.0	0.0	0.0
DEC	0.0	3.0	1.2	1.1	8.0	7.4	7.6	7.1	13.0	12.5	12.8	11.9	19.8	19.3	19.6	18.5	59.2	57.8	58.9	61.4	0.0	0.0	0.0	0.0
JAN	0.0	0.4	0.4	0.4	17.9	17.3	17.3	17.3	19.6	19.6	19.6	19.6	43.7	43.8	43.8	43.8	18.8	18.8	18.8	18.8	0.0	0.0	0.0	0.0
FEB	0.0	0.3	0.3	0.3	4.8	4.6	4.6	4.6	35.6	35.5	35.5	35.5	32.9	32.9	32.9	32.9	26.7	26.6	26.6	26.6	0.0	0.0	0.0	0.0
MAR	0.0	0.2	0.2	0.2	8.2	7.9	7.9	7.9	49.9	49.9	49.9	49.9	15.3	15.3	15.3	15.3	26.6	26.6	26.6	26.6	0.0	0.0	0.0	0.0
APR	0.0	0.1	0.1	0.1	2.8	2.7	2.7	2.7	56.1	56.1	56.1	56.1	12.8	12.9	12.9	12.9	28.2	28.2	28.2	28.2	0.0	0.0	0.0	0.0
MAY	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5	70.9	70.9	70.9	70.9	4.4	4.4	4.4	4.4	24.3	24.2	24.2	24.2	0.0	0.0	0.0	0.0
JUN	0.0	0.0	0.0	0.0	4.1	4.0	4.0	4.0	48.3	48.3	48.3	48.3	7.4	7.4	7.4	7.4	40.2	40.2	40.2	40.2	0.0	0.0	0.0	0.0
JUL	0.0	15.5	15.5	15.0	7.0	5.6	5.6	5.6	33.1	27.5	27.5	27.5	6.7	6.1	6.1	6.1	53.0	45.1	45.1	45.5	0.2	0.2	0.2	0.2
AUG	0.0	7.0	7.0	19.6	6.1	5.5	5.5	4.7	19.9	18.4	18.4	15.6	5.8	5.5	5.5	4.8	67.6	63.0	63.0	54.6	0.6	0.6	0.6	0.6
SEP	0.0	0.0	0.0	0.0	0.5	0.4	0.4	0.3	39.5	29.5	29.5	26.2	2.8	2.5	2.5	2.3	57.1	67.5	67.5	70.9	0.0	0.1	0.1	0.2

C-061572

Table B1-12. Continued

Water	DW Project				Agricultural Drains				SJR Inflow				Eastside Streams				Sacramento Inflow				Benicia Boundary			
Year	No-Proj.	Alt. 1	Alt. 2	Alt. 3	No-Proj.	Alt. 1	Alt. 2	Alt. 3	No-Proj.	Alt. 1	Alt. 2	Alt. 3	No-Proj.	Alt. 1	Alt. 2	Alt. 3	No-Proj.	Alt. 1	Alt. 2	Alt. 3	No-Proj.	Alt. 1	Alt. 2	Alt. 3
1983																								
OCT	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	81.2	81.2	81.2	81.2	0.9	0.9	0.9	0.9	17.7	17.7	17.7	17.7	0.0	0.0	0.0	0.0
NOV	0.0	0.1	0.1	0.1	4.5	4.3	4.3	4.3	56.2	56.3	56.3	56.3	12.0	12.0	12.0	12.0	27.3	27.3	27.3	27.3	0.0	0.0	0.0	0.0
DEC	0.0	0.1	0.1	0.1	5.9	5.6	5.6	5.6	54.3	54.4	54.4	54.4	12.8	12.8	12.8	12.8	27.0	27.1	27.1	27.1	0.0	0.0	0.0	0.0
JAN	0.0	0.1	0.1	0.1	5.6	5.4	5.4	5.4	56.7	56.8	56.8	56.8	11.1	11.1	11.1	11.1	26.6	26.6	26.6	26.6	0.0	0.0	0.0	0.0
FEB	0.0	0.1	0.1	0.1	2.5	2.4	2.4	2.4	62.3	62.3	62.3	62.3	8.5	8.5	8.5	8.5	26.7	26.7	26.7	26.7	0.0	0.0	0.0	0.0
MAR	0.0	0.1	0.1	0.1	3.8	3.7	3.7	3.7	58.5	58.5	58.5	58.5	10.6	10.6	10.6	10.6	27.1	27.1	27.1	27.1	0.0	0.0	0.0	0.0
APR	0.0	0.1	0.1	0.1	0.3	0.2	0.2	0.2	72.6	72.5	72.5	72.5	3.7	3.7	3.7	3.7	23.4	23.4	23.4	23.4	0.0	0.0	0.0	0.0
MAY	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	75.9	75.9	75.9	75.9	2.4	2.4	2.4	2.4	21.5	21.5	21.5	21.5	0.0	0.0	0.0	0.0
JUN	0.0	0.0	0.0	0.0	1.2	1.2	1.2	1.2	77.9	77.9	77.9	77.9	1.6	1.6	1.6	1.6	19.3	19.3	19.3	19.3	0.0	0.0	0.0	0.0
JUL	0.0	0.0	0.0	0.0	4.1	4.0	4.0	4.0	73.4	73.5	73.5	73.5	2.4	2.4	2.4	2.4	20.0	20.0	20.0	20.0	0.0	0.0	0.0	0.0
AUG	0.0	0.0	0.0	0.0	4.8	4.6	4.6	4.6	38.3	38.2	38.2	37.9	5.5	5.5	5.5	5.5	51.3	51.5	51.5	51.9	0.2	0.2	0.2	0.2
SEP	0.0	0.0	0.0	0.0	1.9	1.8	1.8	1.8	75.6	75.2	75.2	74.7	1.7	1.7	1.7	1.8	20.8	21.2	21.2	21.7	0.0	0.0	0.0	0.0
1984																								
OCT	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5	82.2	82.2	82.2	82.2	0.7	0.7	0.7	0.7	16.6	16.6	16.6	16.6	0.0	0.0	0.0	0.0
NOV	0.0	0.1	0.1	0.1	5.0	4.9	4.9	4.9	52.8	52.8	52.8	52.8	14.5	14.5	14.5	14.5	27.7	27.7	27.7	27.7	0.0	0.0	0.0	0.0
DEC	0.0	0.1	0.1	0.1	5.7	5.5	5.5	5.5	52.3	52.4	52.4	52.4	14.5	14.5	14.5	14.5	27.4	27.5	27.5	27.5	0.0	0.0	0.0	0.0
JAN	0.0	0.1	0.1	0.1	0.6	0.6	0.6	0.6	73.9	73.9	73.9	73.9	3.1	3.1	3.1	3.1	22.4	22.4	22.4	22.4	0.0	0.0	0.0	0.0
FEB	0.0	0.2	0.2	0.2	1.6	1.5	1.5	1.5	68.0	67.9	67.9	67.9	5.5	5.5	5.5	5.5	24.9	24.9	24.9	24.9	0.0	0.0	0.0	0.0
MAR	0.0	0.3	0.3	0.2	0.0	0.0	0.0	0.0	53.0	52.6	52.6	52.4	9.3	9.3	9.3	9.3	37.7	37.8	37.8	38.0	0.0	0.0	0.0	0.0
APR	0.0	0.7	2.5	2.5	1.0	1.0	1.0	1.0	67.3	67.1	65.8	65.8	4.9	4.9	5.1	5.1	26.8	26.4	25.6	25.6	0.0	0.0	0.0	0.0
MAY	0.0	0.2	7.0	7.0	3.4	3.4	3.2	3.2	65.3	65.2	60.7	60.7	3.7	3.7	4.0	4.0	27.5	27.4	25.0	25.0	0.1	0.1	0.1	0.1
JUN	0.0	0.1	0.1	0.1	7.5	7.3	7.3	7.3	25.2	25.4	25.4	25.4	5.5	5.6	5.6	5.6	61.6	61.5	61.5	61.5	0.2	0.2	0.2	0.2
JUL	0.0	4.3	4.3	3.9	6.3	5.8	5.8	5.8	10.9	10.4	10.4	10.4	4.0	3.9	3.9	3.9	78.7	75.4	75.4	75.9	0.2	0.2	0.2	0.2
AUG	0.0	21.0	16.5	29.8	7.6	5.7	6.1	5.0	19.4	15.1	16.0	13.2	6.2	5.1	5.3	4.6	66.2	52.5	55.5	46.8	0.6	0.6	0.6	0.6
SEP	0.0	0.0	0.0	0.0	2.6	2.6	2.6	2.5	16.9	17.0	17.0	16.9	5.0	5.0	5.0	5.0	74.7	74.7	74.7	74.8	0.8	0.8	0.8	0.8
1985																								
OCT	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	21.5	17.0	17.0	17.0	4.2	3.5	3.5	3.5	73.9	78.7	78.7	78.7	0.3	0.6	0.6	0.6
NOV	0.0	0.1	0.1	0.1	2.6	2.3	2.3	1.9	28.5	26.4	26.4	21.5	5.6	5.4	5.4	4.7	63.3	65.8	65.8	71.8	0.0	0.0	0.0	0.0
DEC	0.0	0.2	0.2	0.2	7.3	7.0	7.0	7.0	34.9	34.7	34.7	34.7	5.7	5.7	5.7	5.7	52.1	52.4	52.4	52.4	0.0	0.0	0.0	0.0
JAN	0.0	0.2	1.6	1.6	2.7	2.5	2.5	2.5	25.2	25.0	24.7	24.7	2.3	2.3	2.2	2.2	69.5	69.5	68.6	68.6	0.4	0.4	0.4	0.4
FEB	0.0	0.4	27.3	27.3	2.9	2.8	2.0	2.0	29.0	28.9	20.4	20.4	8.2	8.2	6.6	6.6	59.8	59.6	43.8	43.8	0.0	0.0	0.0	0.0
MAR	0.0	0.4	4.9	26.5	6.3	6.0	5.7	4.3	28.2	28.0	26.6	20.0	9.4	9.4	9.1	7.5	56.1	56.1	53.6	41.7	0.0	0.0	0.0	0.0
APR	0.0	15.2	1.0	1.0	0.5	0.4	0.5	0.5	73.3	62.0	72.5	72.5	3.3	4.7	3.4	3.4	22.7	17.5	22.3	22.3	0.2	0.2	0.2	0.2
MAY	0.0	7.4	0.3	0.3	4.6	4.2	4.6	4.5	43.3	39.7	42.8	42.5	4.6	4.5	4.5	4.5	47.4	44.1	47.7	48.1	0.1	0.1	0.1	0.1
JUN	0.0	0.1	0.1	0.1	8.2	8.0	8.0	8.0	18.7	18.9	18.9	18.9	3.2	3.2	3.2	3.2	69.5	69.3	69.3	69.4	0.5	0.5	0.5	0.5
JUL	0.0	0.0	0.0	0.0	5.9	5.8	5.8	5.7	9.7	9.8	9.8	9.7	2.0	2.0	2.0	2.0	81.9	82.0	82.0	82.1	0.4	0.4	0.4	0.4
AUG	0.0	6.4	0.0	0.0	5.1	4.7	5.0	5.0	7.6	7.1	7.6	7.6	2.1	2.0	2.1	2.1	84.5	79.2	84.6	84.7	0.7	0.7	0.7	0.7
SEP	0.0	11.3	0.0	0.0	4.3	3.7	4.2	4.1	14.5	12.8	14.5	14.4	2.4	2.2	2.4	2.4	77.3	68.6	77.4	77.5	1.5	1.5	1.5	1.5

Table B1–12. Continued

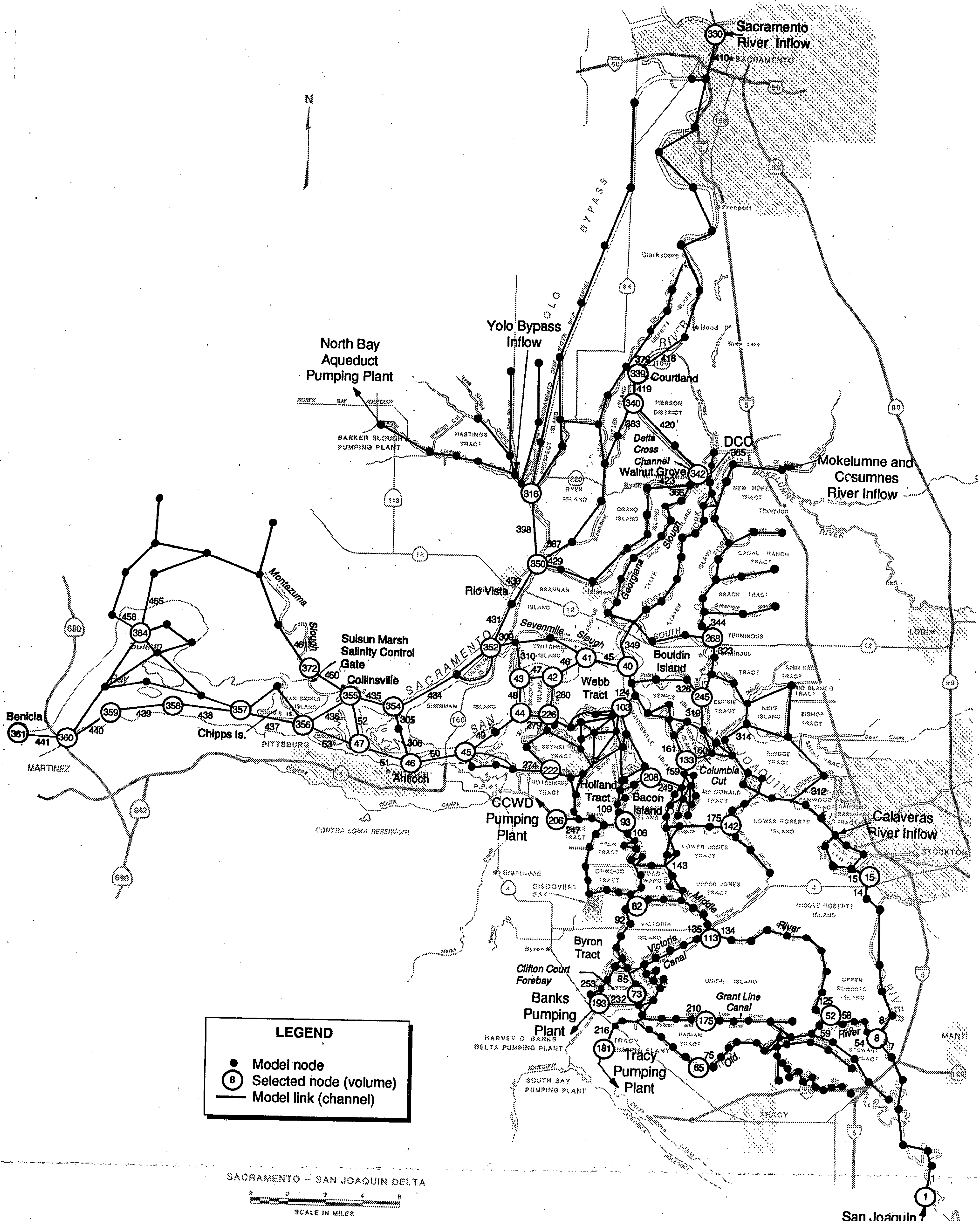
Water Year	DW Project No-Proj.	DW Project Alt. 1	DW Project Alt. 2	DW Project Alt. 3	Agricultural Drains No-Proj.	Agricultural Drains Alt. 1	Agricultural Drains Alt. 2	Agricultural Drains Alt. 3	SJR Inflow No-Proj.	SJR Inflow Alt. 1	SJR Inflow Alt. 2	SJR Inflow Alt. 3	Eastside Streams No-Proj.	Eastside Streams Alt. 1	Eastside Streams Alt. 2	Eastside Streams Alt. 3	Sacramento Inflow No-Proj.	Sacramento Inflow Alt. 1	Sacramento Inflow Alt. 2	Sacramento Inflow Alt. 3	Benicia Boundary No-Proj.	Benicia Boundary Alt. 1	Benicia Boundary Alt. 2	Benicia Boundary Alt. 3
1986																								
OCT	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5	19.7	19.7	19.7	19.6	1.1	1.1	1.1	1.1	77.2	77.2	77.2	77.3	1.5	1.5	1.5	1.5
NOV	0.0	0.2	0.2	0.2	0.5	0.5	0.5	0.5	27.5	27.5	27.5	27.3	3.0	3.0	3.0	3.0	67.7	67.5	67.5	67.7	1.3	1.3	1.3	1.3
DEC	0.0	0.2	0.2	0.2	8.0	7.4	7.4	7.4	17.7	17.1	17.1	17.0	4.0	3.9	3.9	3.9	69.6	70.6	70.6	70.7	0.7	0.8	0.8	0.8
JAN	0.0	0.3	0.3	0.3	8.4	6.6	6.6	6.6	11.7	9.6	9.6	9.6	8.1	6.8	6.8	6.8	71.7	76.4	76.4	76.4	0.1	0.3	0.3	0.3
FEB	0.0	0.3	0.3	0.3	9.6	9.3	9.3	9.3	30.4	30.4	30.4	30.4	36.0	36.0	36.0	36.0	24.1	24.1	24.1	24.1	0.0	0.0	0.0	0.0
MAR	0.0	0.1	0.1	0.1	3.7	3.6	3.6	3.6	57.7	57.7	57.7	57.7	11.2	11.2	11.2	11.2	27.4	27.4	27.4	27.4	0.0	0.0	0.0	0.0
APR	0.0	0.2	0.2	0.2	0.0	0.0	0.0	0.0	75.8	75.6	75.6	75.6	2.5	2.5	2.5	2.5	21.7	21.7	21.7	21.7	0.0	0.0	0.0	0.0
MAY	0.0	0.2	28.0	23.6	1.7	1.7	1.2	1.3	70.8	70.7	50.7	53.8	4.1	4.1	6.0	5.9	23.4	23.3	14.1	15.4	0.0	0.0	0.0	0.0
JUN	0.0	0.1	0.1	23.4	6.5	6.4	6.4	4.7	45.1	45.4	45.4	33.3	5.7	5.7	5.7	5.3	42.4	42.2	42.2	33.1	0.3	0.2	0.2	0.2
JUL	0.0	23.6	0.0	0.0	8.6	6.3	8.4	8.3	17.8	13.3	17.8	17.7	4.0	3.2	4.0	3.9	69.4	53.4	69.6	69.8	0.3	0.3	0.3	0.3
AUG	0.0	0.0	0.0	0.0	8.4	8.2	8.2	8.1	22.4	22.5	22.5	22.3	5.3	5.3	5.3	5.3	63.3	63.4	63.4	63.6	0.6	0.6	0.6	0.6
SEP	0.0	0.0	0.0	0.0	2.4	2.3	2.3	2.3	25.4	25.4	25.4	25.3	4.0	4.0	4.0	4.0	66.8	66.9	66.9	67.1	1.3	1.3	1.3	1.3
1987																								
OCT	0.0	0.0	0.0	0.0	1.5	1.5	1.5	1.5	43.5	43.5	43.5	43.5	3.2	3.2	3.2	3.2	50.3	50.4	50.4	50.4	1.5	1.5	1.5	1.5
NOV	0.0	0.1	0.1	0.1	1.0	1.0	1.0	1.0	27.6	27.6	27.6	27.5	4.2	4.2	4.2	4.1	66.0	66.0	66.0	66.1	1.2	1.2	1.2	1.1
DEC	0.0	0.2	0.2	0.2	0.0	0.0	0.0	0.0	39.3	39.2	39.2	39.0	3.2	3.2	3.2	3.2	56.1	56.0	56.0	56.2	1.3	1.3	1.3	1.3
JAN	0.0	0.4	0.4	0.4	0.5	0.5	0.5	0.5	16.2	16.1	16.1	16.1	3.1	3.1	3.1	3.1	79.1	78.8	78.8	78.8	1.0	1.0	1.0	1.0
FEB	0.0	0.7	0.7	0.7	15.0	14.4	14.4	14.4	15.2	15.1	15.1	15.1	5.6	5.6	5.6	5.6	64.1	64.1	64.1	64.1	0.1	0.1	0.1	0.1
MAR	0.0	0.4	0.4	0.4	8.9	7.8	7.8	7.8	15.9	14.5	14.5	14.5	6.9	6.4	6.4	6.4	68.3	71.0	71.0	71.0	0.0	0.0	0.0	0.0
APR	0.0	18.0	12.8	12.3	1.0	0.8	0.8	0.8	53.8	43.6	46.4	46.4	3.2	3.3	3.3	3.3	42.0	34.3	36.6	37.1	0.1	0.1	0.1	0.1
MAY	0.0	2.2	5.4	4.6	5.8	5.6	5.4	5.4	37.2	36.1	34.9	34.9	3.9	3.9	3.8	3.8	52.8	52.0	50.3	51.0	0.3	0.3	0.3	0.3
JUN	0.0	0.1	0.1	0.1	8.4	8.2	8.2	8.2	18.4	18.6	18.6	18.6	2.8	2.9	2.9	2.9	69.8	69.7	69.7	69.7	0.5	0.5	0.5	0.5
JUL	0.0	0.0	0.0	0.0	5.9	5.8	5.8	5.7	8.3	8.4	8.4	8.3	1.9	1.9	1.9	1.9	83.4	83.5	83.5	83.6	0.4	0.4	0.4	0.4
AUG	0.0	0.0	0.0	0.0	5.8	5.6	5.6	5.6	7.6	7.6	7.6	7.6	2.2	2.2	2.2	2.2	83.6	83.7	83.7	83.8	0.8	0.8	0.8	0.8
SEP	0.0	0.0	0.0	0.0	4.9	4.8	4.8	4.8	13.7	13.7	13.7	13.7	2.9	2.9	2.9	2.9	76.8	76.9	76.9	77.0	1.7	1.7	1.7	1.7
1988																								
OCT	0.0	0.0	0.0	0.0	1.1	1.1	1.1	1.1	18.7	18.6	18.6	18.5	1.8	1.8	1.8	1.8	76.6	76.6	76.6	76.7	1.8	1.8	1.8	1.8
NOV	0.0	0.2	0.2	0.2	0.0	0.0	0.0	0.0	22.3	22.2	22.2	22.1	4.0	4.0	4.0	4.0	72.1	72.0	72.0	72.1	1.6	1.6	1.6	1.6
DEC	0.0	0.2	0.2	0.2	3.8	3.6	3.6	3.6	11.0	10.9	10.9	10.9	5.7	5.7	5.7	5.7	78.7	78.7	78.7	78.7	0.8	0.9	0.9	0.9
JAN	0.0	0.4	0.4	0.5	10.1	7.2	7.2	6.3	8.5	6.3	6.3	5.6	3.9	3.0	3.0	2.6	77.5	83.0	83.0	84.9	0.0	0.1	0.1	0.1
FEB	0.0	0.6	36.7	39.4	0.0	0.0	0.0	0.0	12.5	12.4	7.7	7.3	2.4	2.4	1.6	1.5	85.0	84.6	54.0	51.7	0.0	0.1	0.1	0.1
MAR	0.0	0.6	1.1	22.7	0.7	0.7	0.7	0.5	24.6	24.4	24.2	18.4	1.9	1.9	1.9	1.6	72.5	72.2	71.9	56.6	0.2	0.2	0.2	0.2
APR	0.0	15.3	1.4	1.3	2.6	2.2	2.6	2.5	52.3	43.9	51.2	50.9	5.1	5.2	5.1	5.1	39.7	33.0	39.4	39.7	0.3	0.3	0.3	0.3
MAY	0.0	9.5	0.4	0.4	4.5	4.0	4.5	4.4	43.9	39.2	43.2	42.7	4.5	4.4	4.5	4.5	46.6	42.4	47.1	47.5	0.5	0.5	0.5	0.5
JUN	0.0	0.1	0.1	0.1	7.1	6.9	6.9	6.9	19.3	19.5	19.5	19.5	2.9	2.9	2.9	2.9	70.2	70.1	70.1	70.1	0.5	0.5	0.5	0.5
JUL	0.0	16.4	0.0	0.0	8.0	6.5	7.8	7.7	9.5	7.9	9.6	9.5	2.5	2.2	2.5	2.5	79.2	66.3	79.3	79.5	0.8	0.8	0.8	0.8
AUG	0.0	0.0	0.0	0.0	8.6	8.3	8.3	8.3	11.1	11.2	11.2	11.1	3.2	3.2	3.2	3.2	75.4	75.6	75.6	75.8	1.7	1.7	1.7	1.7
SEP	0.0	0.0	0.0	0.0	7.2	7.0	7.0	7.0	18.6	18.7	18.7	18.6	4.0	4.0	4.0	4.0	67.8	67.9	67.9	68.1	2.4	2.4	2.4	2.4

C-061574

Table B1-12. Continued

Water Year	DW Project No-Proj.	DW Project Alt. 1	DW Project Alt. 2	DW Project Alt. 3	Agricultural Drains No-Proj.	Agricultural Drains Alt. 1	Agricultural Drains Alt. 2	Agricultural Drains Alt. 3	SJR Inflow No-Proj.	SJR Inflow Alt. 1	SJR Inflow Alt. 2	SJR Inflow Alt. 3	Eastside Streams No-Proj.	Eastside Streams Alt. 1	Eastside Streams Alt. 2	Eastside Streams Alt. 3	Sacramento Inflow No-Proj.	Sacramento Inflow Alt. 1	Sacramento Inflow Alt. 2	Sacramento Inflow Alt. 3	Benicia Boundary No-Proj.	Benicia Boundary Alt. 1	Benicia Boundary Alt. 2	Benicia Boundary Alt. 3
1989																								
OCT	0.0	0.0	0.0	0.0	2.9	2.8	2.8	2.8	29.9	29.9	29.9	29.6	2.0	2.0	2.0	2.0	62.5	62.5	62.5	62.8	2.8	2.8	2.8	2.8
NOV	0.0	0.2	0.2	0.2	0.0	0.0	0.0	0.0	19.9	19.9	19.9	19.7	4.2	4.2	4.2	4.2	73.8	73.6	73.6	73.8	2.1	2.1	2.1	2.1
DEC	0.0	0.3	0.3	0.3	0.5	0.5	0.5	0.5	13.8	13.7	13.7	13.7	5.7	5.6	5.6	5.6	78.7	78.4	78.4	78.5	1.4	1.4	1.4	1.4
JAN	0.0	0.3	0.3	0.3	2.8	2.6	2.6	2.6	10.0	9.9	9.9	9.9	1.7	1.7	1.7	1.7	84.4	84.4	84.4	84.4	1.1	1.1	1.1	1.1
FEB	0.0	0.6	0.6	0.6	3.0	2.8	2.8	2.8	11.9	11.8	11.8	11.8	3.6	3.6	3.6	3.6	81.1	80.7	80.7	80.7	0.5	0.5	0.5	0.5
MAR	0.0	0.2	0.2	0.2	3.9	2.8	2.8	2.8	11.8	8.8	8.8	8.8	11.5	8.9	8.9	8.9	72.8	79.3	79.3	79.3	0.0	0.0	0.0	0.0
APR	0.0	0.8	0.8	0.8	0.5	0.5	0.5	0.5	34.8	34.6	34.6	34.6	7.4	7.4	7.4	7.4	57.3	56.7	56.7	56.7	0.0	0.0	0.0	0.0
MAY	0.0	13.2	9.0	8.4	5.2	4.4	4.6	4.6	40.3	34.6	36.3	36.3	4.8	4.6	4.7	4.7	49.7	43.2	45.3	46.0	0.1	0.1	0.1	0.1
JUN	0.0	0.1	0.1	0.1	8.3	8.1	8.1	8.1	19.3	19.5	19.5	19.5	3.1	3.2	3.2	3.2	68.8	68.7	68.7	68.7	0.5	0.5	0.5	0.5
JUL	0.0	0.0	0.0	0.0	5.9	5.8	5.8	5.7	6.1	6.1	6.1	6.1	2.1	2.1	2.1	2.1	85.4	85.6	85.6	85.7	0.4	0.4	0.4	0.4
AUG	0.0	0.0	0.0	0.0	4.7	4.5	4.5	4.5	6.4	6.4	6.4	6.3	2.0	2.0	2.0	2.0	86.4	86.5	86.5	86.6	0.6	0.6	0.6	0.6
SEP	0.0	25.4	27.5	24.1	0.8	0.6	0.6	0.6	11.6	8.5	8.2	8.6	3.1	2.4	2.3	2.4	83.1	61.8	60.0	63.0	1.4	1.4	1.4	1.4
1990																								
OCT	0.0	0.0	0.0	0.0	0.6	0.6	0.6	0.6	22.5	22.4	22.4	22.2	1.5	1.5	1.5	1.5	73.7	73.8	73.8	74.0	1.7	1.7	1.7	1.7
NOV	0.0	0.2	0.2	0.2	0.0	0.0	0.0	0.0	24.4	24.3	24.3	24.1	3.6	3.6	3.6	3.6	70.4	70.2	70.2	70.5	1.6	1.6	1.6	1.6
DEC	0.0	0.2	0.2	0.2	0.3	0.3	0.3	0.3	11.3	11.3	11.3	11.2	0.7	0.7	0.7	0.7	86.7	86.5	86.5	86.6	1.0	1.0	1.0	1.0
JAN	0.0	0.3	0.3	0.3	1.2	1.1	1.1	1.1	8.1	7.5	7.5	7.5	2.4	2.2	2.2	2.2	87.8	88.4	88.4	88.4	0.5	0.6	0.6	0.6
FEB	0.0	0.7	14.2	13.9	6.5	6.1	5.2	5.2	14.7	14.6	12.5	12.5	5.6	5.6	4.9	4.9	73.2	72.9	63.1	63.4	0.1	0.1	0.1	0.1
MAR	0.0	0.7	0.7	0.7	0.0	0.0	0.0	0.0	25.3	25.0	25.0	25.0	5.8	5.7	5.7	5.7	68.6	68.3	68.3	68.3	0.3	0.3	0.3	0.3
APR	0.0	14.2	1.1	1.1	2.3	1.9	2.2	2.2	43.0	36.6	42.2	41.9	6.7	6.5	6.7	6.7	47.9	40.7	47.7	47.9	0.1	0.1	0.1	0.1
MAY	0.0	3.3	0.4	0.4	2.5	2.4	2.5	2.5	53.0	50.5	52.0	51.4	3.9	4.0	4.0	4.0	40.0	39.3	40.6	41.2	0.5	0.5	0.5	0.5
JUN	0.0	0.1	0.1	0.1	6.4	6.3	6.3	6.3	17.3	17.4	17.4	17.4	3.5	3.5	3.5	3.5	72.4	72.3	72.3	72.3	0.5	0.5	0.5	0.5
JUL	0.0	0.0	0.0	0.0	8.0	7.8	7.8	7.7	7.9	7.9	7.9	7.8	2.6	2.6	2.6	2.6	80.8	81.0	81.0	81.1	0.8	0.8	0.8	0.7
AUG	0.0	0.0	0.0	0.0	8.5	8.3	8.3	8.2	10.6	10.7	10.7	10.6	3.2	3.2	3.2	3.1	76.1	76.3	76.3	76.4	1.7	1.7	1.7	1.7
SEP	0.0	0.0	0.0	0.0	6.7	6.5	6.5	6.5	18.4	18.5	18.5	18.3	3.7	3.7	3.7	3.7	68.8	68.8	68.8	69.1	2.4	2.4	2.4	2.4
1991																								
OCT	0.0	0.0	0.0	0.0	2.4	2.3	2.3	2.3	31.0	31.0	31.0	30.7	1.6	1.6	1.6	1.6	62.2	62.3	62.3	62.6	2.8	2.8	2.8	2.8
NOV	0.0	0.2	0.2	0.2	1.4	1.4	1.4	1.4	27.0	26.9	26.9	26.7	1.9	1.9	1.9	1.9	67.4	67.2	67.2	67.5	2.3	2.3	2.3	2.3
DEC	0.0	0.3	0.3	0.3	0.0	0.0	0.0	0.0	19.1	19.0	19.0	18.9	2.2	2.2	2.2	2.2	76.8	76.6	76.6	76.7	1.9	1.9	1.9	1.9
JAN	0.0	0.4	0.4	0.4	0.0	0.0	0.0	0.0	12.8	12.7	12.7	12.7	0.9	0.9	0.9	0.9	84.7	84.5	84.5	84.5	1.5	1.5	1.5	1.5
FEB	0.0	0.7	0.7	0.7	0.0	0.0	0.0	0.0	14.0	13.9	13.9	13.8	3.3	3.2	3.2	3.2	82.2	81.7	81.7	81.7	0.6	0.6	0.6	0.6
MAR	0.0	0.5	0.5	0.5	8.4	7.9	7.9	7.9	9.3	9.2	9.2	9.2	11.4	11.3	11.3	11.3	70.9	71.0	71.0	71.0	0.0	0.0	0.0	0.0
APR	0.0	1.1	1.1	1.1	0.6	0.6	0.6	0.6	53.9	52.9	52.9	52.6	5.6	5.7	5.7	5.7	39.8	39.7	39.7	40.0	0.0	0.0	0.0	0.0
MAY	0.0	0.4	0.4	0.4	4.8	4.7	4.7	4.7	46.4	45.6	45.6	45.1	6.7	6.7	6.7	6.7	41.5	42.0	42.0	42.5	0.7	0.7	0.7	0.7
JUN	0.0	0.1	0.1	0.1	5.5	5.3	5.3	5.3	19.9	19.9	19.9	19.8	3.9	3.9	3.9	3.9	70.2	70.3	70.3	70.4	0.5	0.5	0.5	0.5
JUL	0.0	0.0	0.0	0.0	10.0	9.7	9.7	9.6	9.6	9.7	9.7	9.6	3.0	3.0	3.0	3.0	76.2	76.4	76.4	76.6	1.2	1.2	1.2	1.2
AUG	0.0	0.0	0.0	0.0	9.2	8.9	8.9	8.9	11.7	11.7	11.7	11.6	3.3	3.3	3.3	3.3	73.9	74.1	74.1	74.3	1.9	1.9	1.9	1.9
SEP	0.0	0.0	0.0	0.0	6.0	5.9	5.9	5.8	16.0	16.0	16.0	15.9	3.2	3.2	3.2	3.2	72.2	72.3	72.3	72.5	2.5	2.5	2.5	2.5

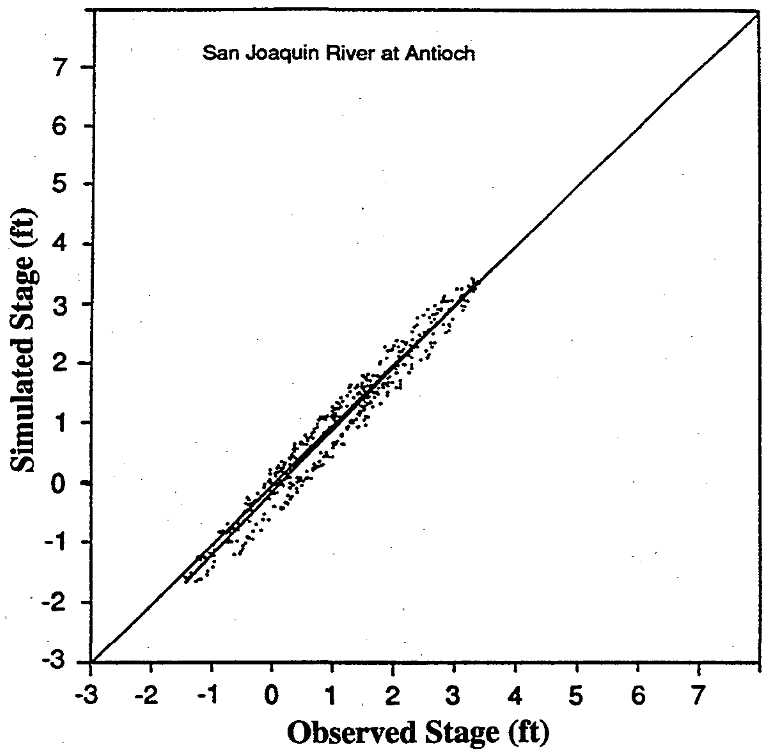
C-061575

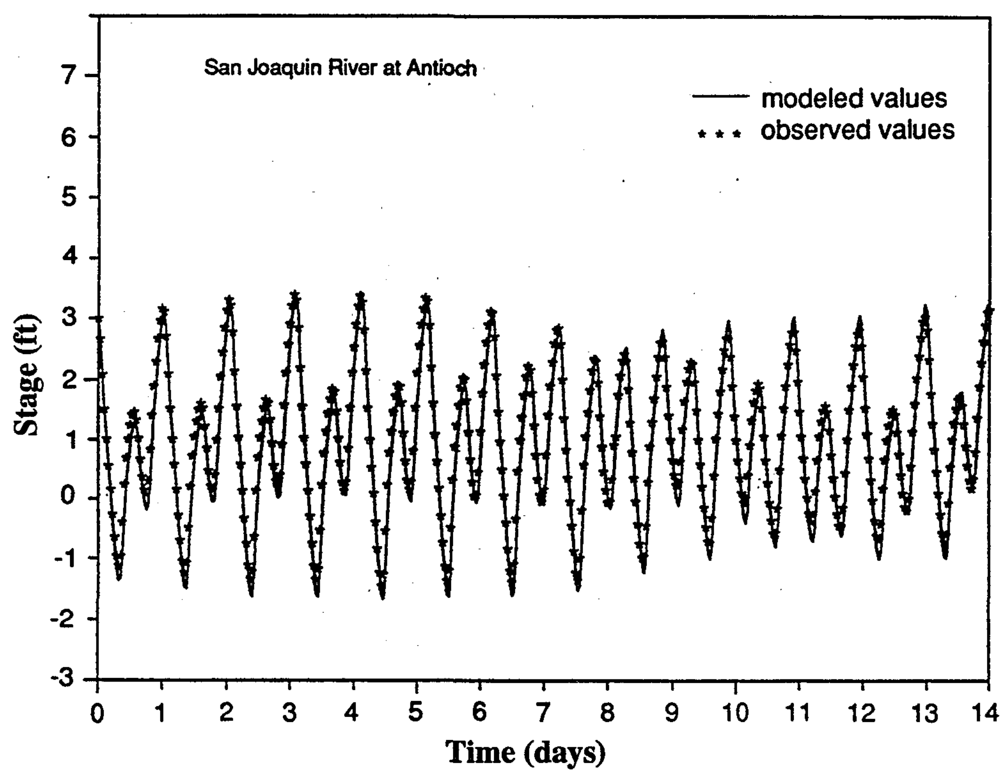


Source: Adapted from California Department of Water Resources 1993.

Figure B1-1.
RMA Delta Model Link-Node Representation of Major Delta Channels

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

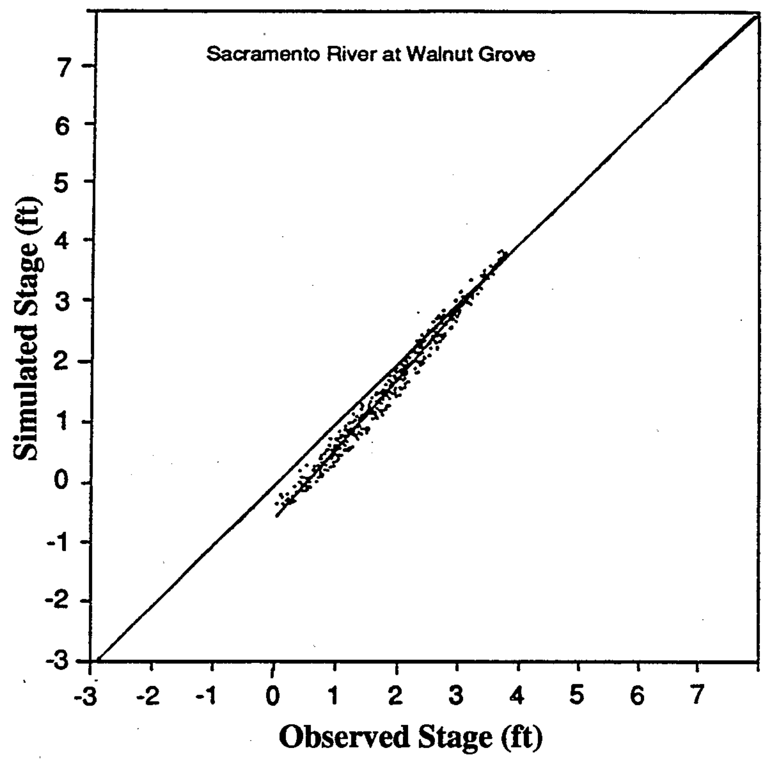


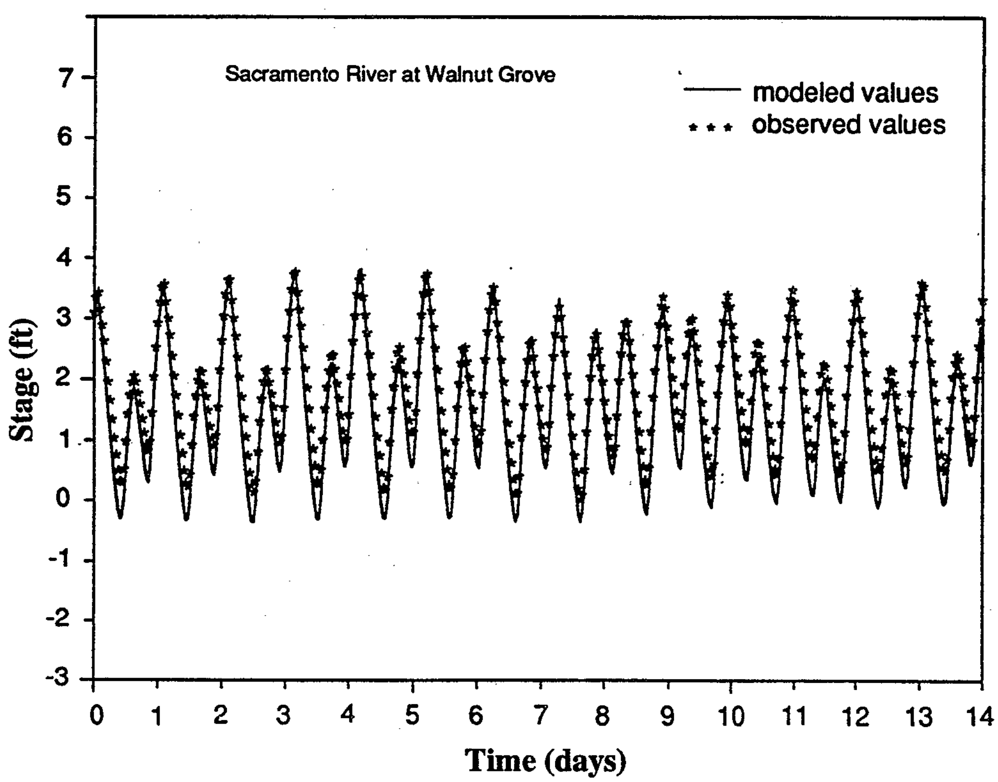


Source: Smith and Durbin 1989.

Figure B1-2.
Comparison of Observed and Simulated Stage on the San Joaquin River at Antioch during July 6-19, 1979

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

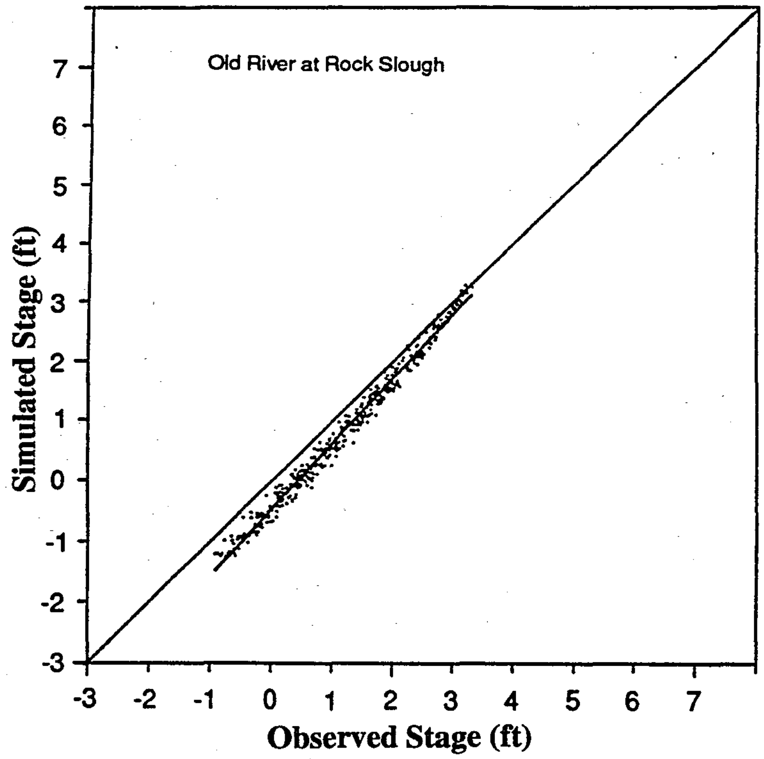


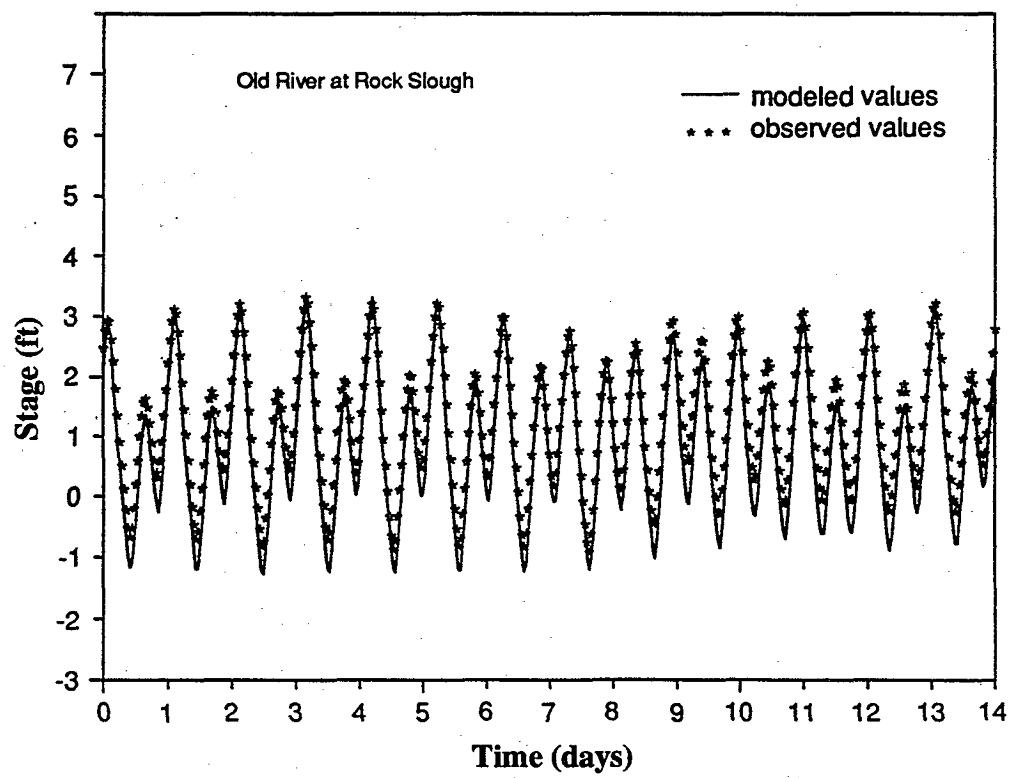


Source: Smith and Durbin 1989.

Figure B1-3.
Comparison of Observed and Simulated Stage on the Sacramento River at Walnut Grove during July 6-19, 1979

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





Source: Smith and Durbin 1989.

Figure B1-4.
Comparison of Observed and Simulated Stage on Old River at Rock Slough during July 6-19, 1979

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

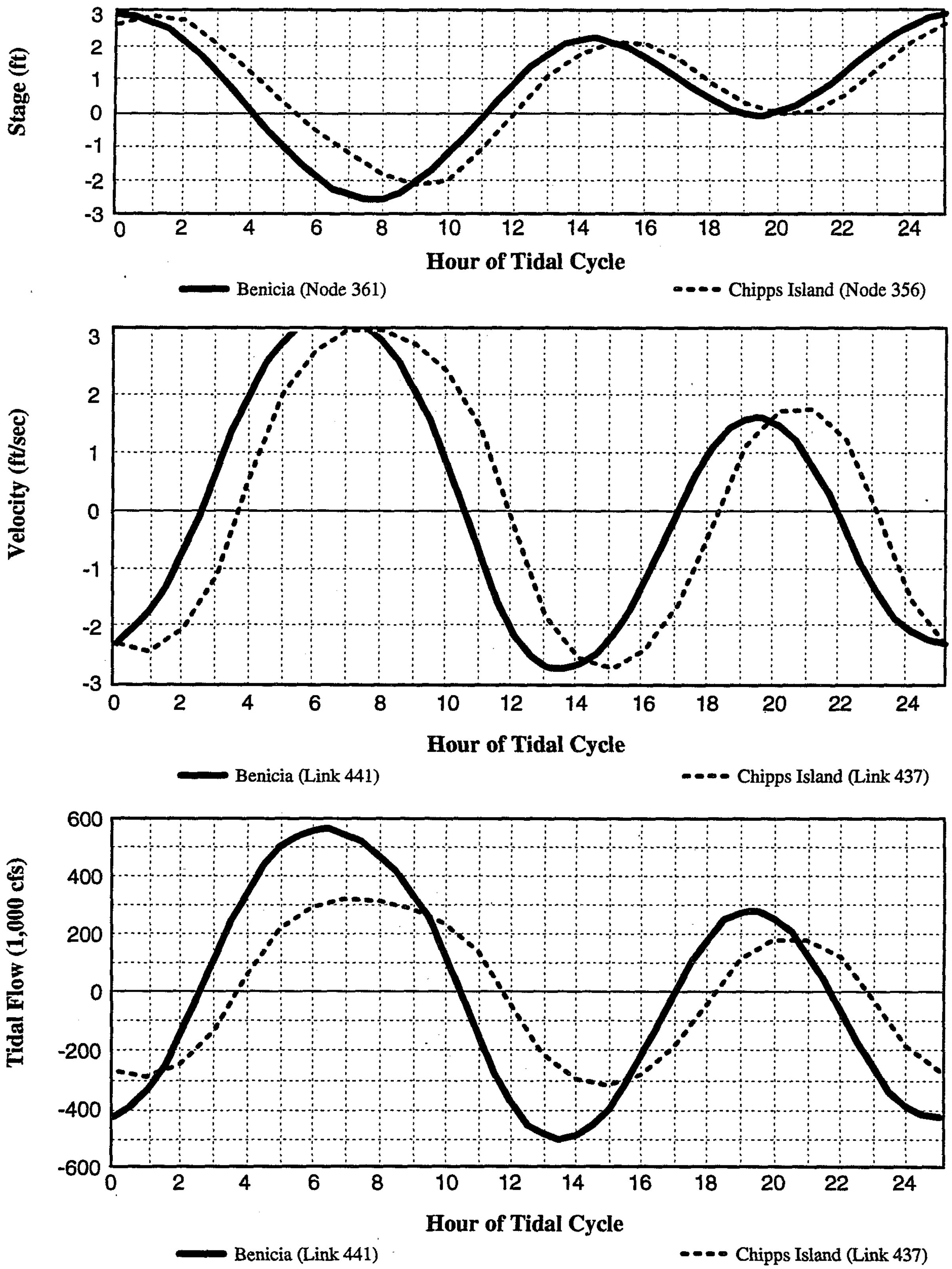


Figure B1-5.
Simulated Tidal Hydraulics in Suisun Bay

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

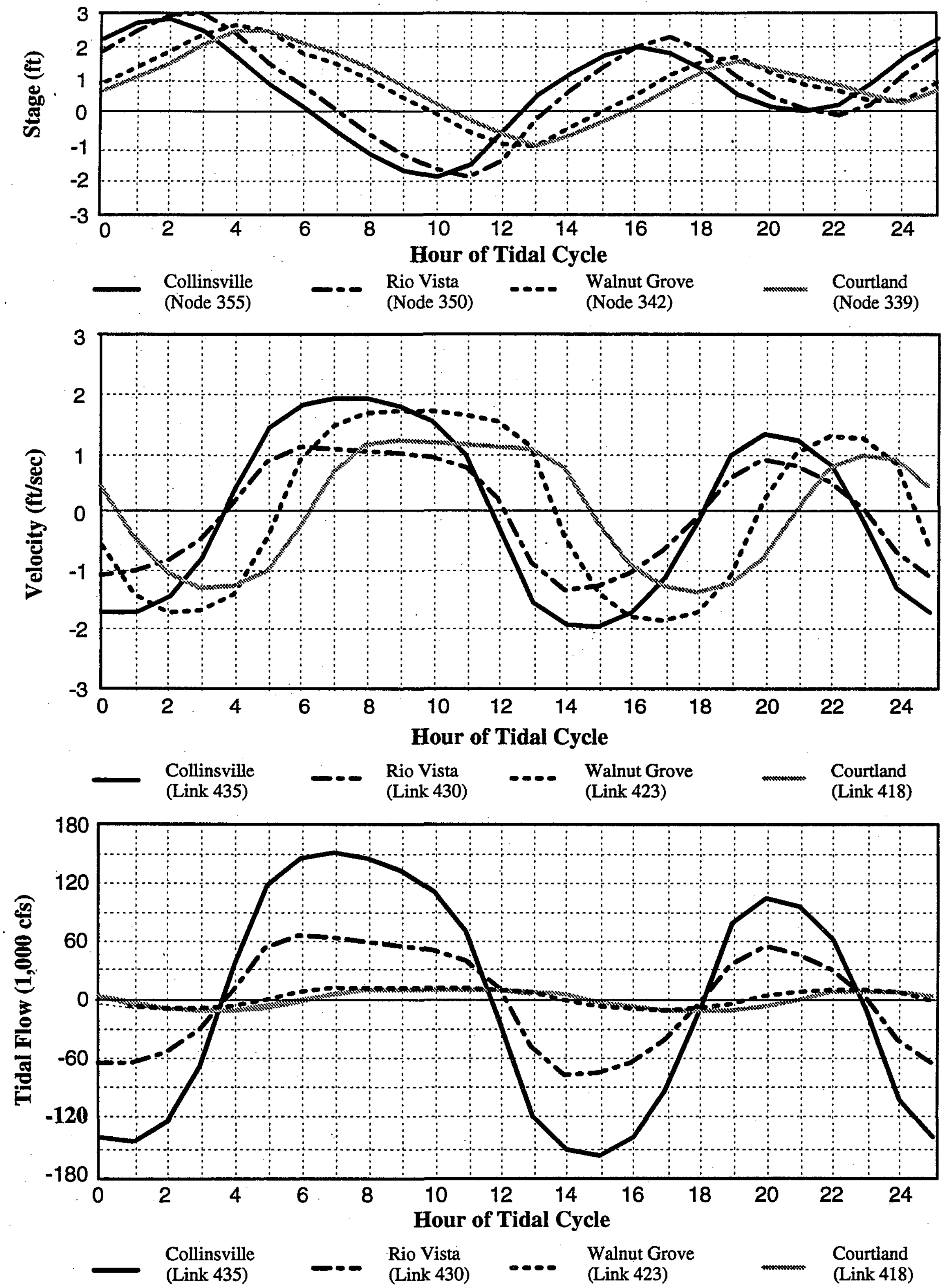


Figure B1-6.
Simulated Tidal Hydraulics
in the Sacramento River

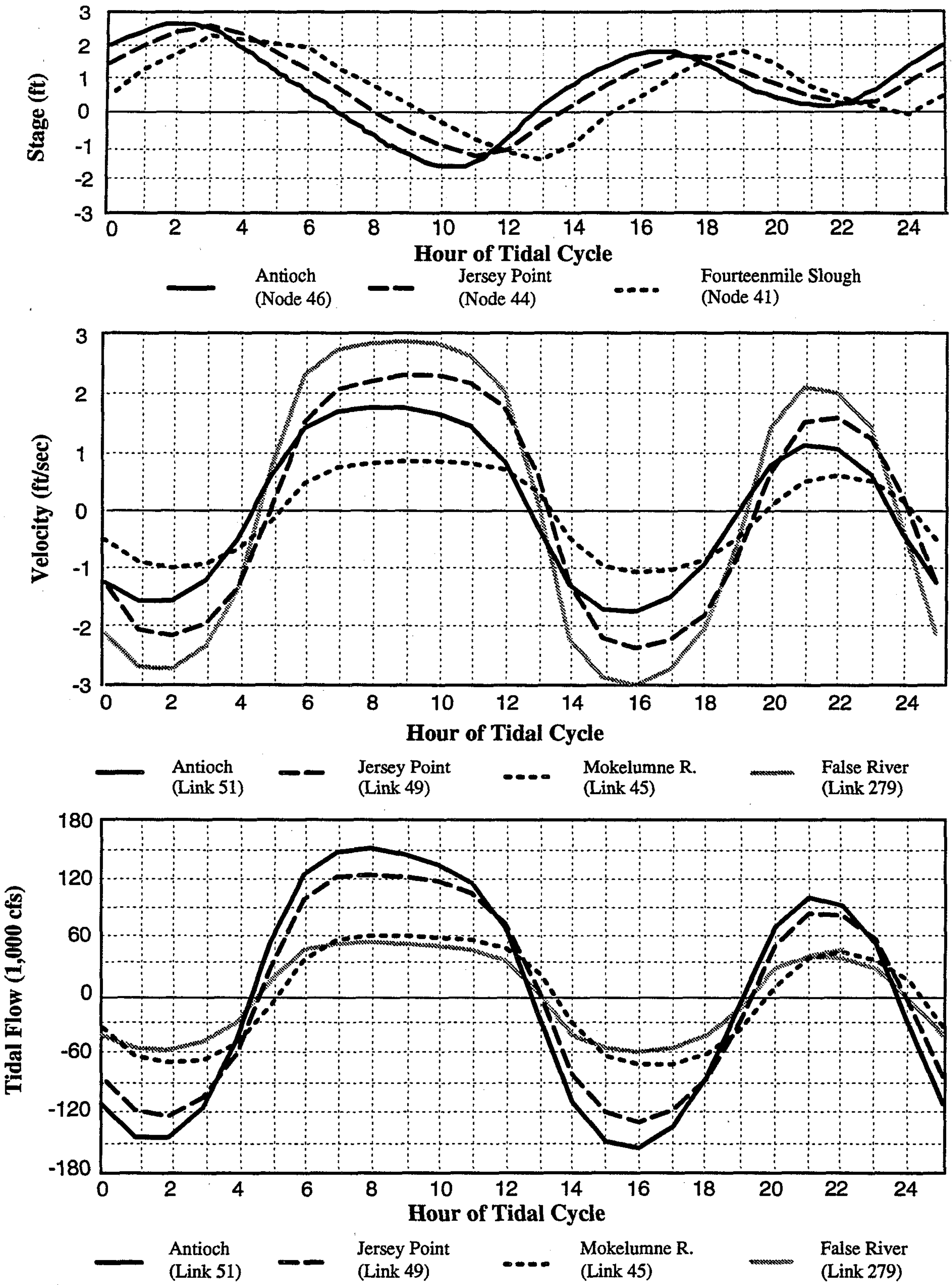


Figure B1-7.
Simulated Tidal Hydraulics
in the San Joaquin River

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

C—061582

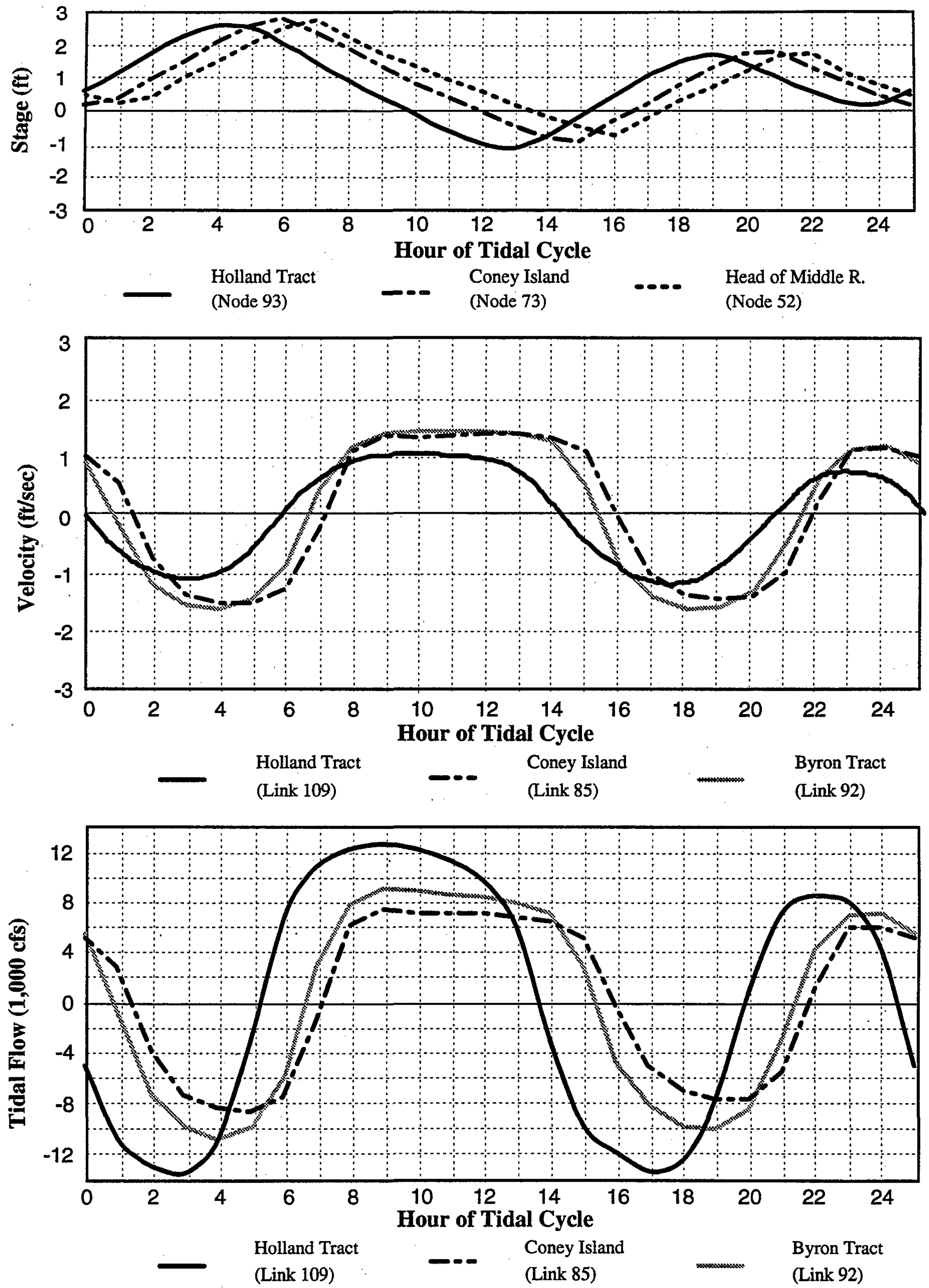


Figure B1-8.
Simulated Tidal Hydraulics in Old River

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

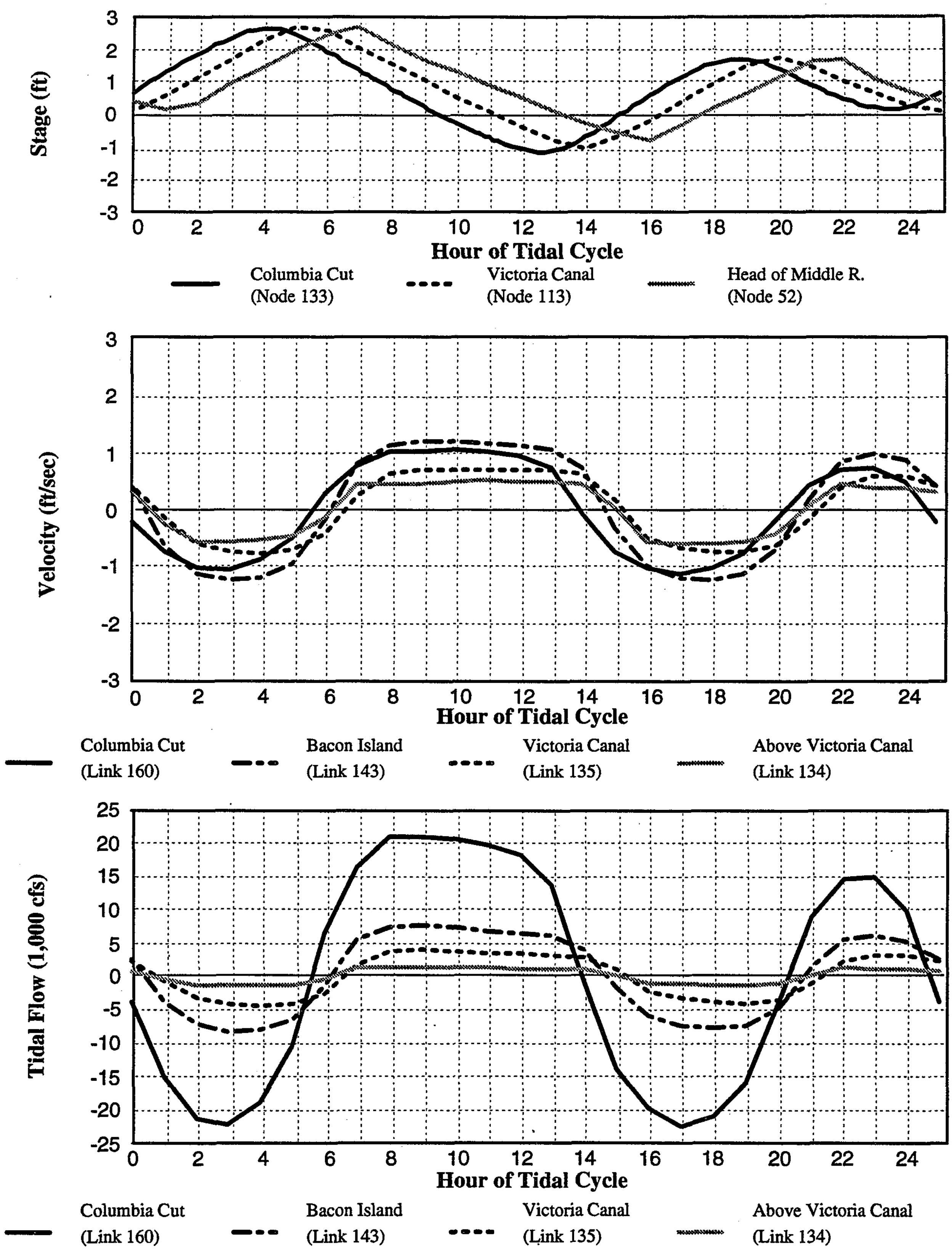


Figure B1-9.
Simulated Tidal Hydraulics in Middle River

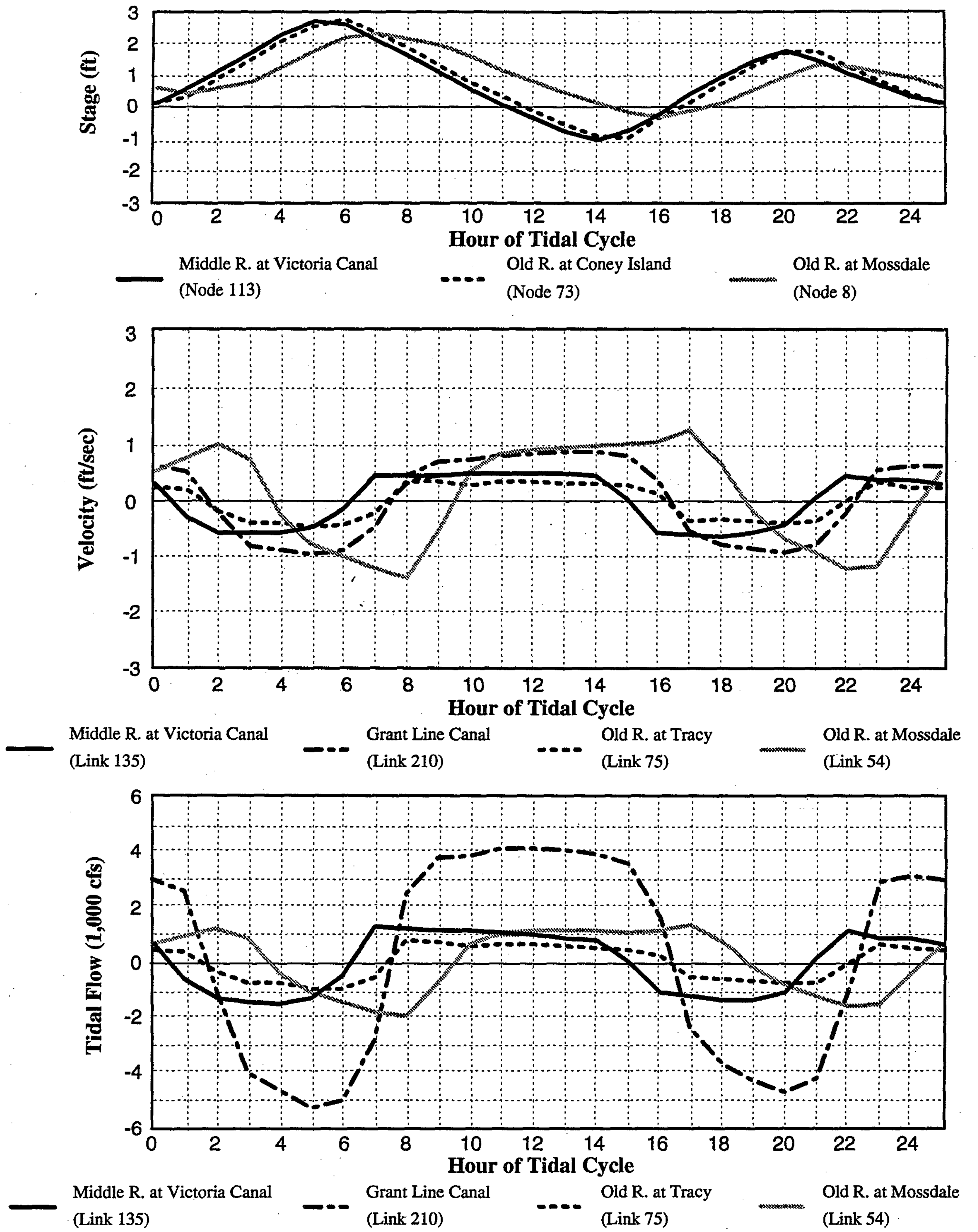


Figure B1-10.
Simulated Tidal Hydraulics in the South Delta

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

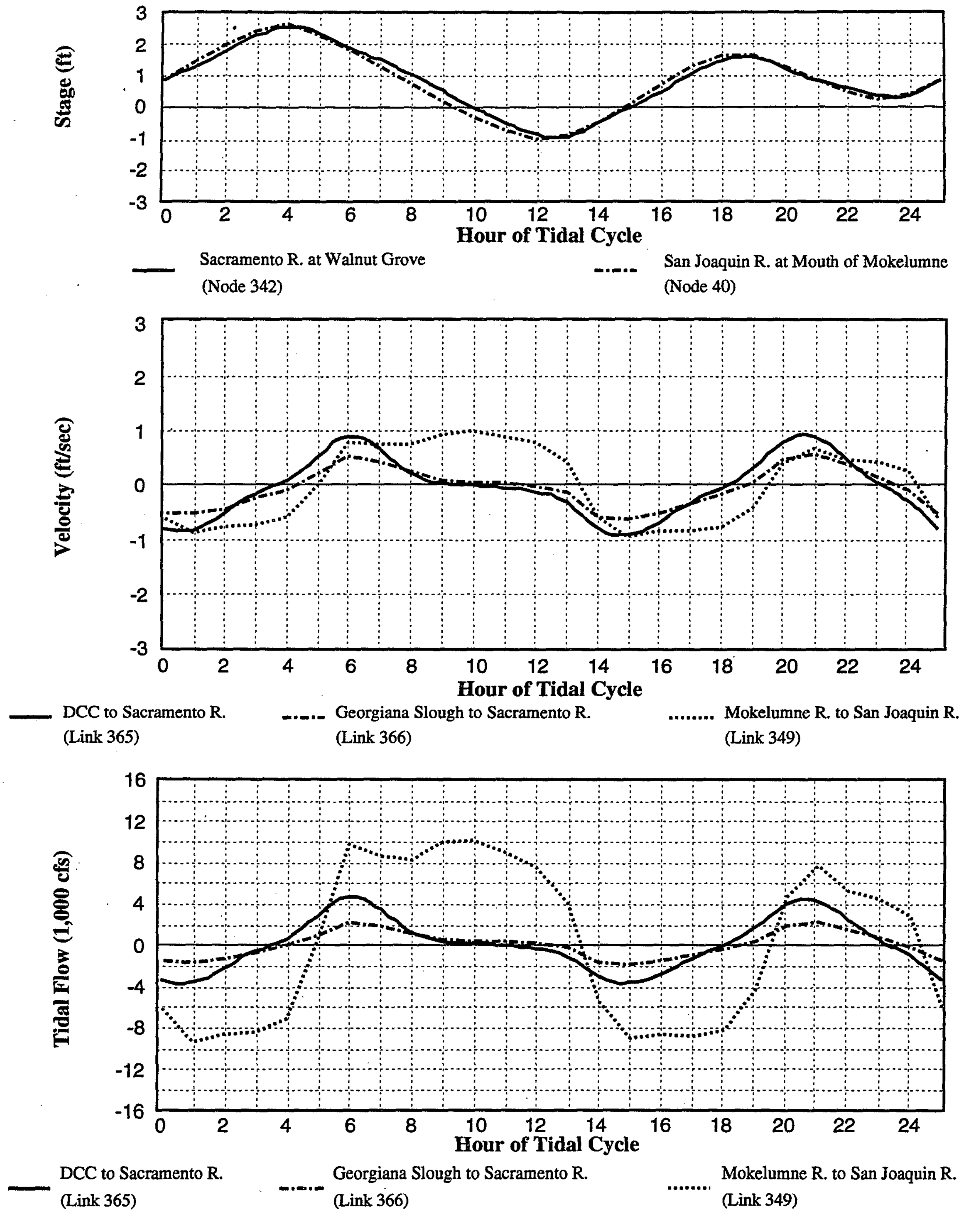


Figure B1-11.
Simulated Tidal Hydraulics
in Mokelumne River Channels

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

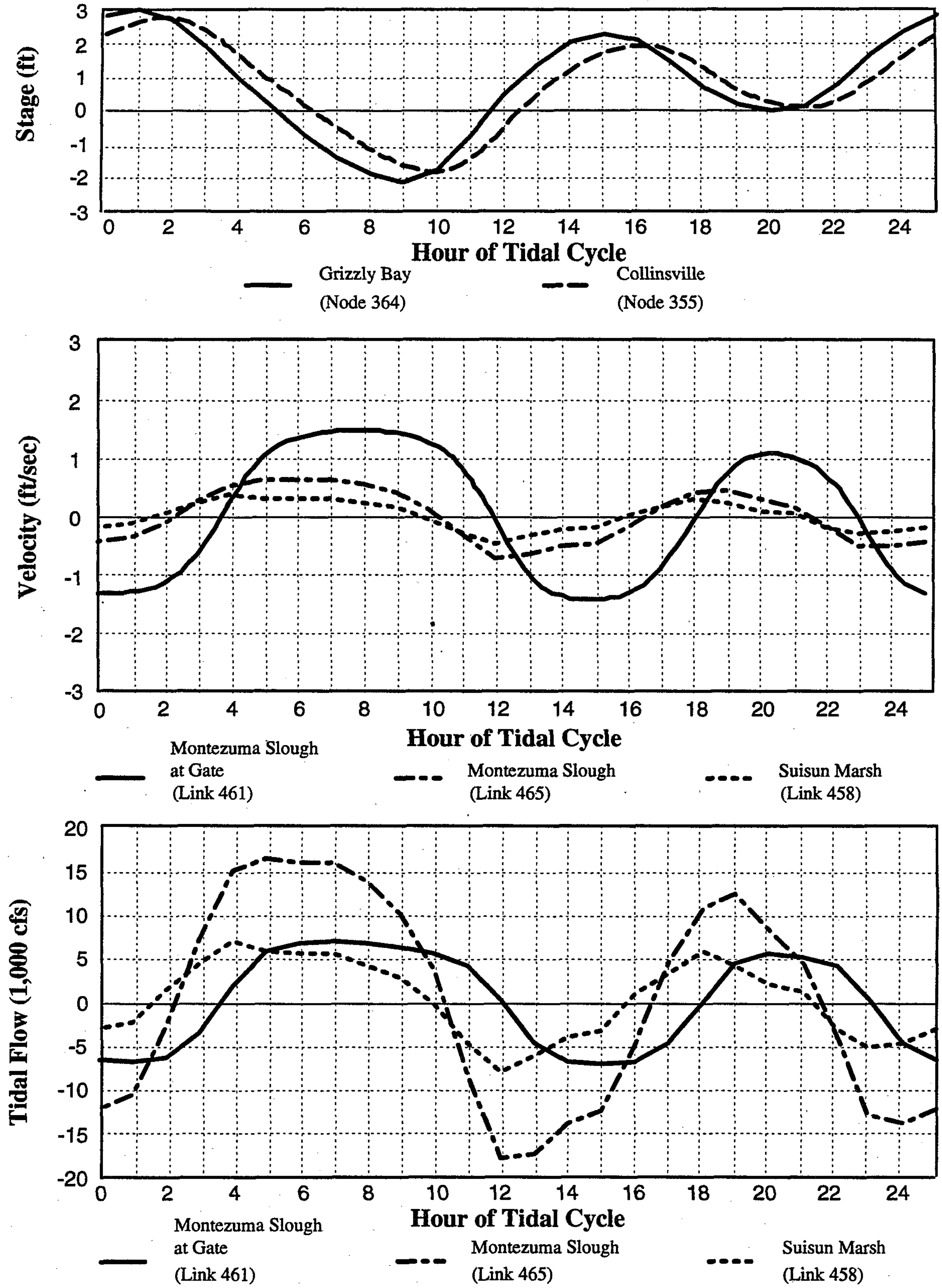


Figure B1-12.
Simulated Tidal Hydraulics in Suisun Marsh

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

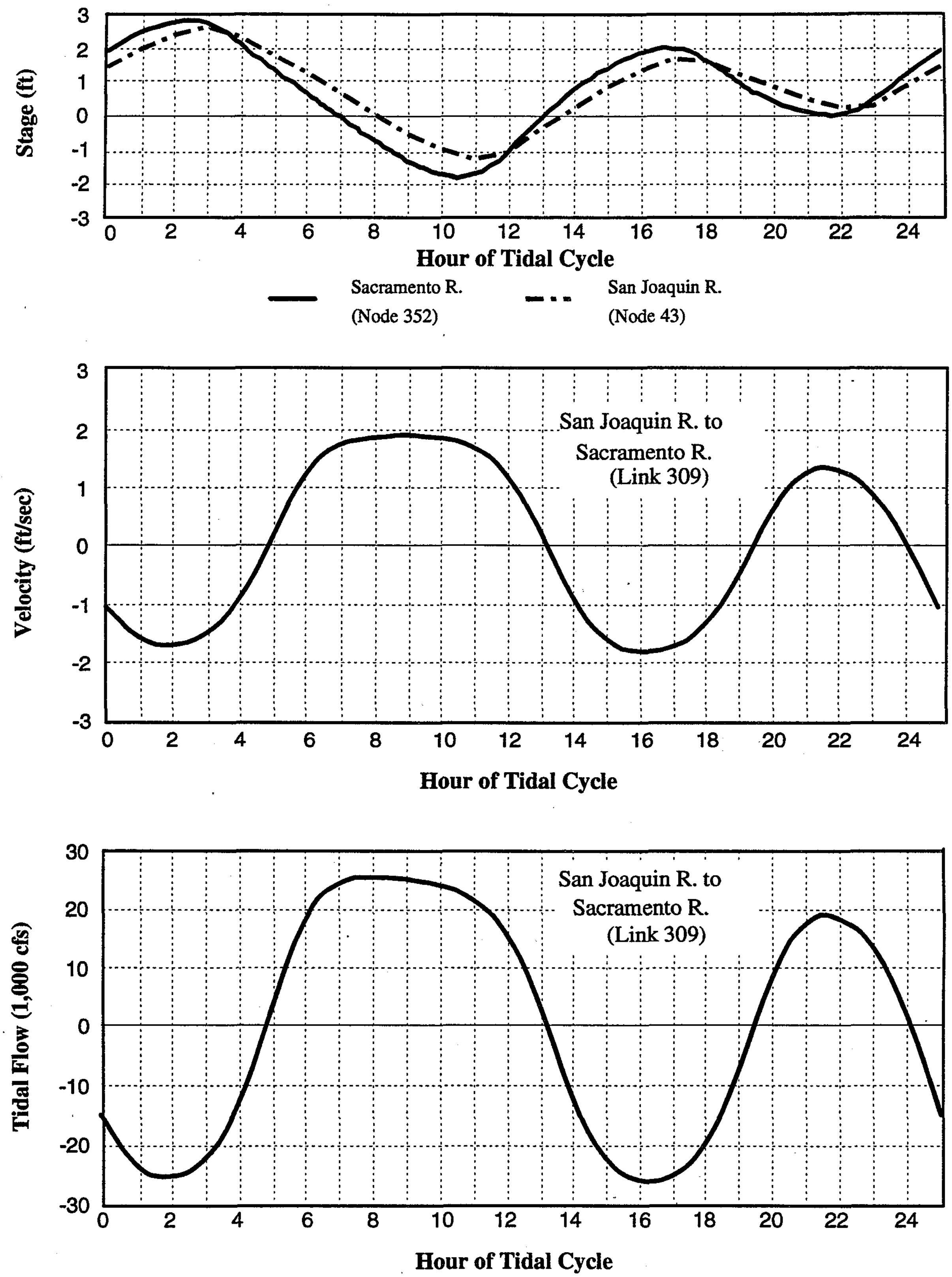
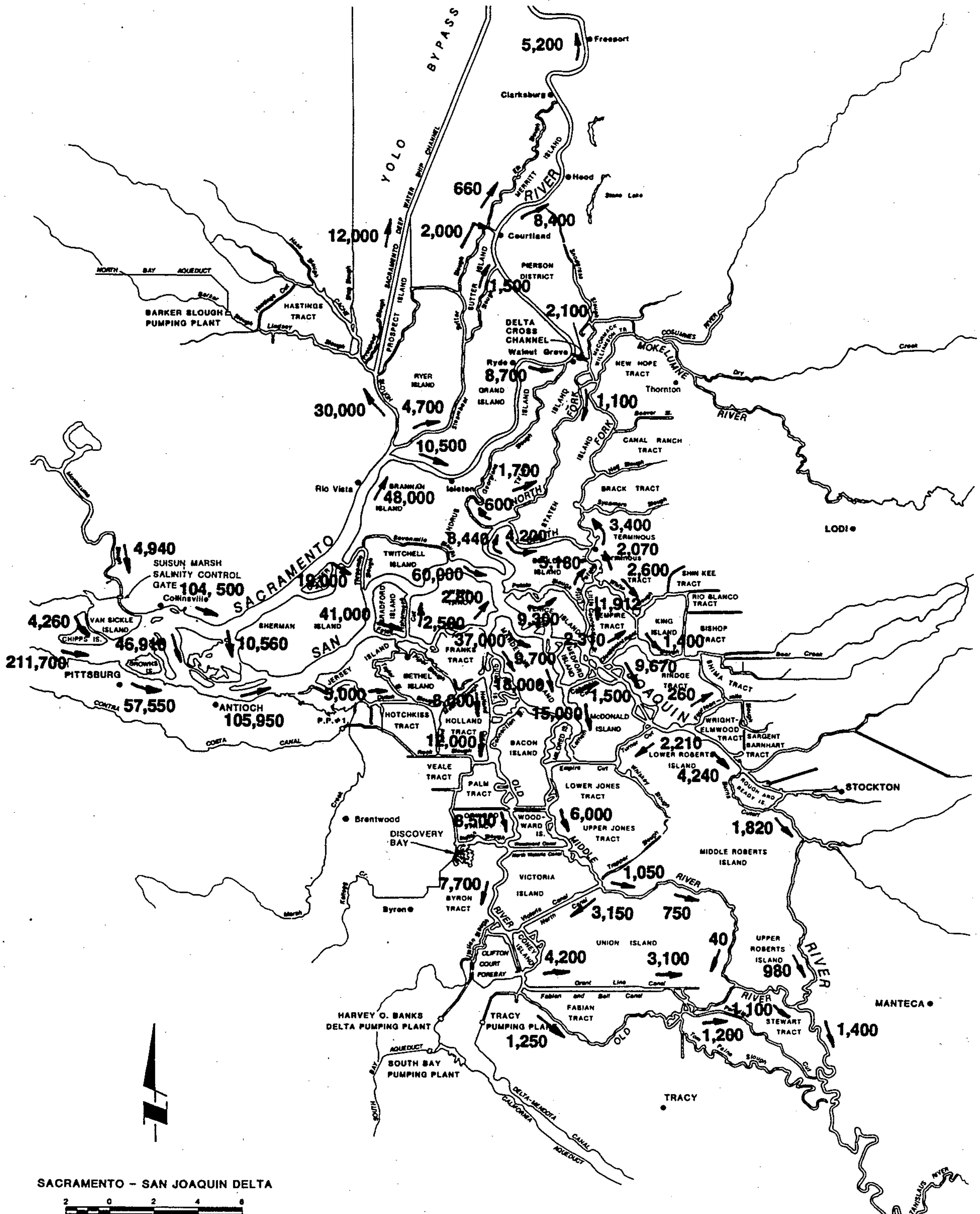


Figure B1-13.
Simulated Tidal Hydraulics
in Threemile Slough

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



Source: Adapted from California Department of Water Resources 1993.

Figure B1-14.
Average Flood Tide Flows (cfs) Simulated by the RMA Delta Model

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

Figure B1-15.
Historical Monthly Average Sacramento River and Yolo Bypass Flows for 1967-1991

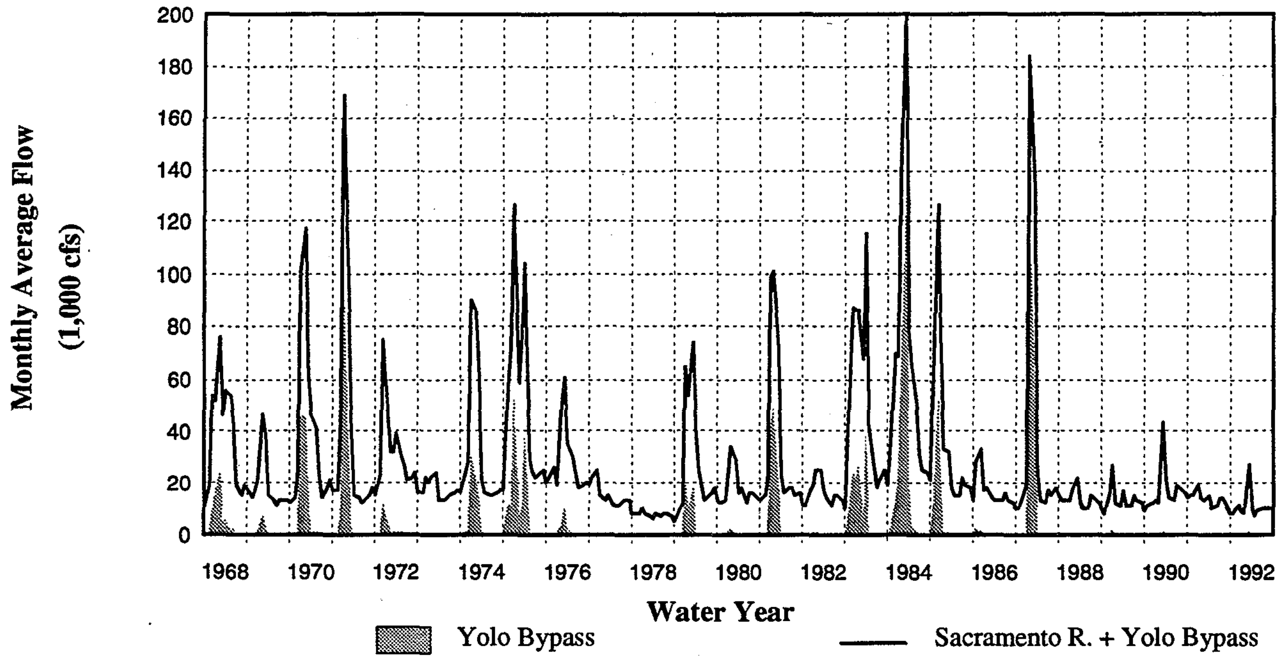
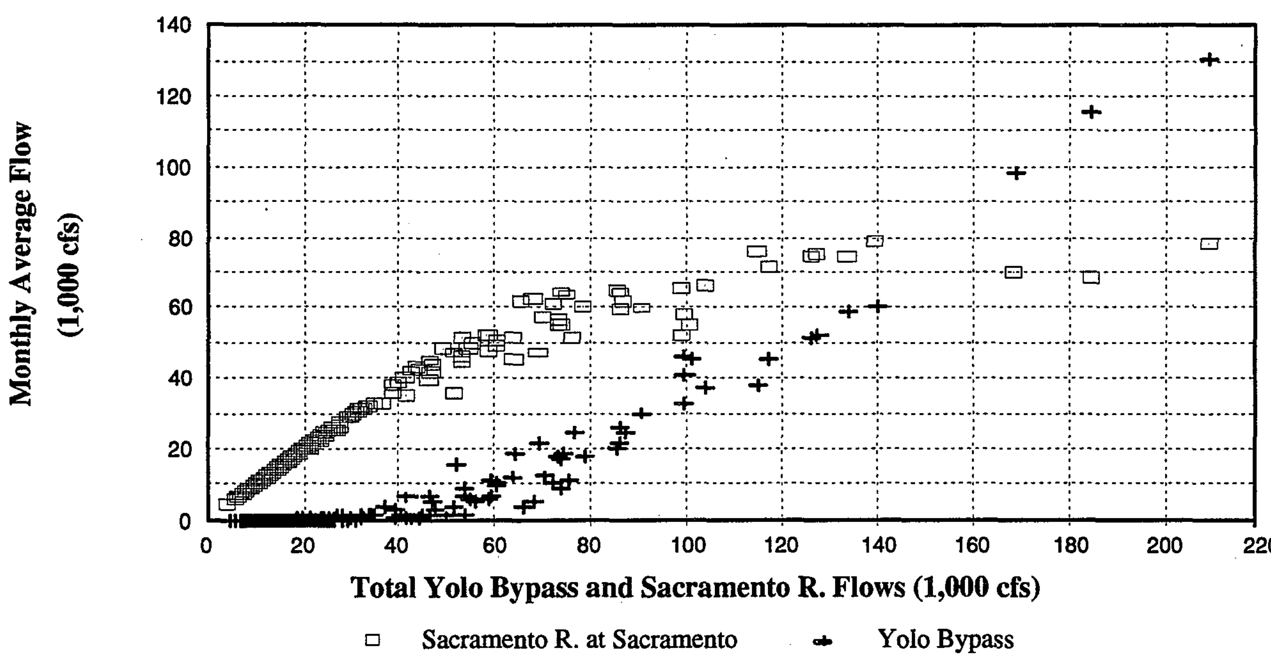


Figure B1-16.
Relationship between Historical Sacramento River and Yolo Bypass Flows for 1967-1991



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

Figure B1-17.
Historical Monthly Average San Joaquin River Flow
at Vernalis for 1967-1991

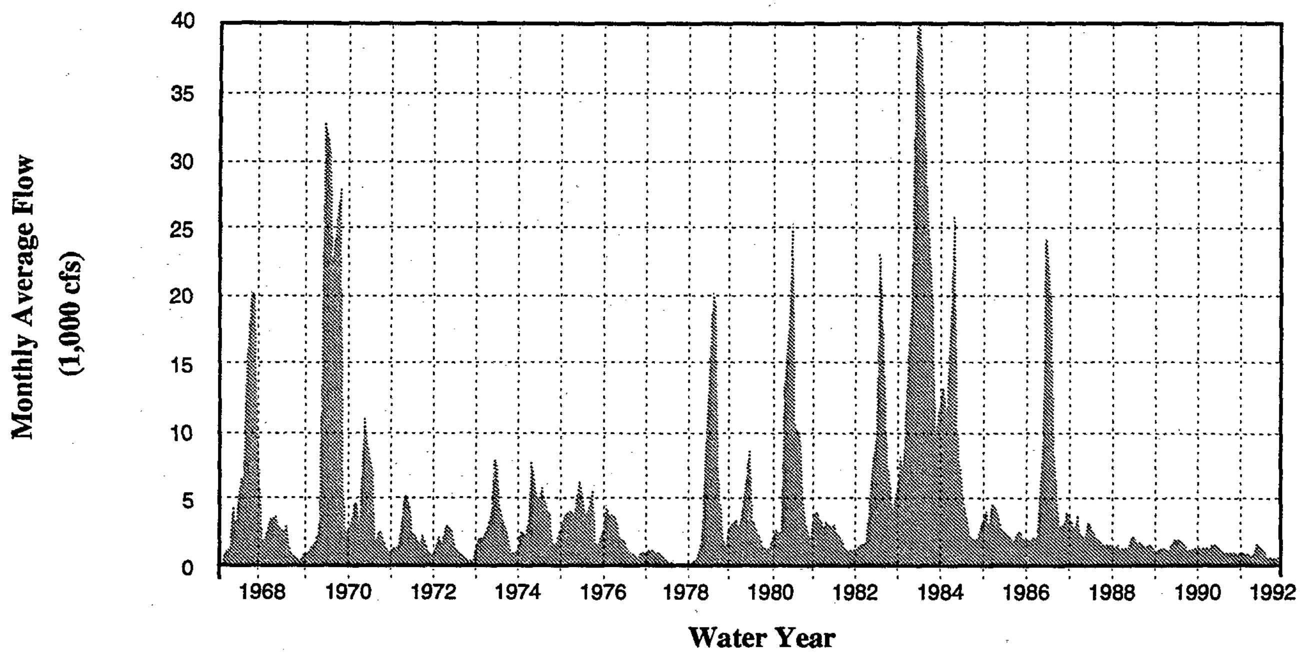
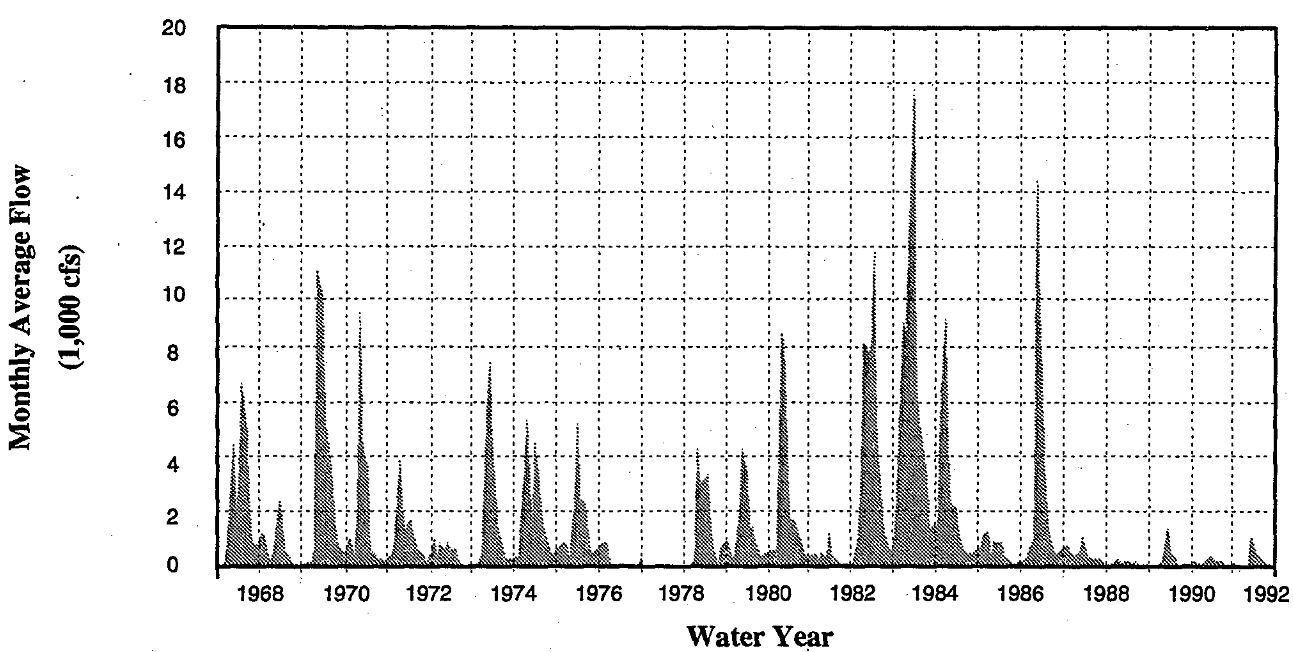


Figure B1-18.
Historical Monthly Average Eastside Stream Flow
for 1967-1991



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

Figure B1-19.
Historical Monthly Average Delta CVP and SWP Exports and CCWD Diversions for 1967-1991

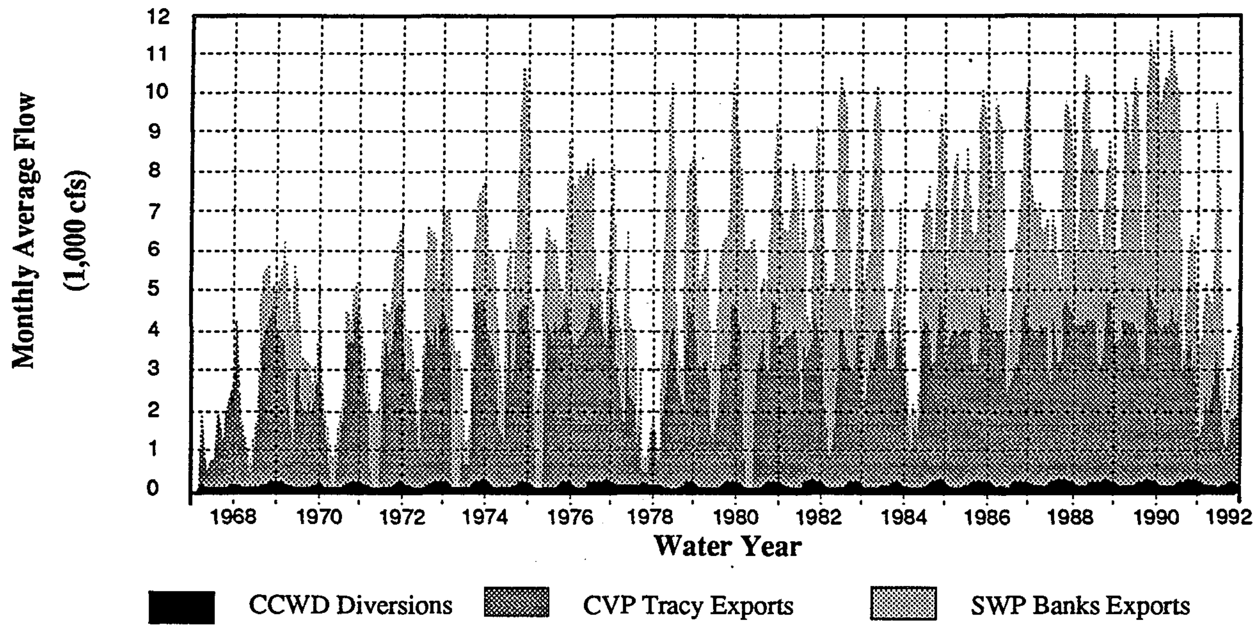
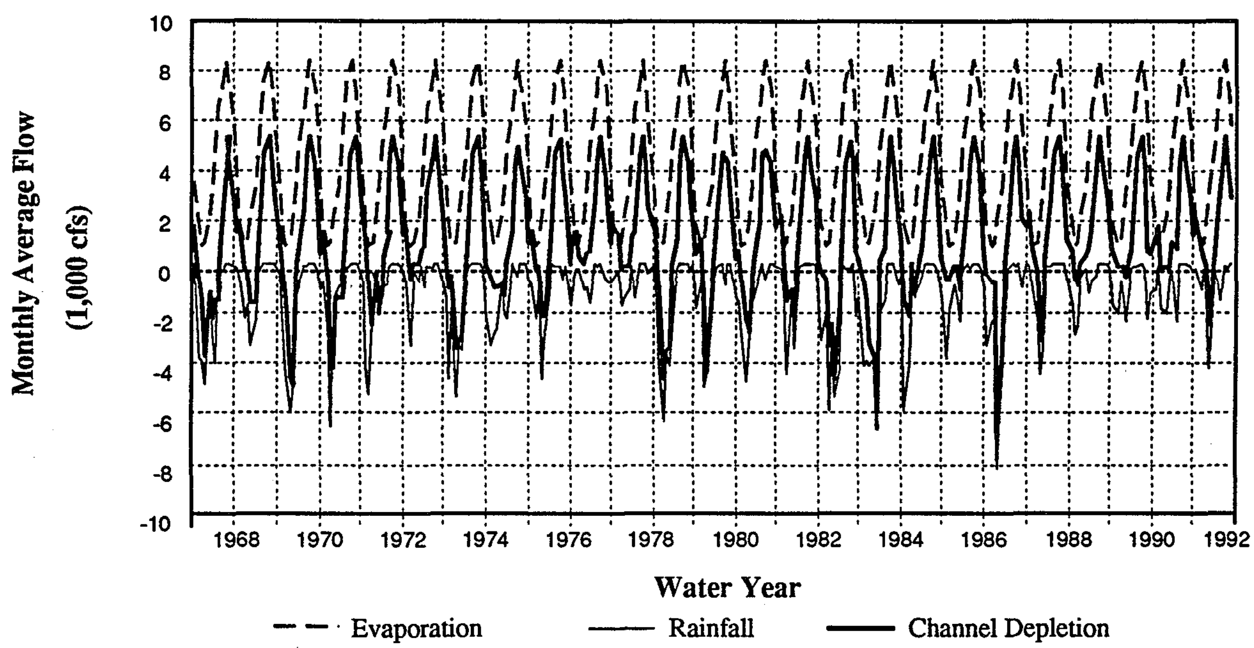


Figure B1-20.
Estimated Historical Monthly Average Delta Channel Depletions for 1967-1991



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

Figure B1-21.
Estimated Historical Monthly Average Delta Outflow
for 1967-1991

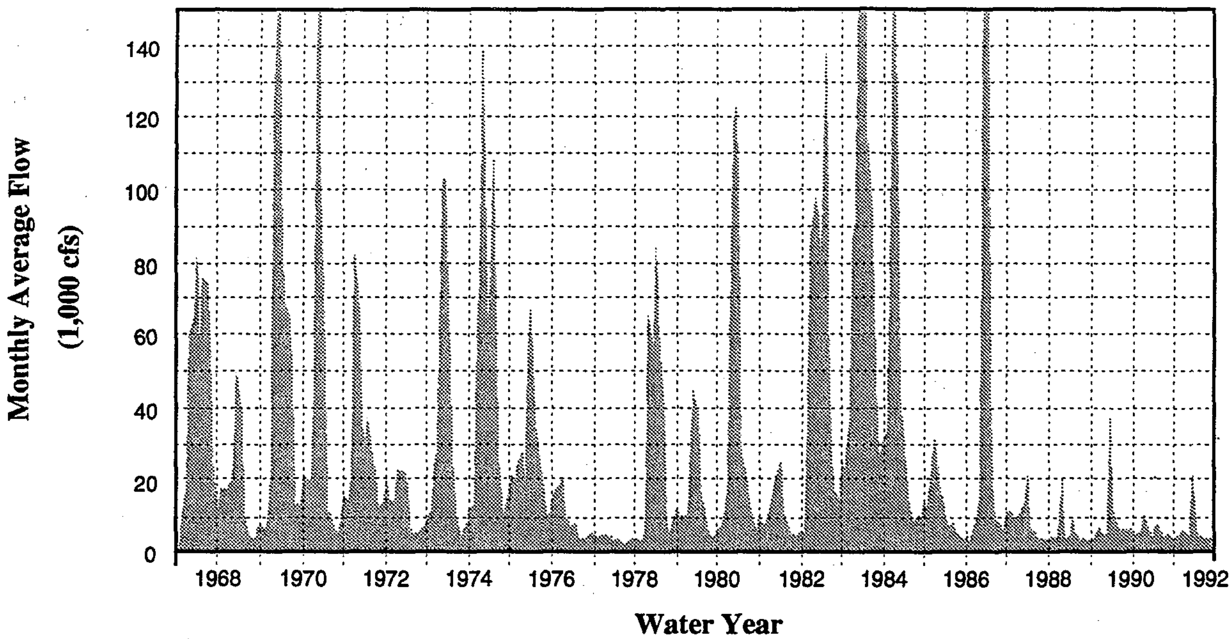
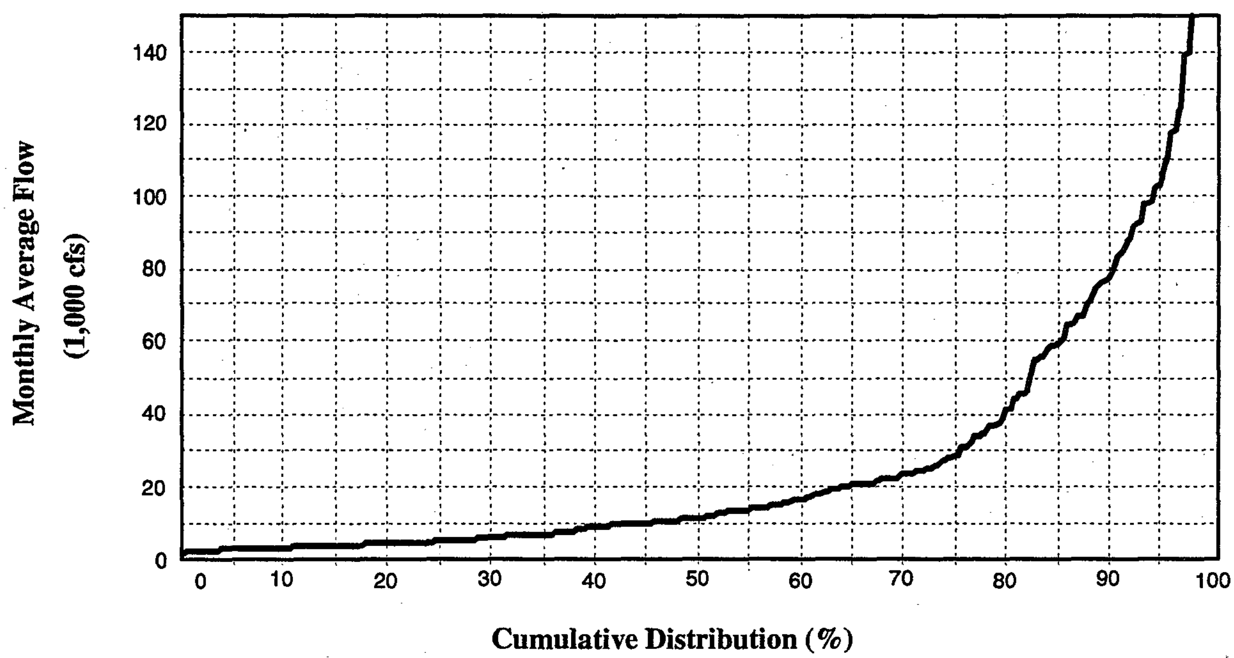
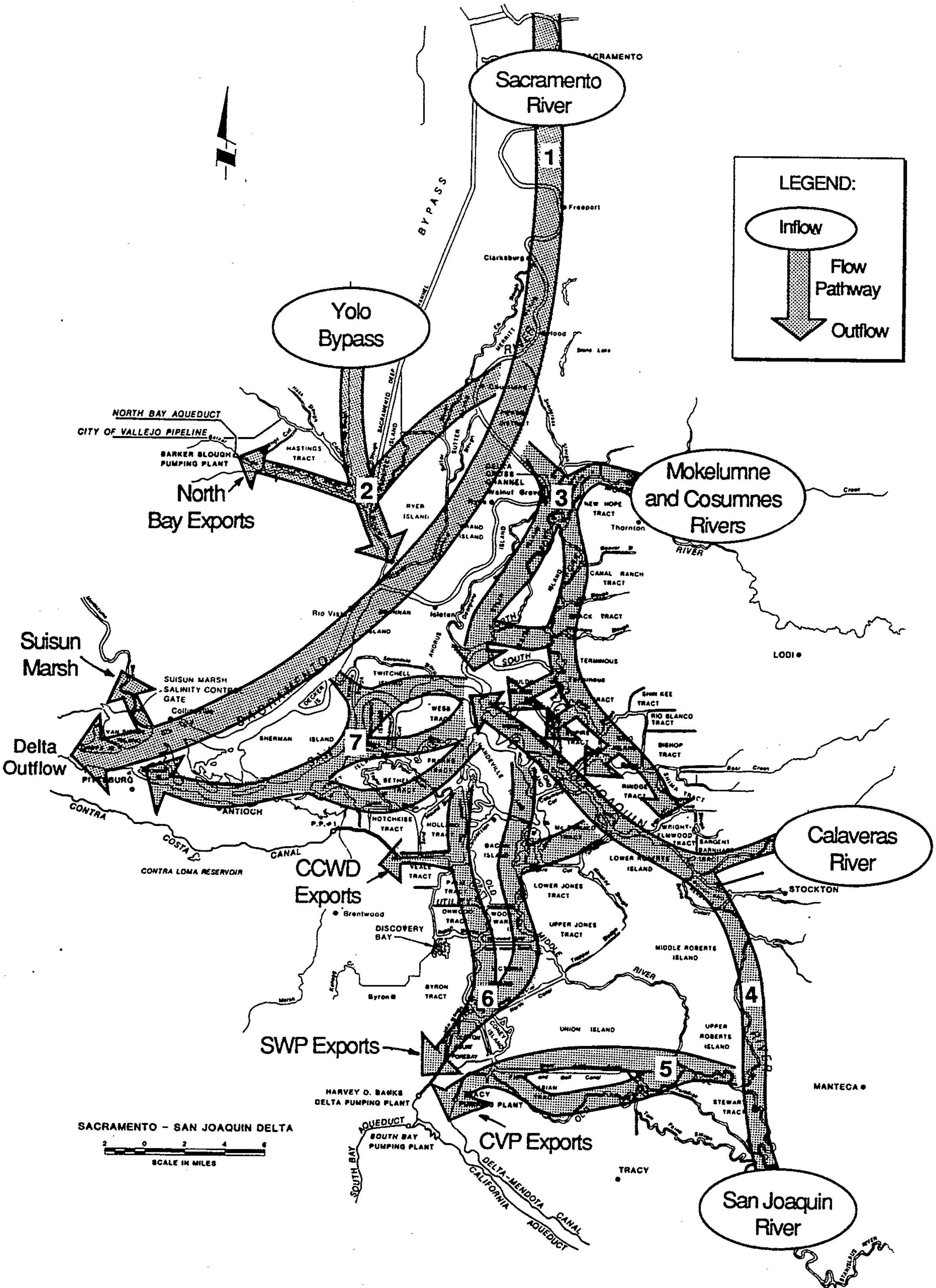


Figure B1-22.
Cumulative Distribution of Estimated Delta Outflow
for 1967-1991



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



Source: Adapted from California Department of Water Resources 1993.

Figure B1-23.
Major Delta Flow Pathways

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

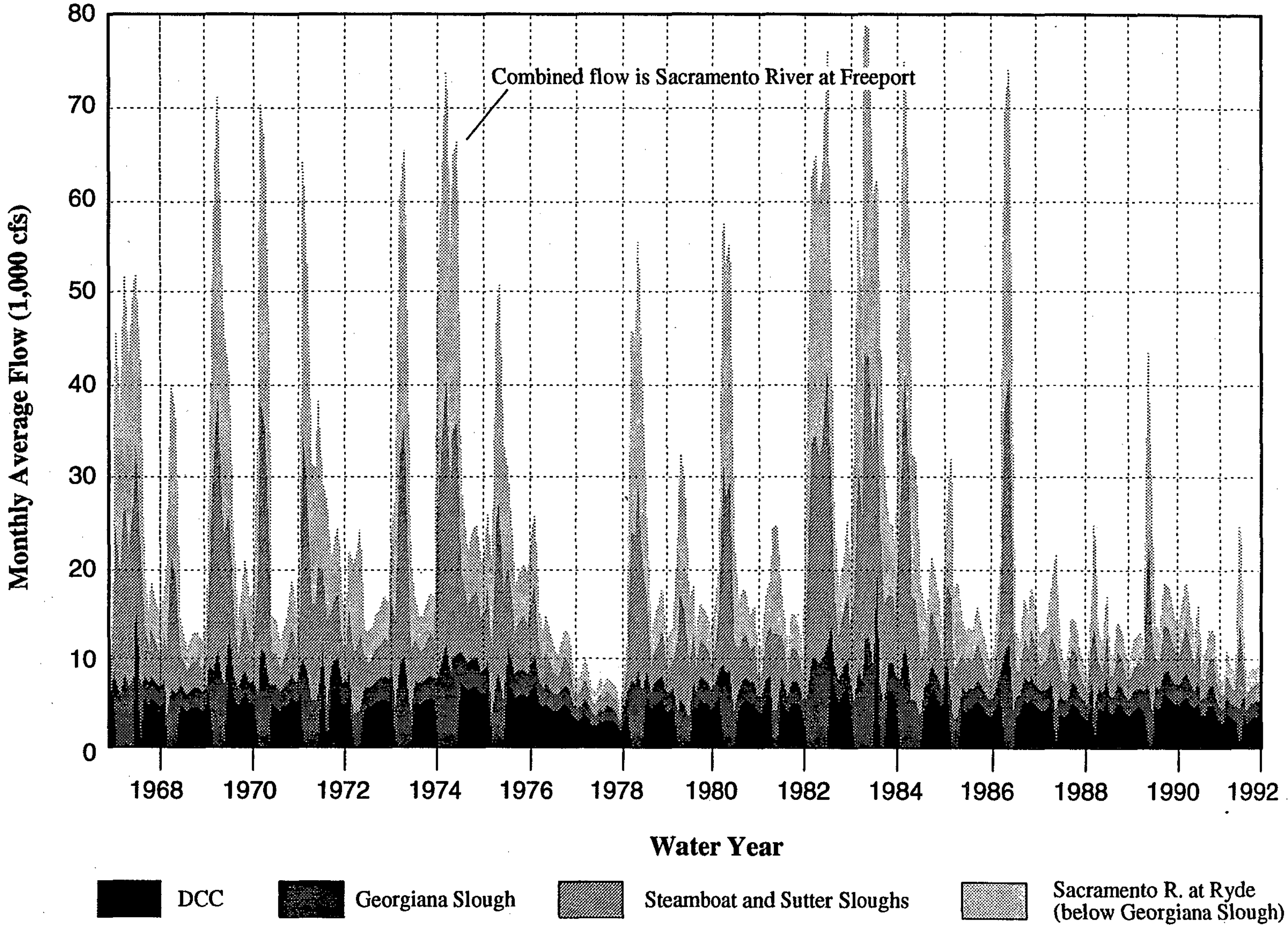
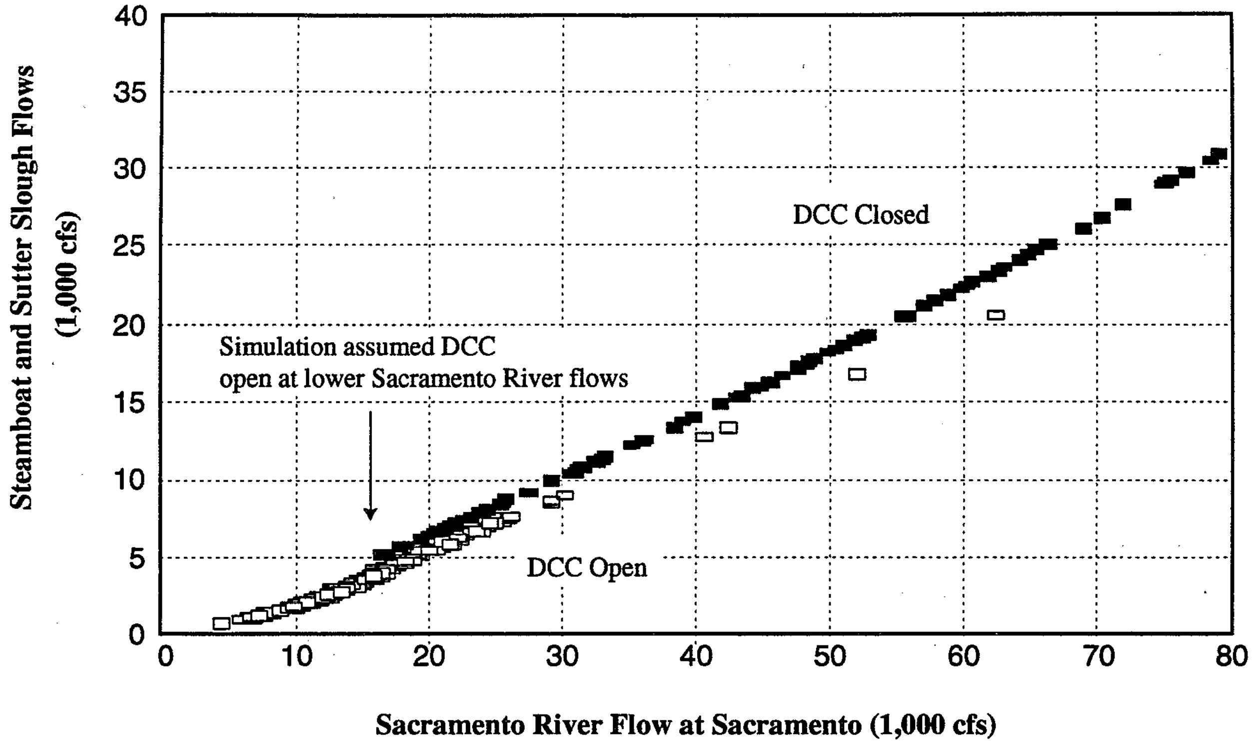


Figure B1-24.
Monthly Average Historical Sacramento River Flow and Simulated Diversions to Steamboat and Sutter Sloughs, the DCC, and Georgiana Slough for 1967-1991

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



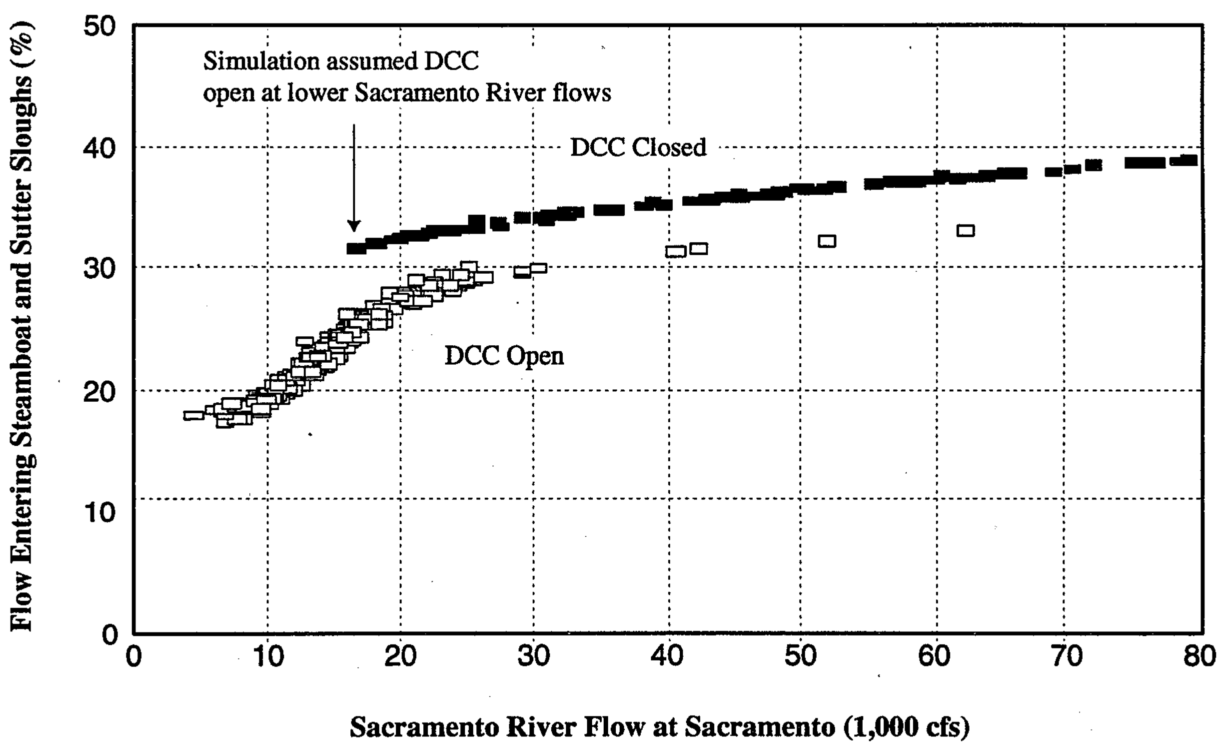
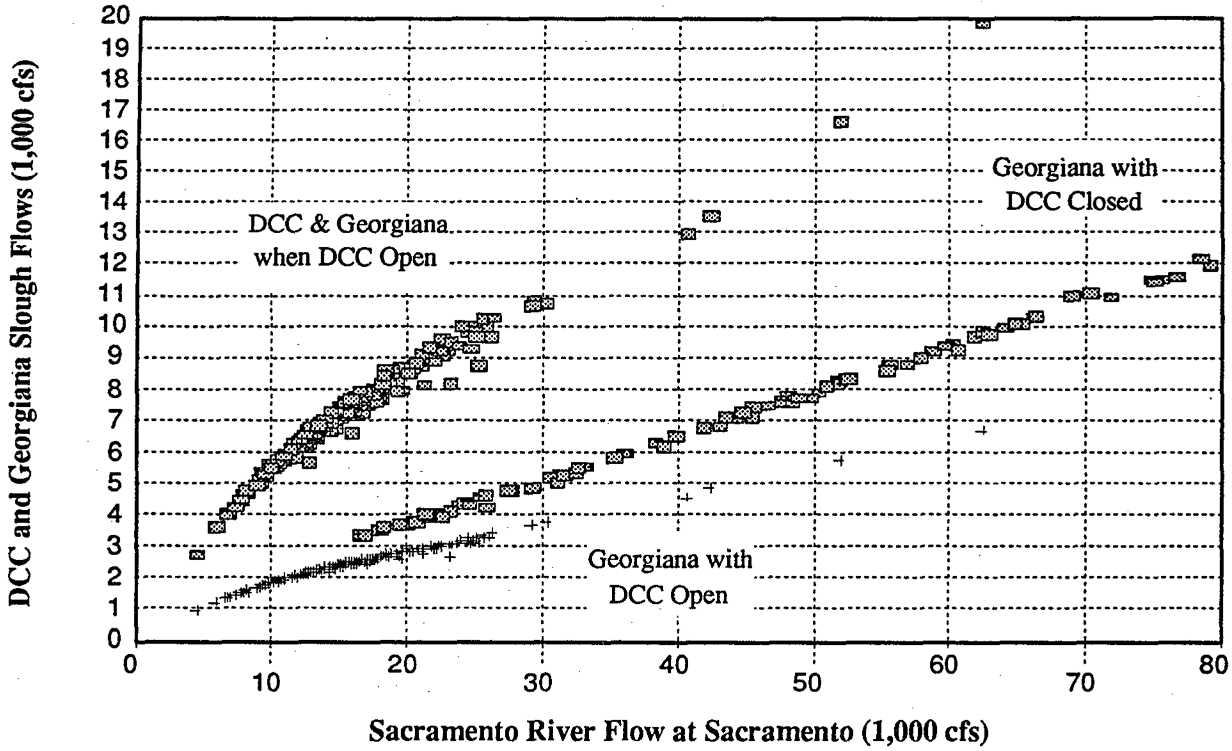


Figure B1-25.
Simulated Relationship between Monthly Average Steamboat and Sutter Slough Diversions and Sacramento River Inflow for 1967-1991

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



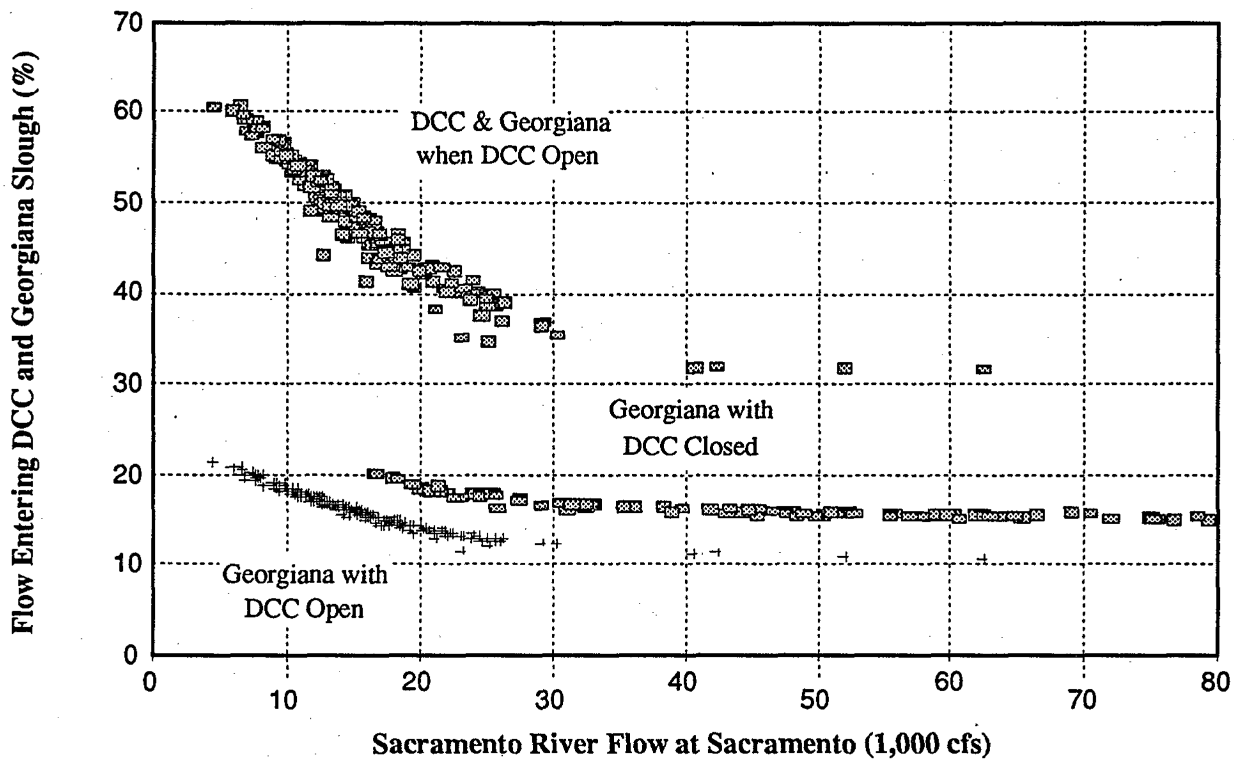


Figure B1-26.
Simulated Relationship between Monthly Average DCC and Georgiana Slough Diversions and Sacramento River Inflow for 1967-1991

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

Figure B1-27.
Simulated Relationship between Monthly Average Threemile Slough and Sacramento and San Joaquin River Flows for 1967-1991

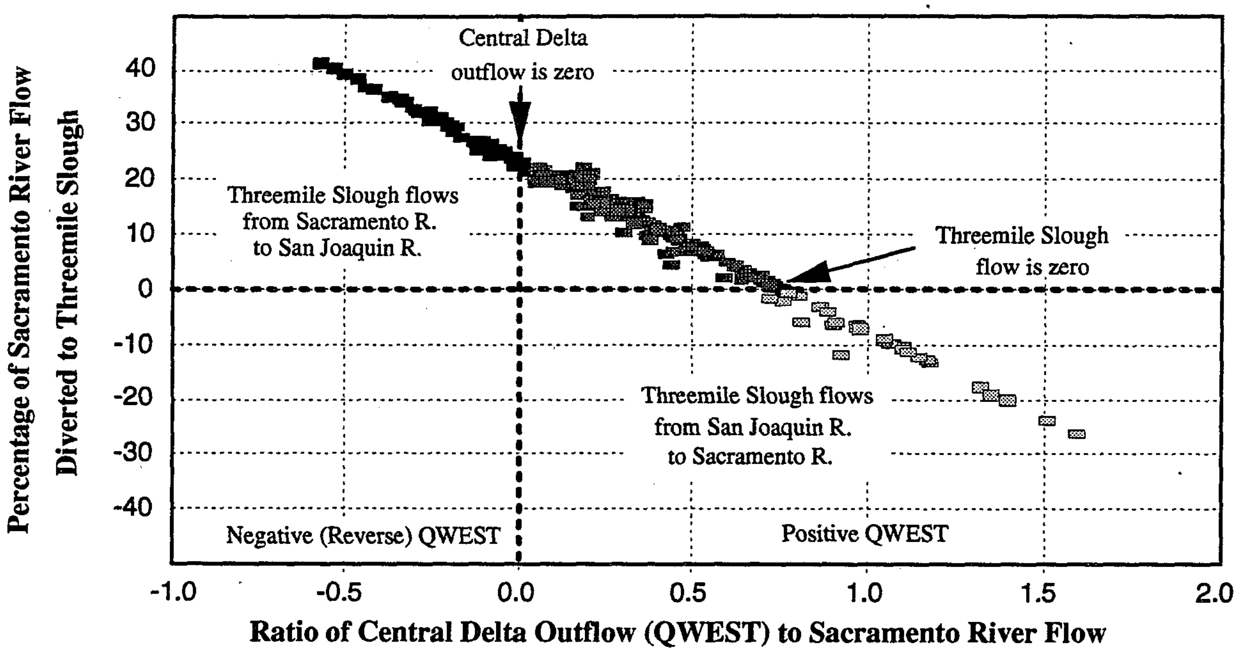
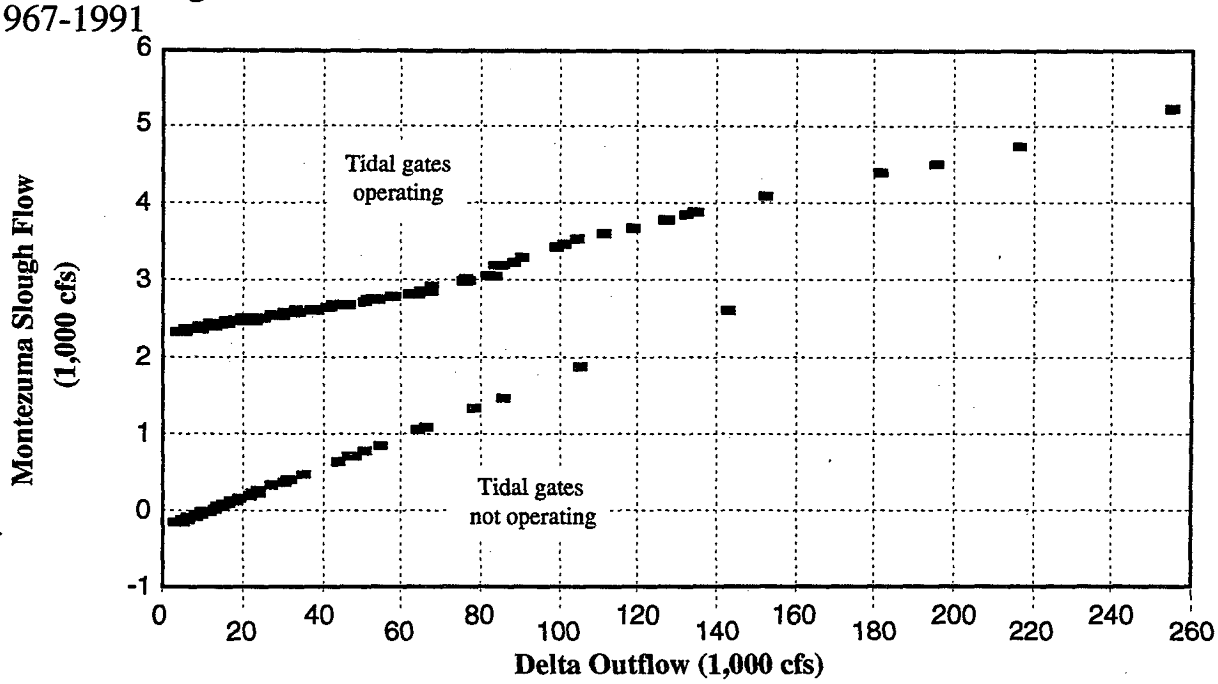


Figure B1-28.
Simulated Relationship between Monthly Average Montezuma Slough Flow and Delta Outflow for 1967-1991



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

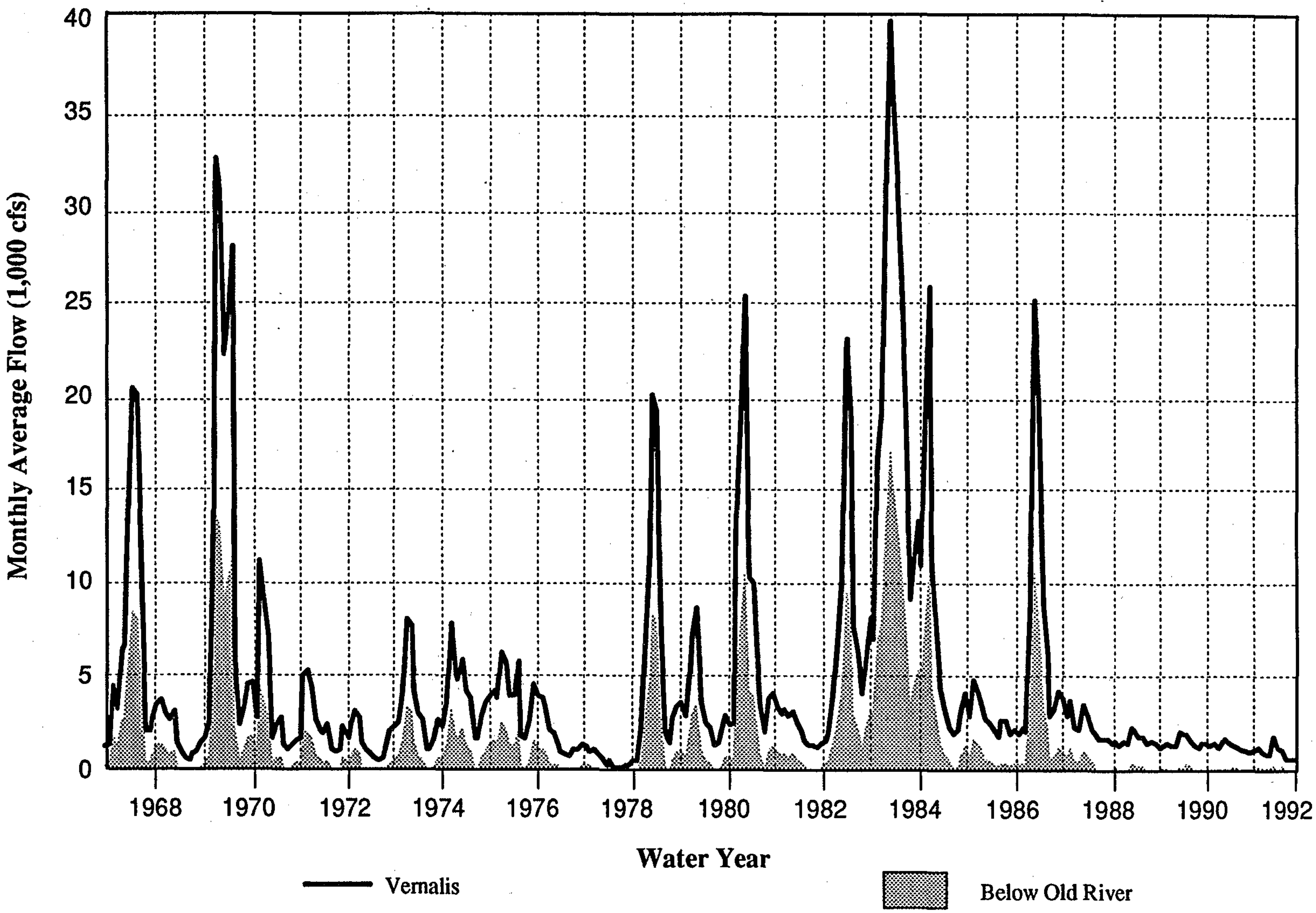
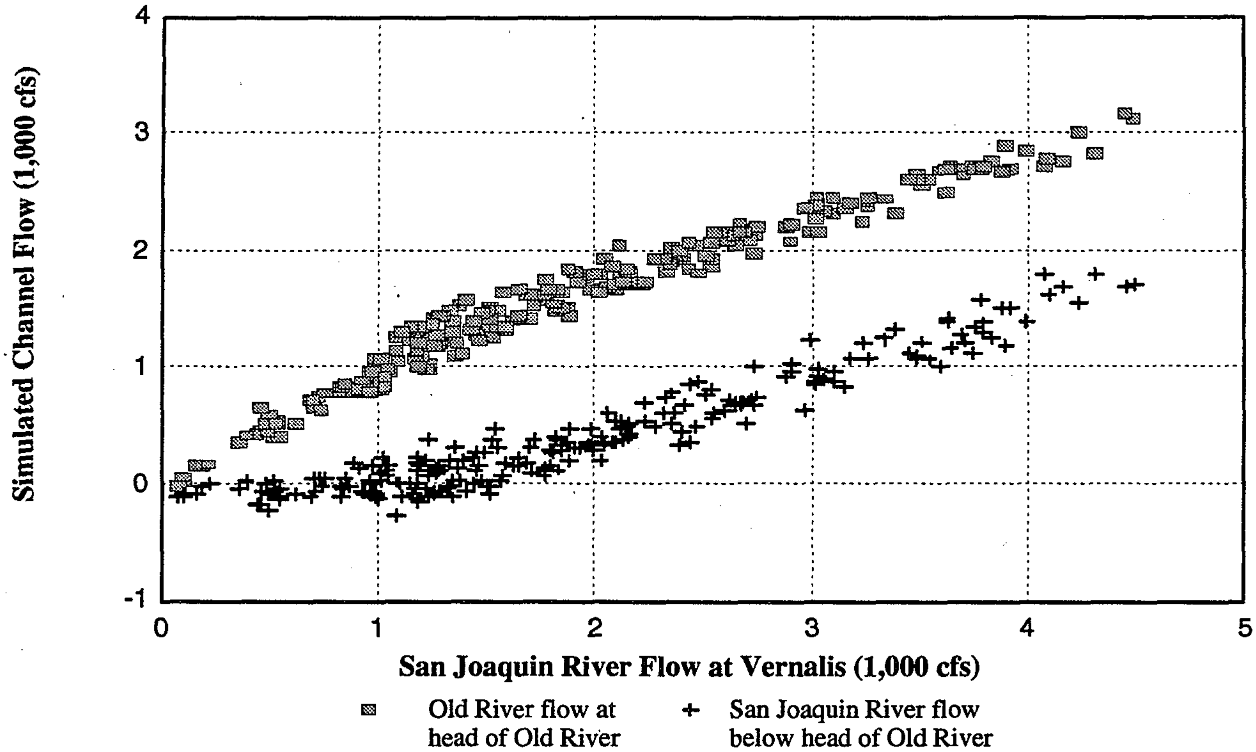


Figure B1-29.
Monthly Average Historical San Joaquin River Flow at Vernalis and Simulated Flow Downstream of the Head of Old River for 1967-1991

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

C-061599



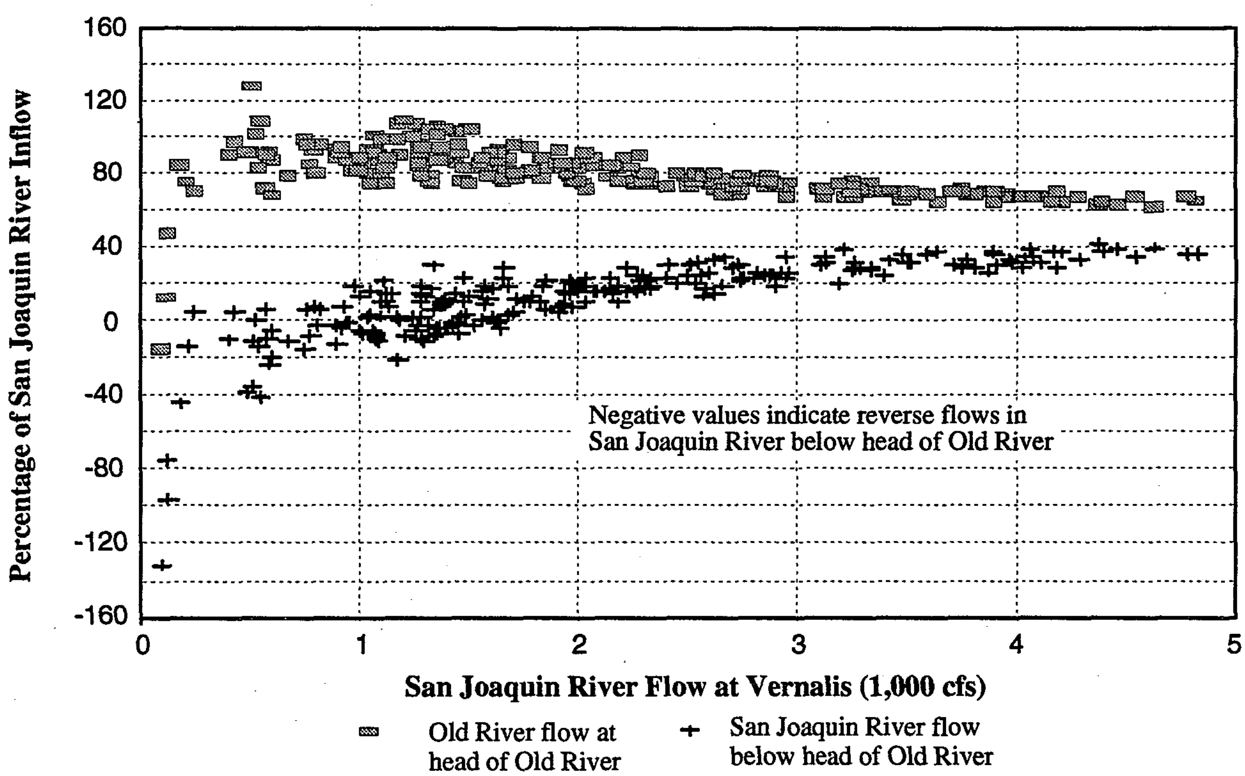


Figure B1-30.
Simulated Relationship between Monthly Average Head of Old River and San Joaquin River Flows for 1967-1991

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

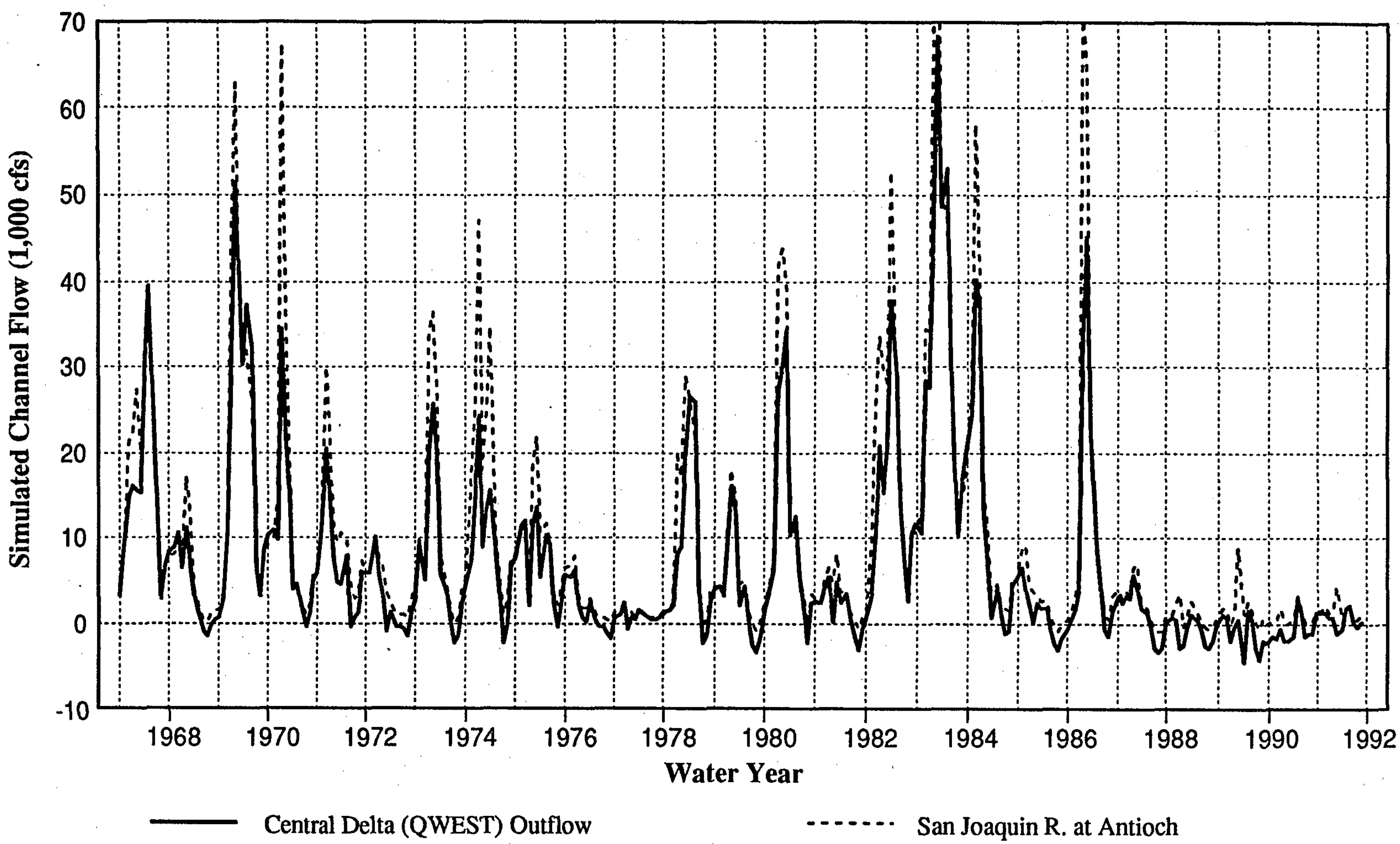


Figure B1-31.
Simulated Historical Monthly Average Central Delta (QWEST) Flow and San Joaquin River Flow at Antioch for 1967-1991

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

C-061601

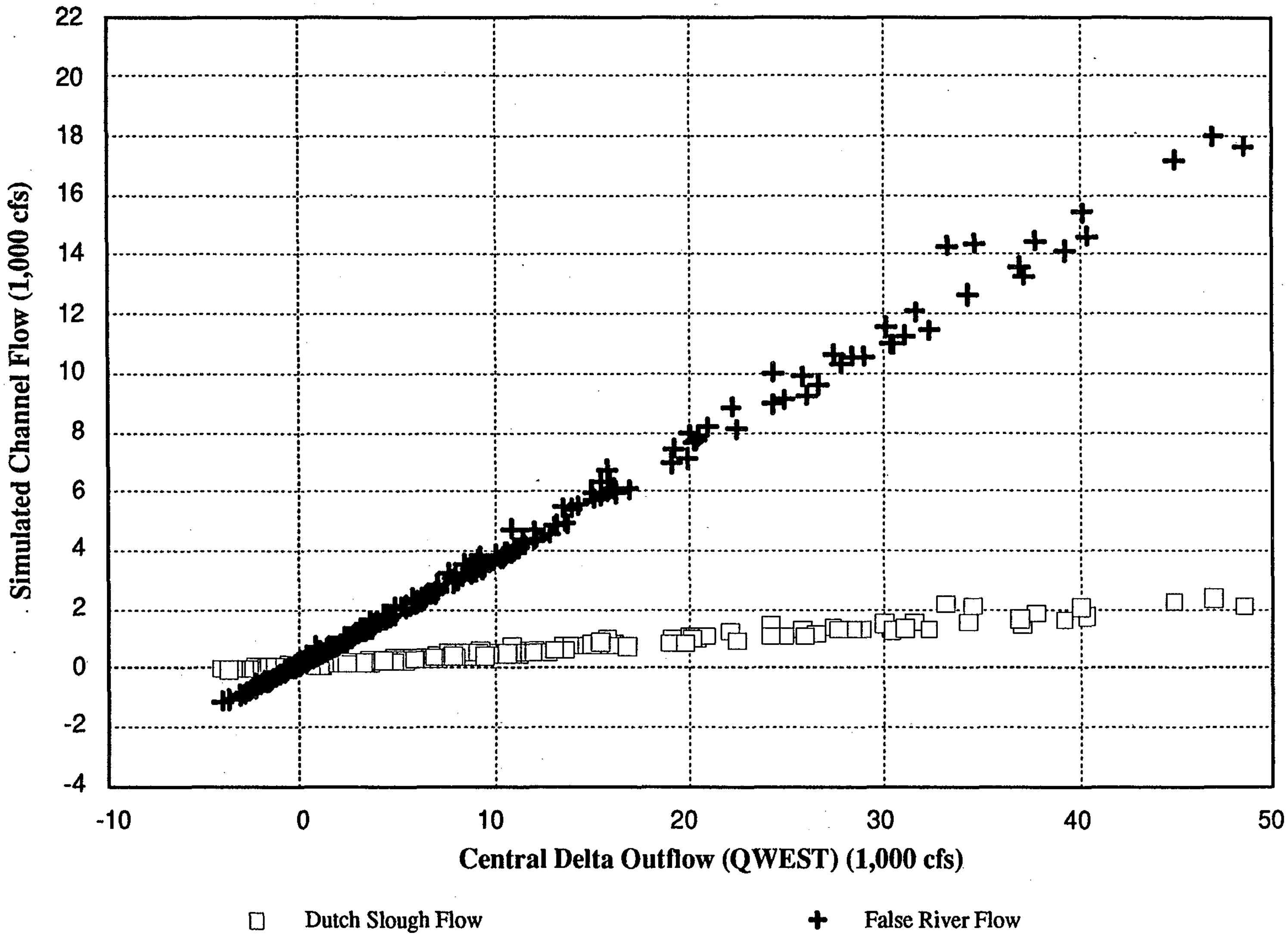


Figure B1-32.
Simulated Relationship between Monthly Dutch Slough and False River Flows and Central Delta Outflow (QWEST) for 1967-1991

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

C—061602

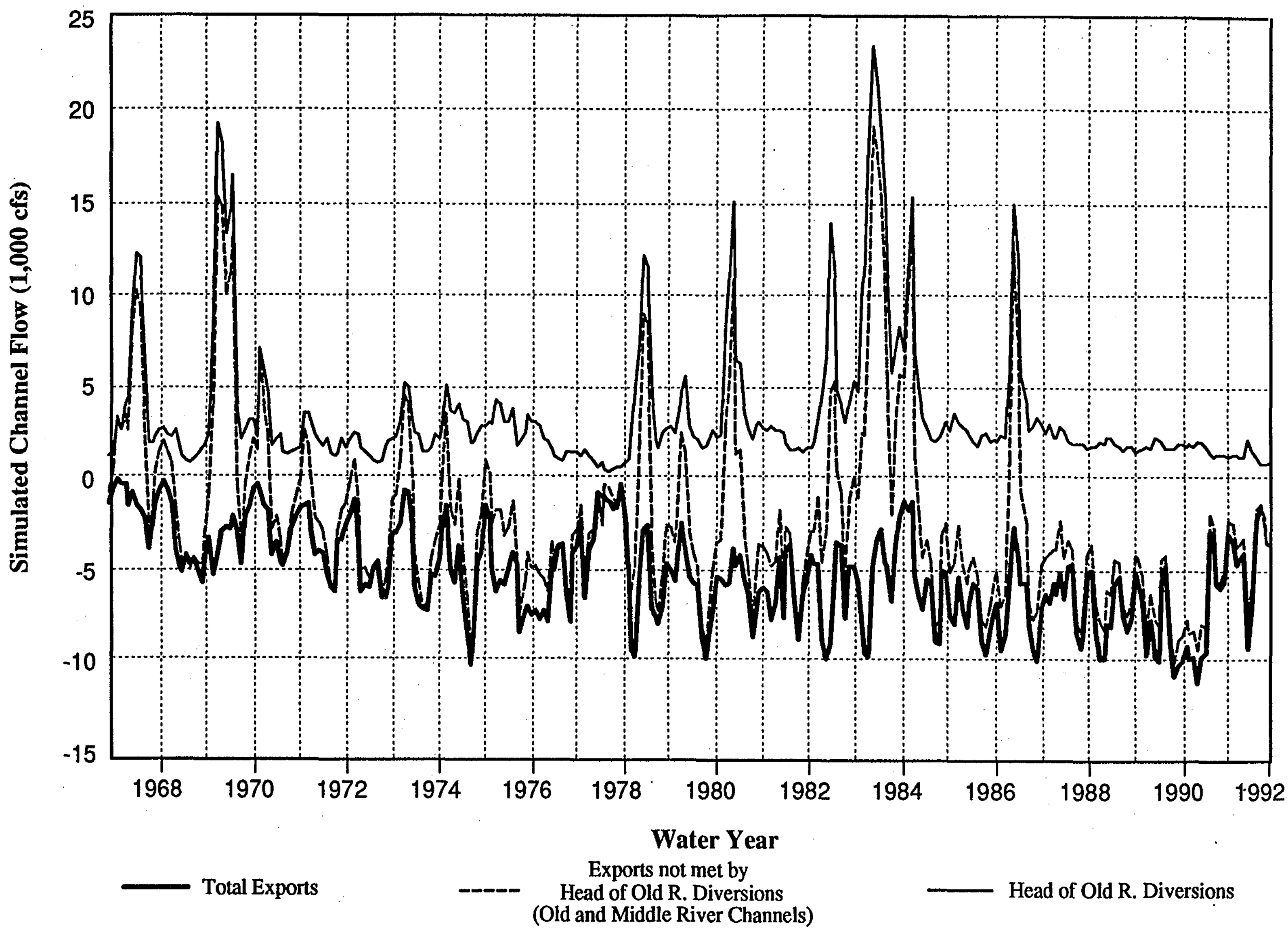


Figure B1-33.
Simulated Historical Monthly Average Channel Flows Supplying Exports for 1967-1991

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

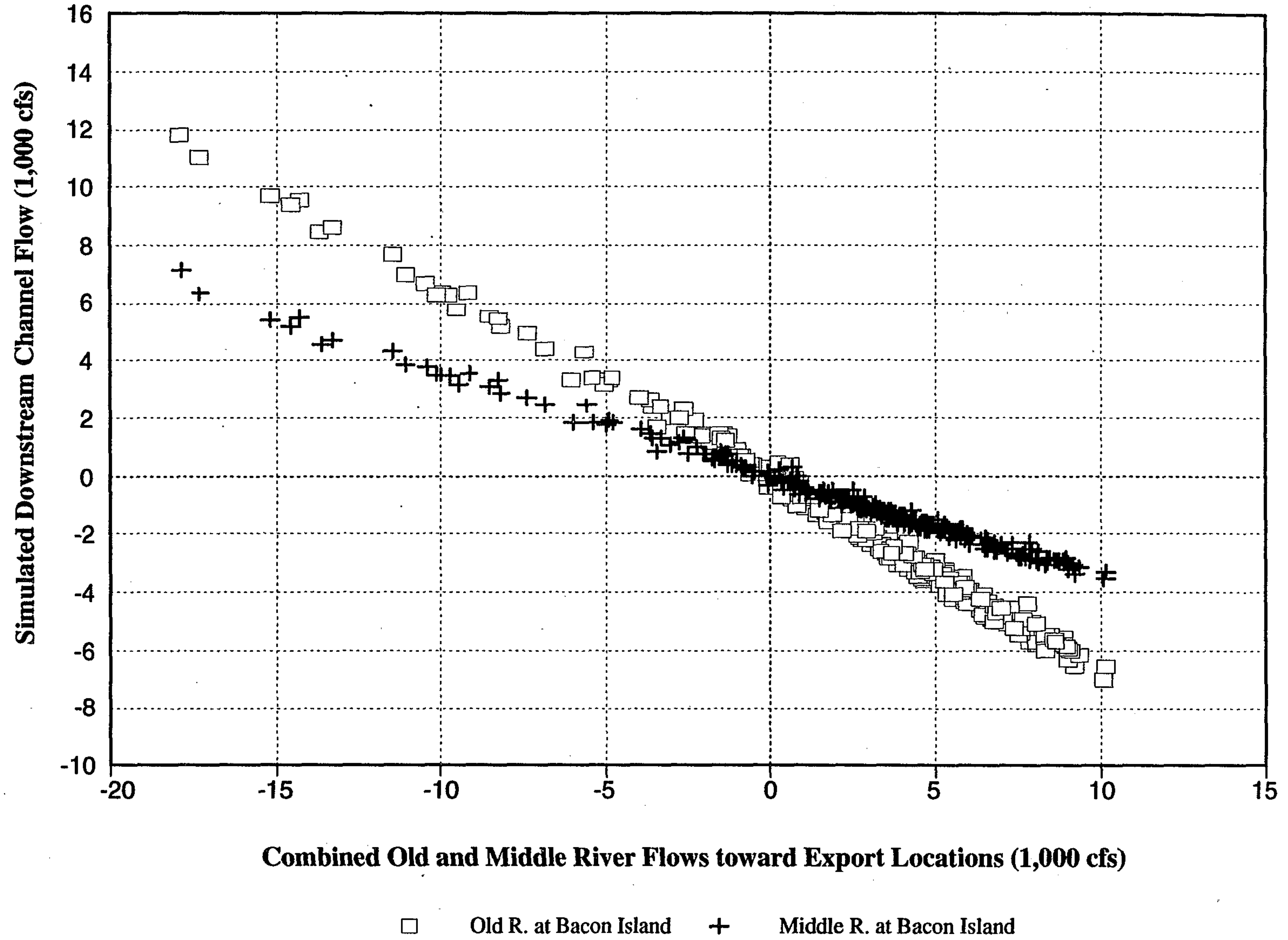


Figure B1-34.
Simulated Relationship between Old and Middle River Flows for 1967-1991

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

C-061604

C-061604

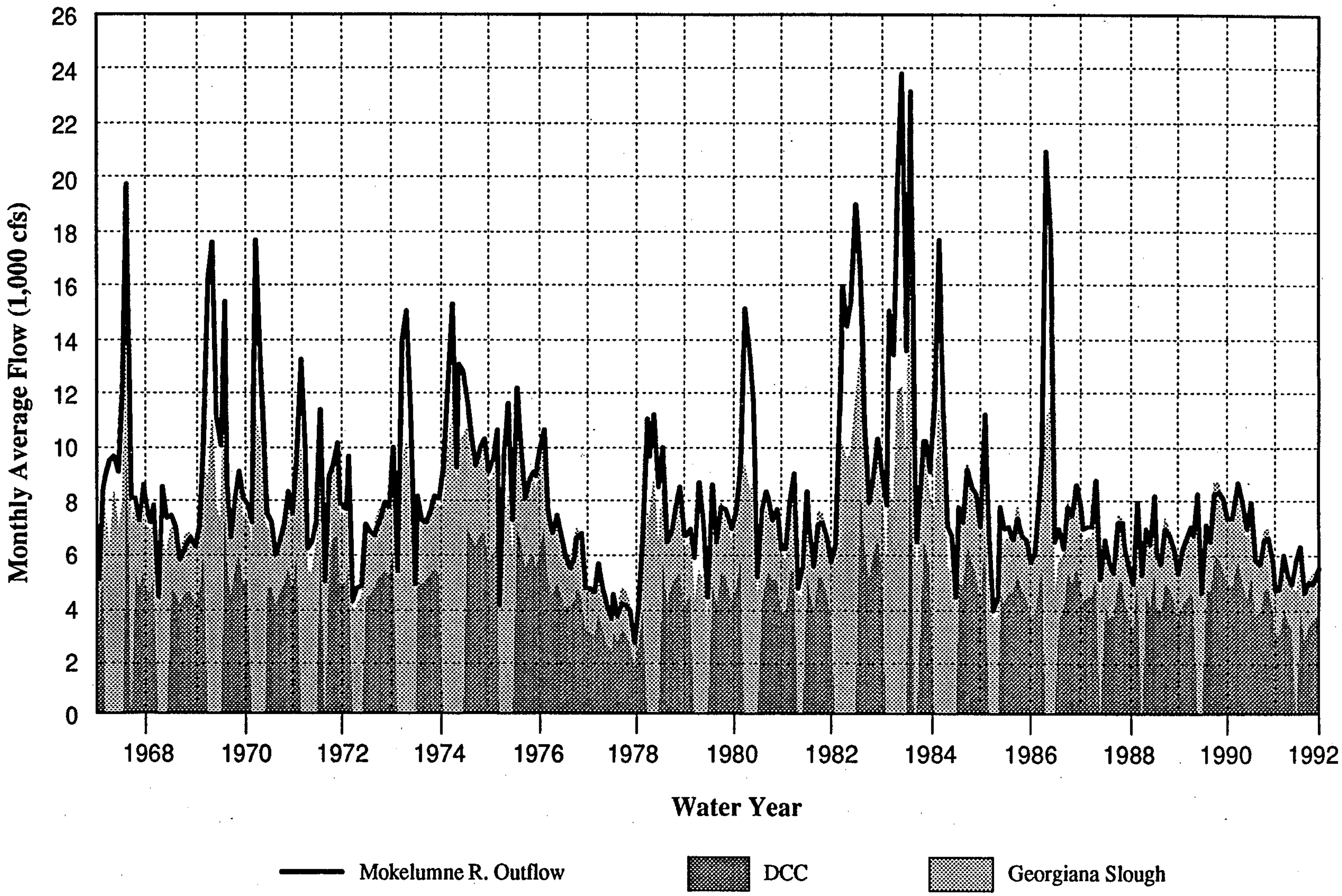


Figure B1-35.
Simulated Historical Monthly Average Mokelumne River Outflow (Including DCC and Georgiana Slough Flows) for 1967-1991

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

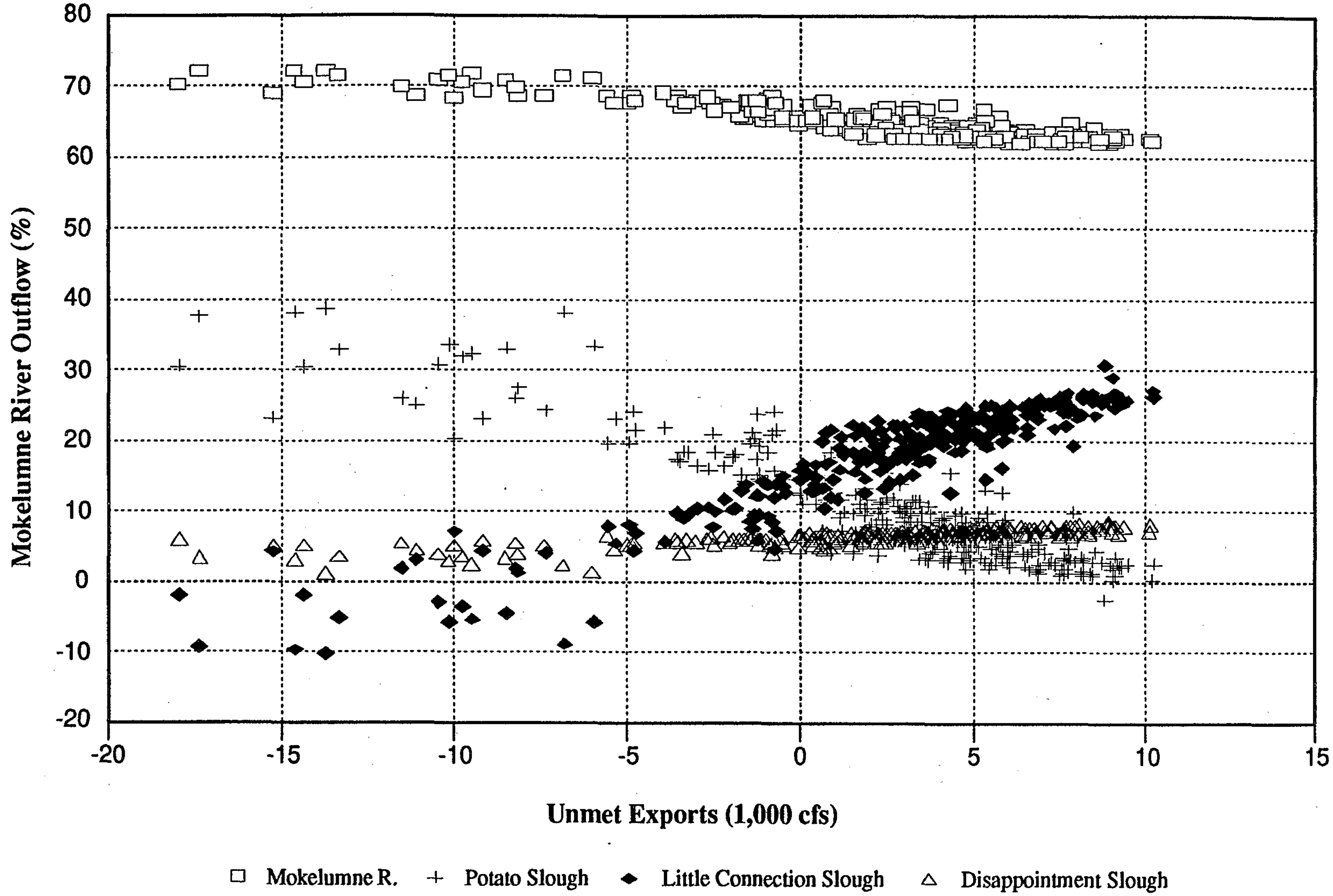


Figure B1-36.
Simulated Relationship between Monthly Average Mokelumne River Channel Flows and Unmet Delta Exports for 1967-1991

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

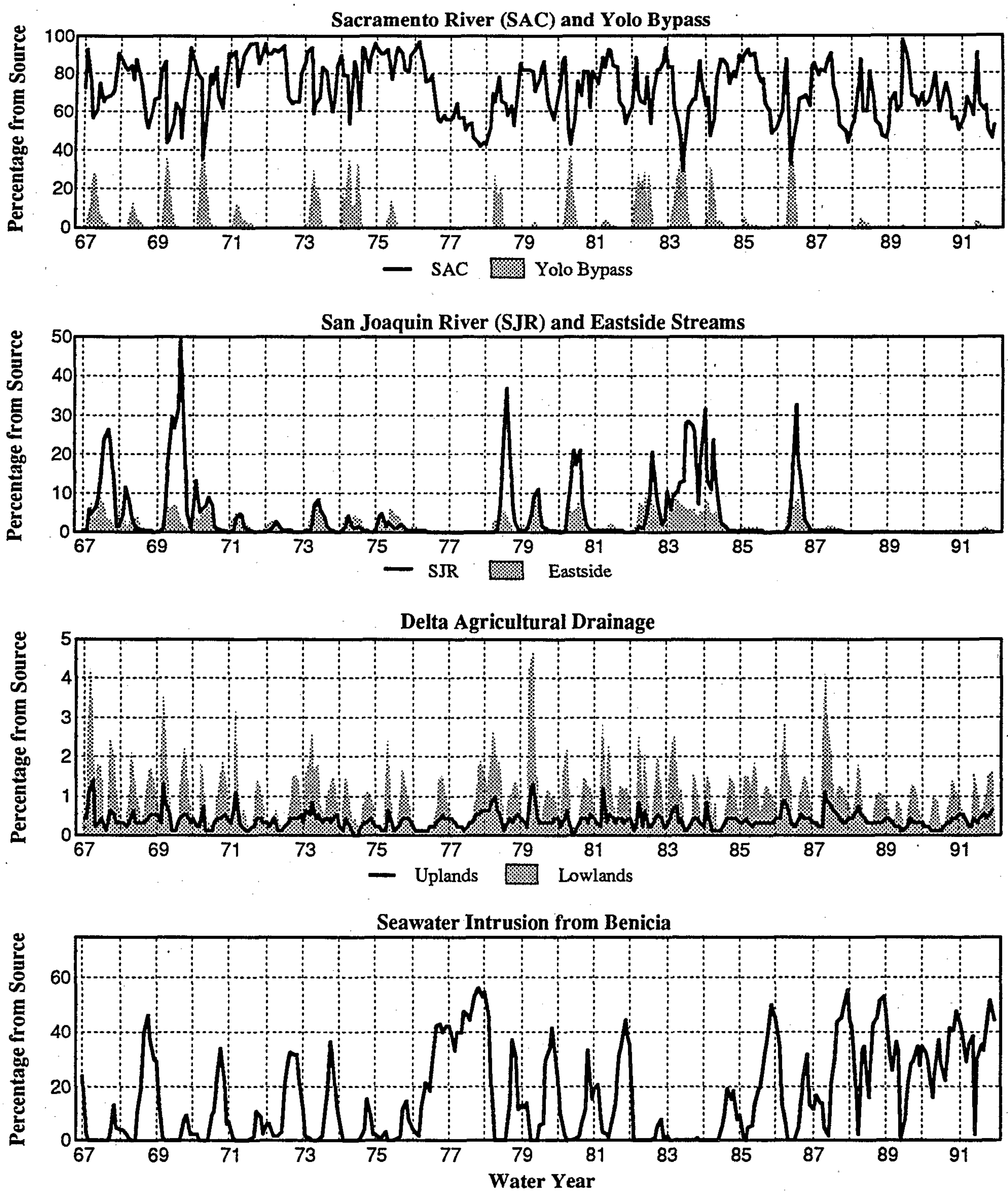


Figure B1-37.
Simulated Historical Monthly Average Contributions of Delta Inflow Sources, Agricultural Drainage, and Seawater Intrusion at Chipps Island for 1967-1991

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

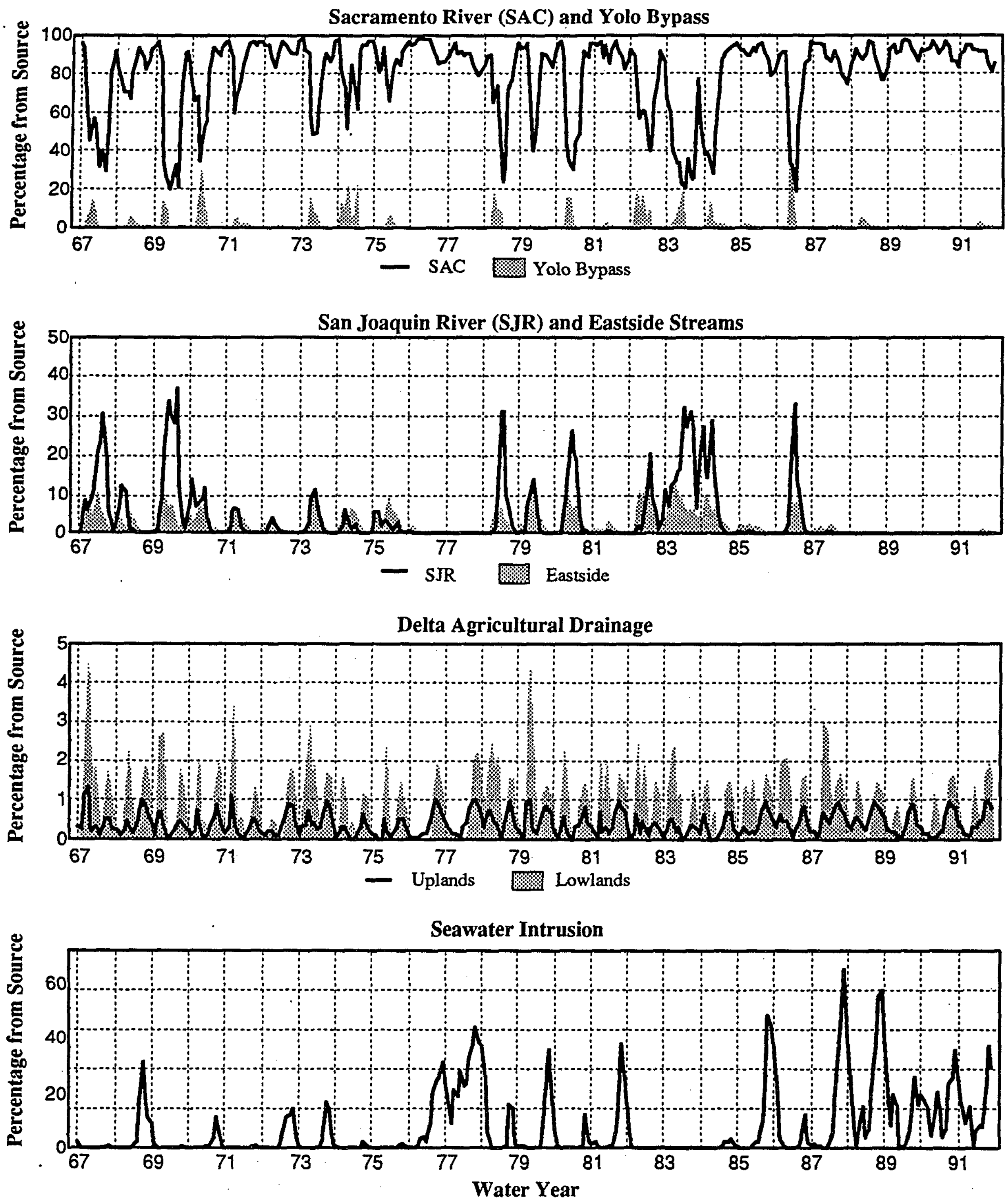


Figure B1-38.
Simulated Historical Monthly Average Contributions of Delta Inflow Sources, Agricultural Drainage, and Seawater Intrusion at Antioch for 1967-1991

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

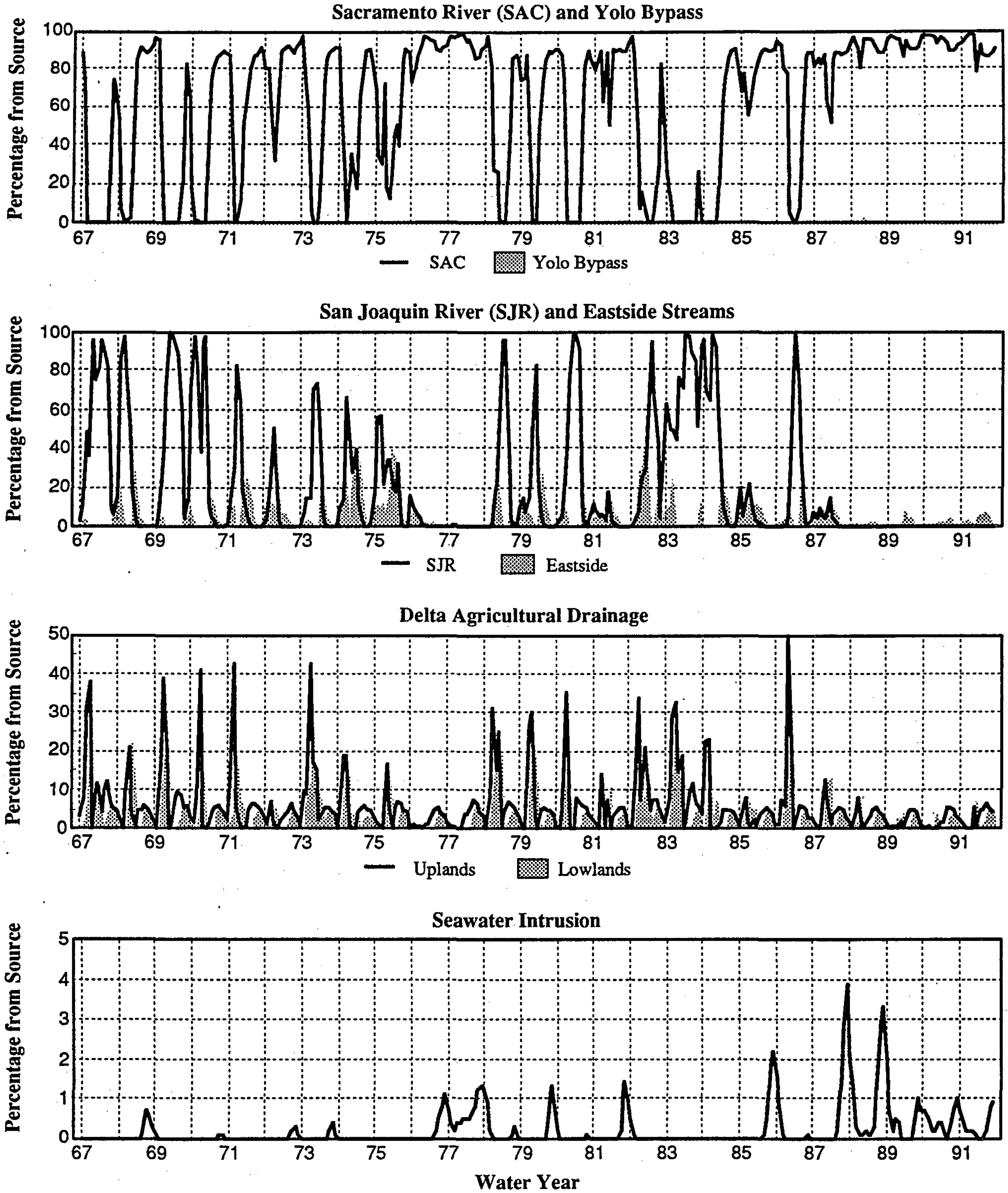


Figure B1-39.
Simulated Historical Monthly Average Contributions of Delta Inflow Sources, Agricultural Drainage, and Seawater Intrusion at CCWD Rock Slough Intake for 1967-1991

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

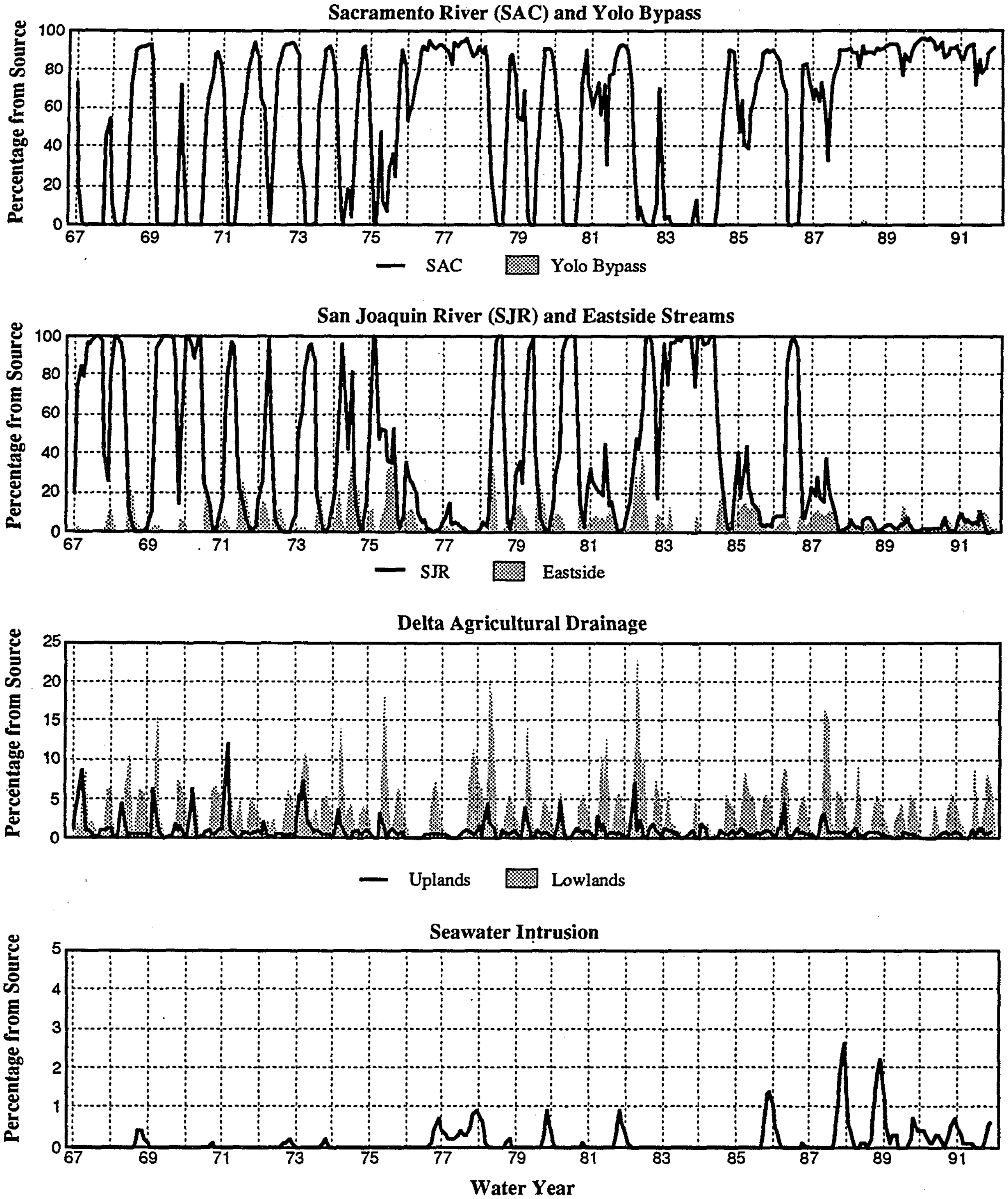


Figure B1-40.
Simulated Historical Monthly Average Contributions of Delta Inflow Sources, Agricultural Drainage, and Seawater Intrusion at SWP Banks Pumping Plant for 1967-1991

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

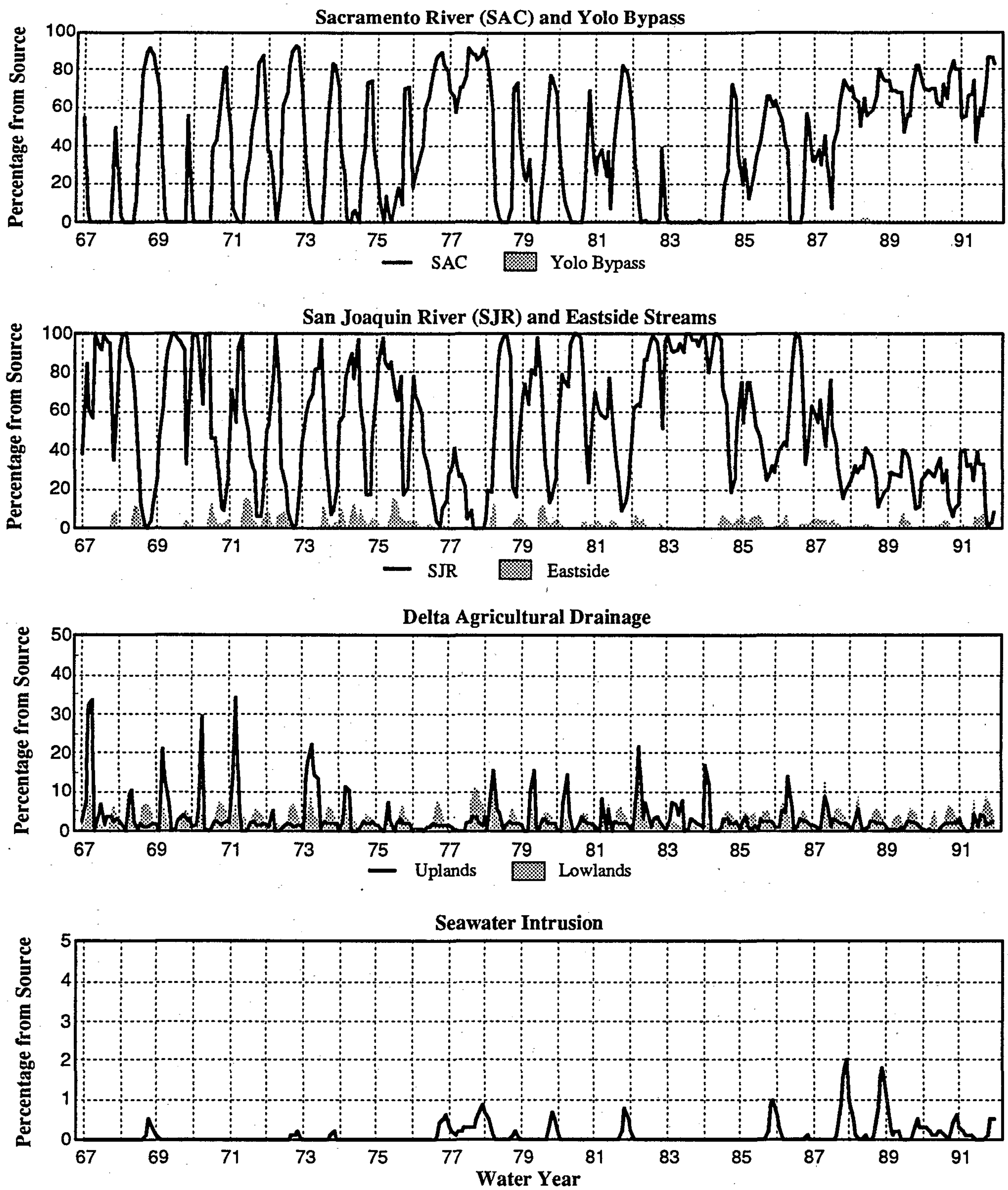


Figure B1-41.
Simulated Historical Monthly Average Contributions of Delta Inflow Sources, Agricultural Drainage, and Seawater Intrusion at CVP Tracy Pumping Plant for 1967-1991

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

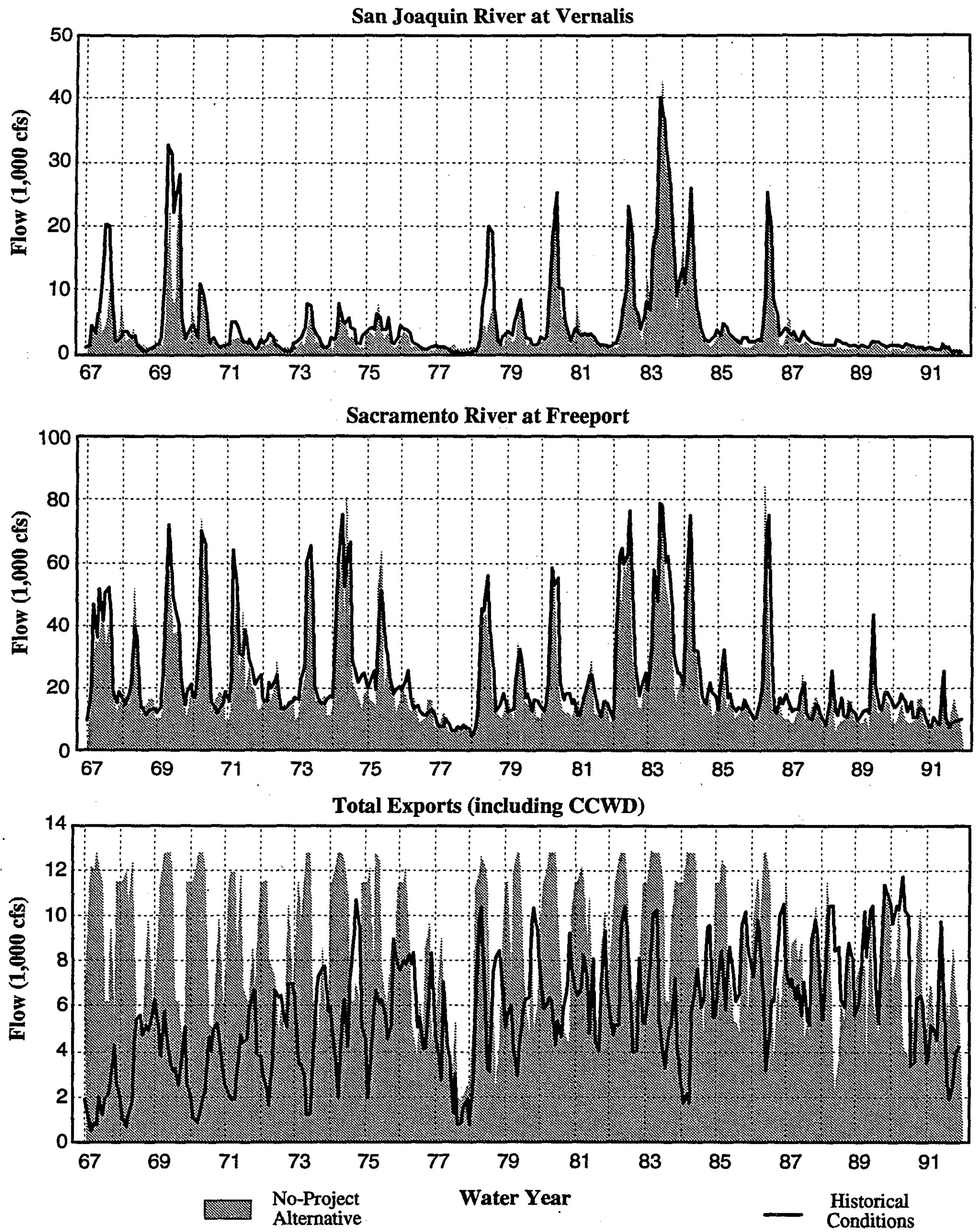


Figure B1-42.
Simulated Monthly Average San Joaquin and Sacramento River Flows and Exports for the No-Project Alternative and Historical Conditions for 1967-1991

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

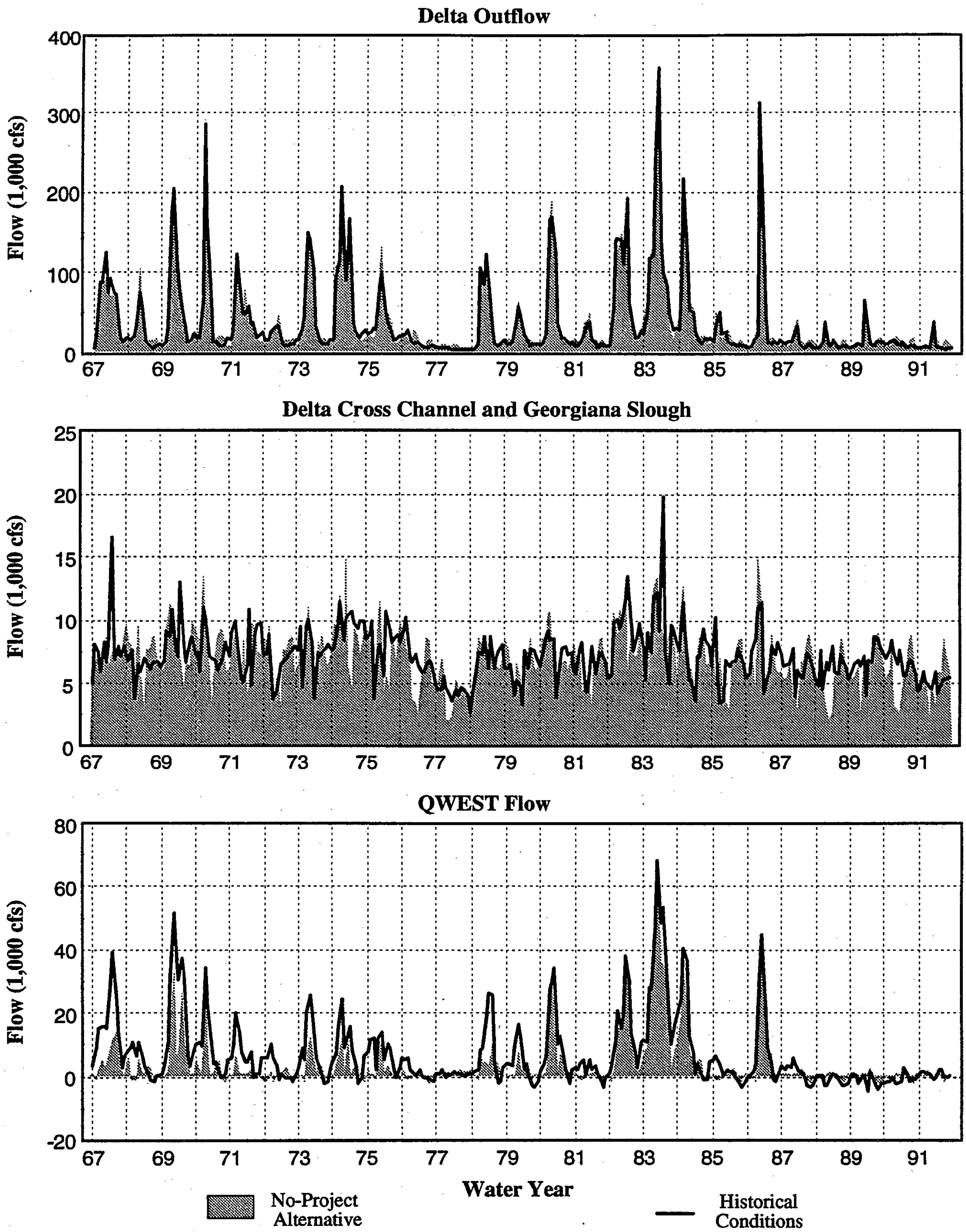


Figure B1-43.
Simulated Monthly Average Delta Outflow, DCC and Georgiana Slough Flow, and QWEST Flow for the No-Project Alternative and Historical Conditions for 1967-1991

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

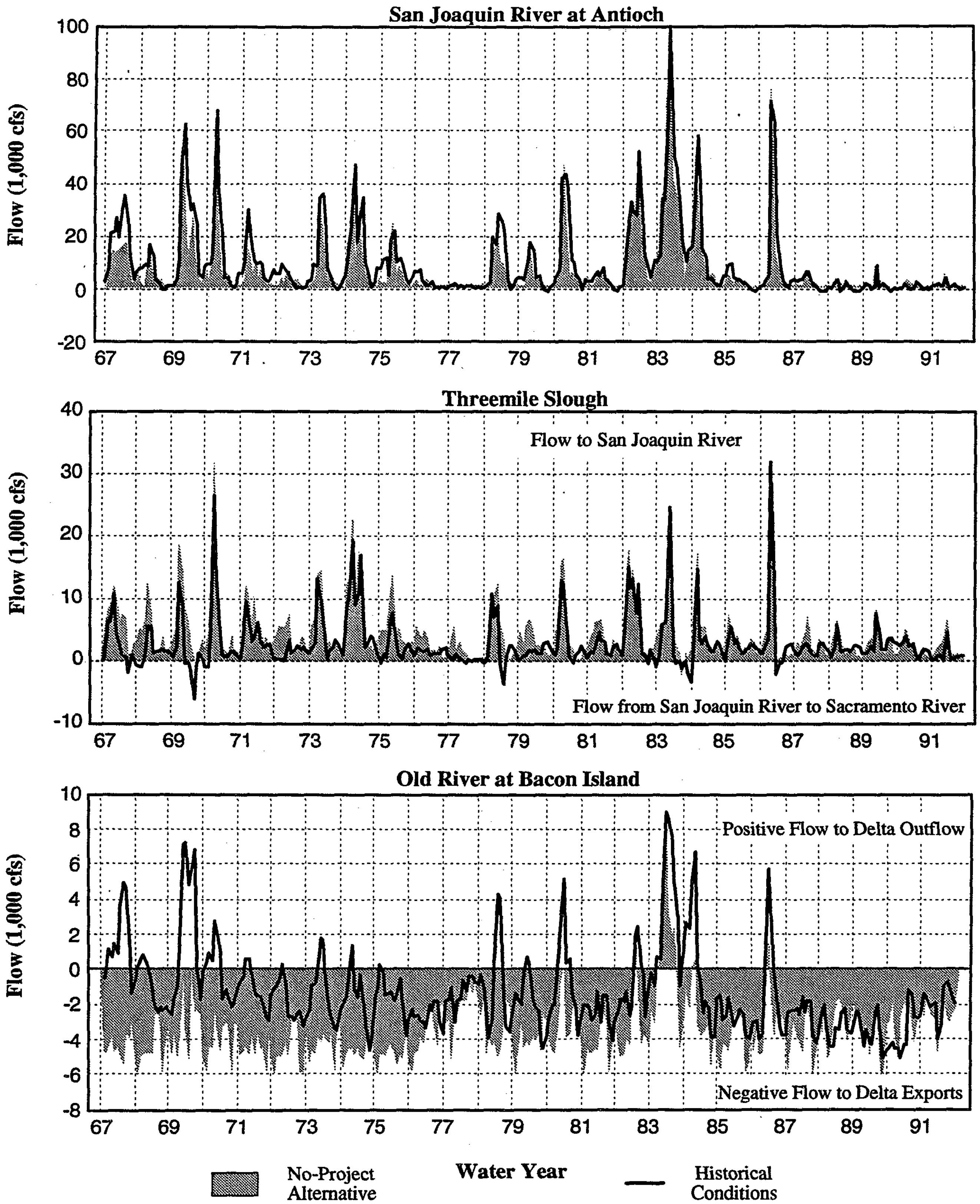
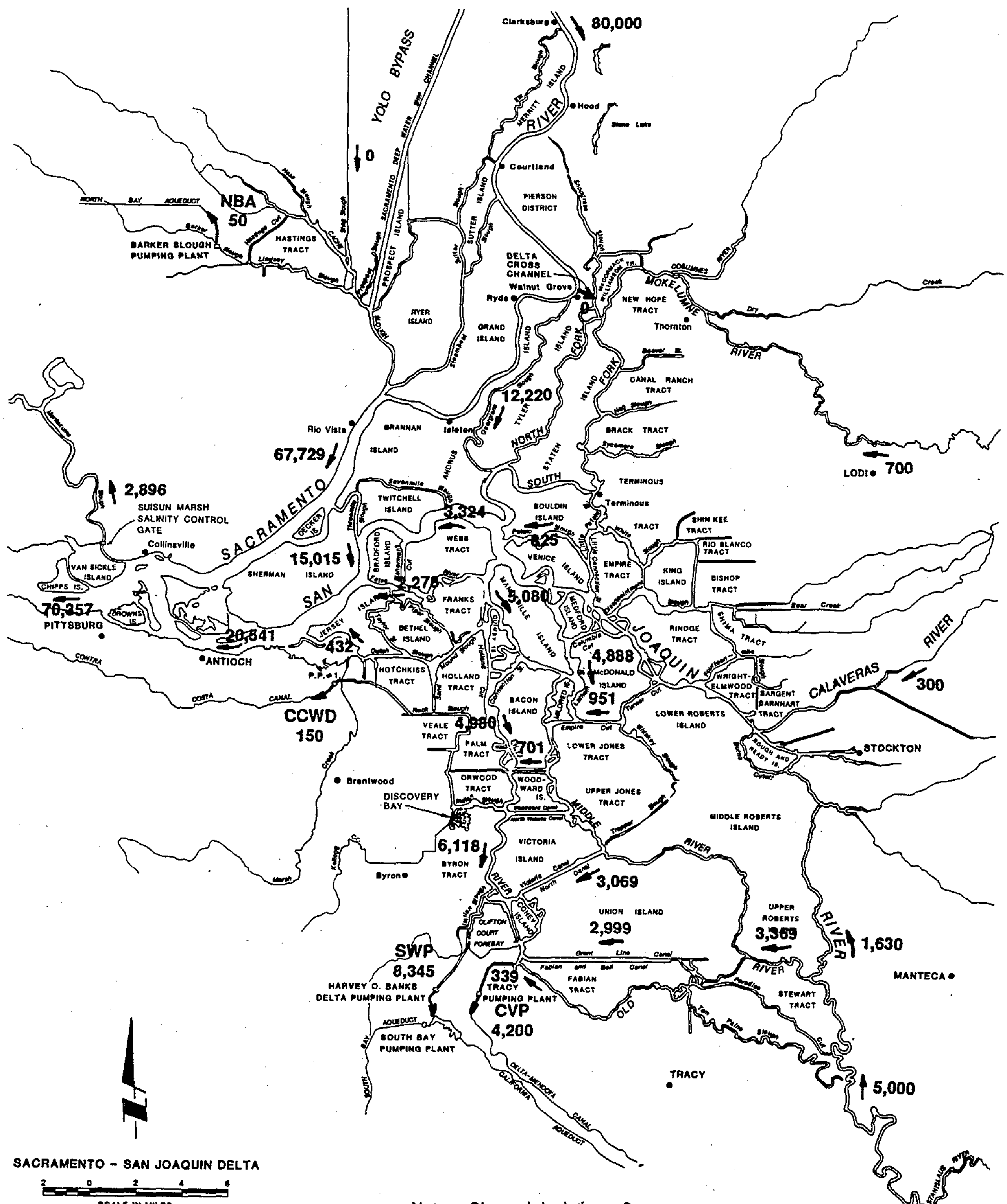


Figure B1-44.
Simulated Monthly Average San Joaquin River, Threemile Slough, and Old River Flows for the No-Project Alternative and Simulated Historical Conditions for 1967-1991

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

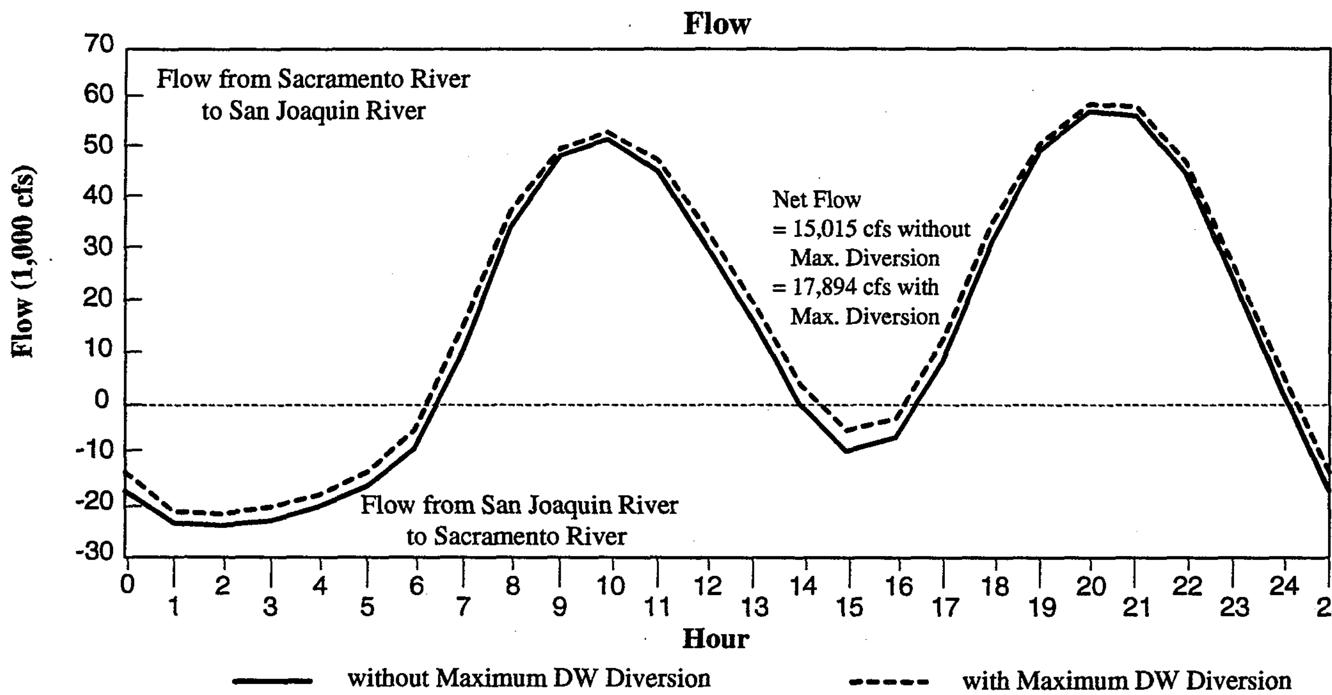


Notes: Channel depletion = 0.
Values from Table B1-7.

Map source: Adapted from California Department of Water Resources 1993.

Figure B1-45.
Delta Flow Patterns (cfs) under Typical Delta Conditions for Maximum DW Diversions (9,000 cfs) but without the DW Project

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



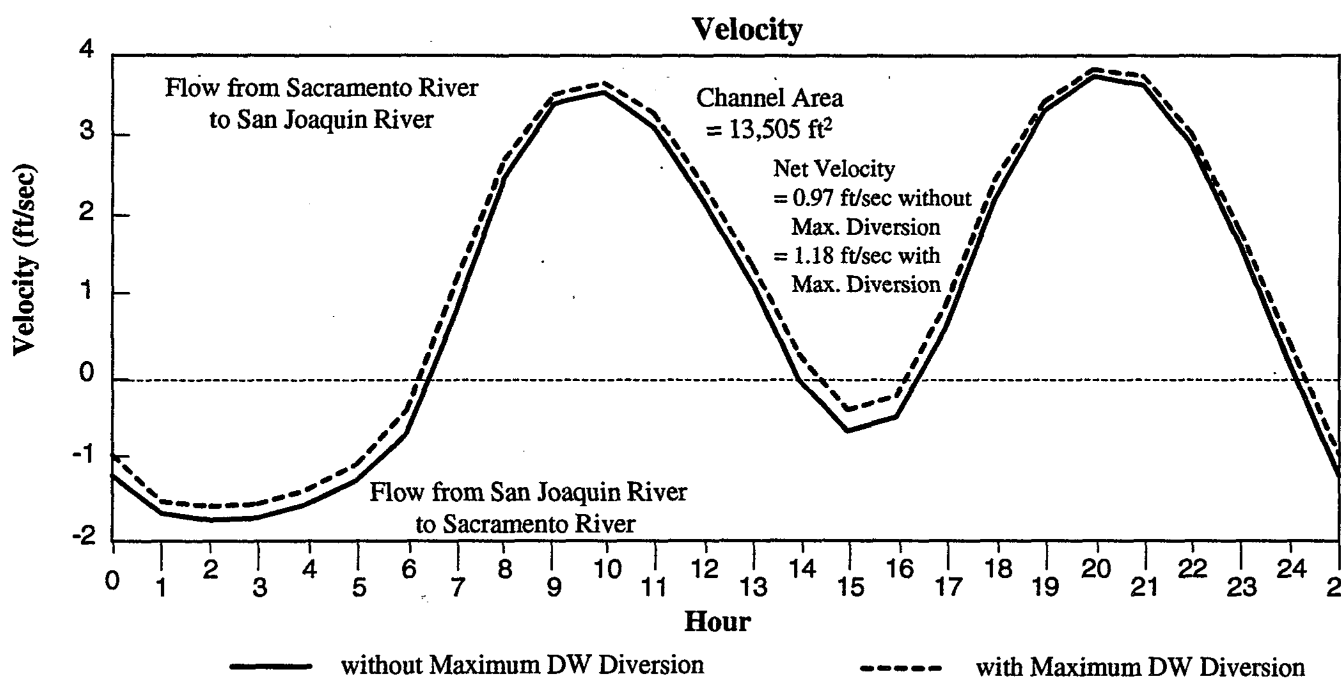


Figure B1-46.
Simulated Tidal Flow and Velocity in Threemile Slough with and without Maximum DW Diversion of 9,000 cfs

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

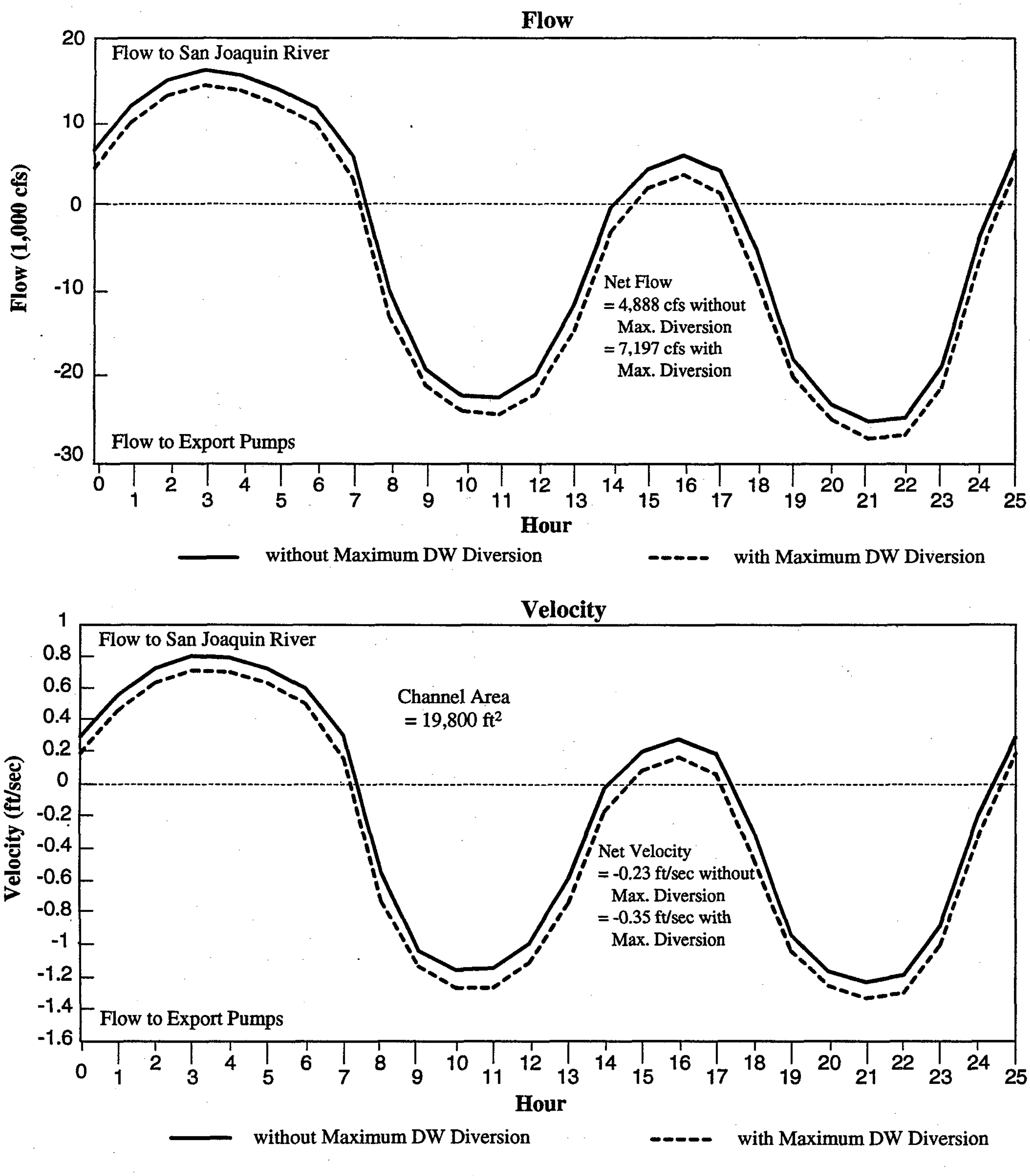
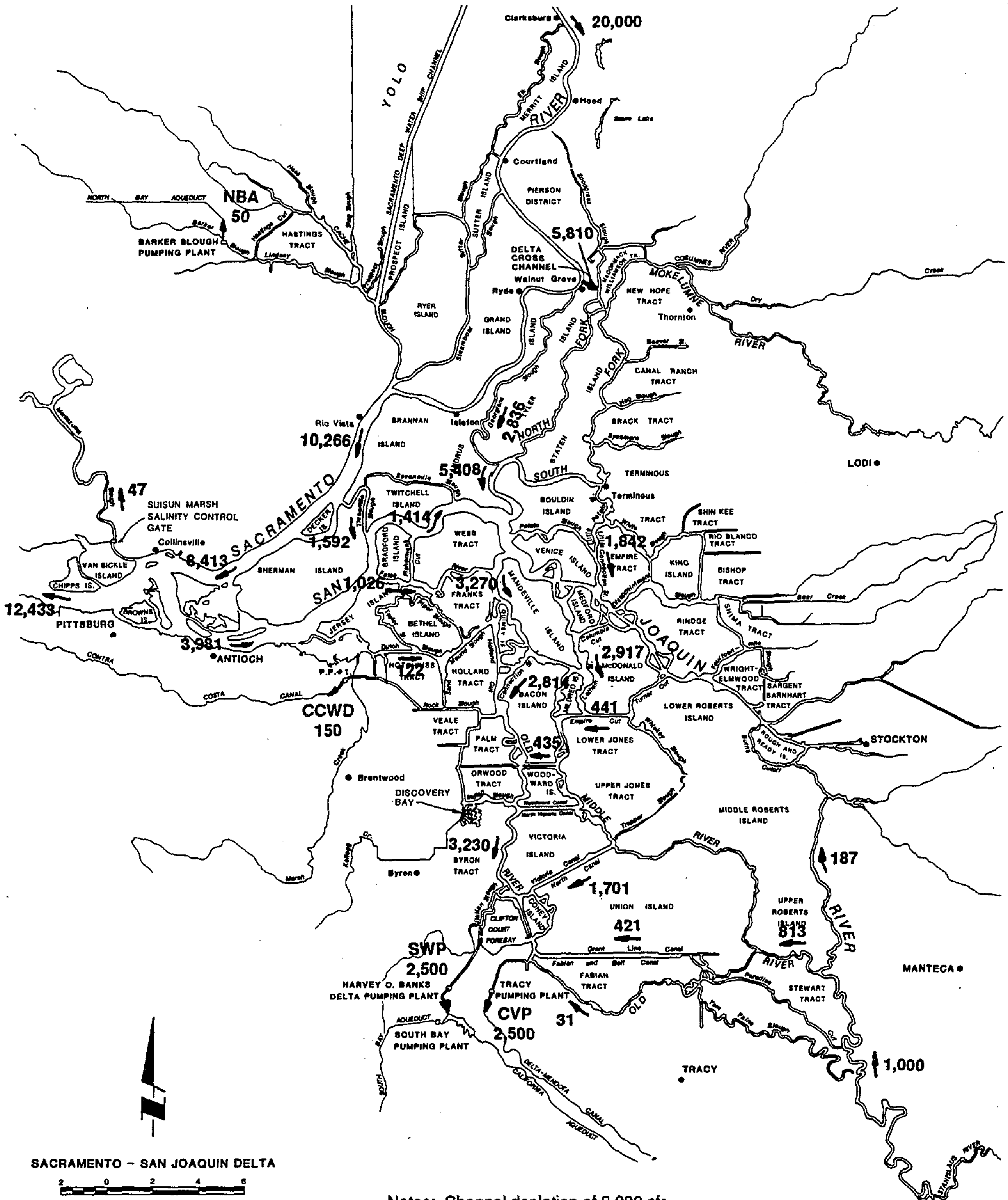


Figure B1-47.
Simulated Tidal Flow and Velocity in Middle River at Columbia Cut with and without Maximum DW Diversion of 9,000 cfs

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

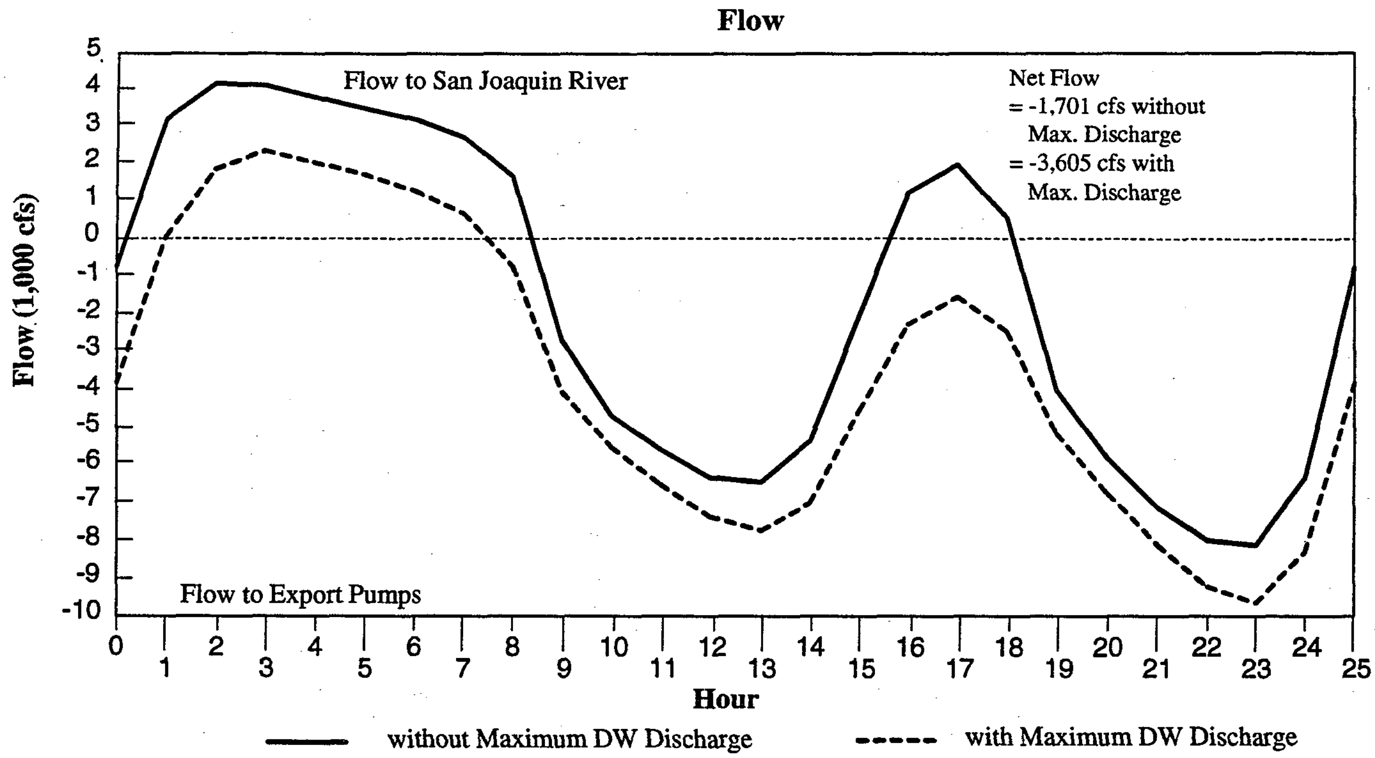


Notes: Channel depletion of 3,000 cfs.
Values from Table B1-8.

Map source: Adapted from California Department of Water Resources 1993.

Figure B1-48.
Delta Flow Patterns (cfs) under Typical Delta Conditions for Maximum DW Discharges (6,000 cfs) but without the DW Project

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



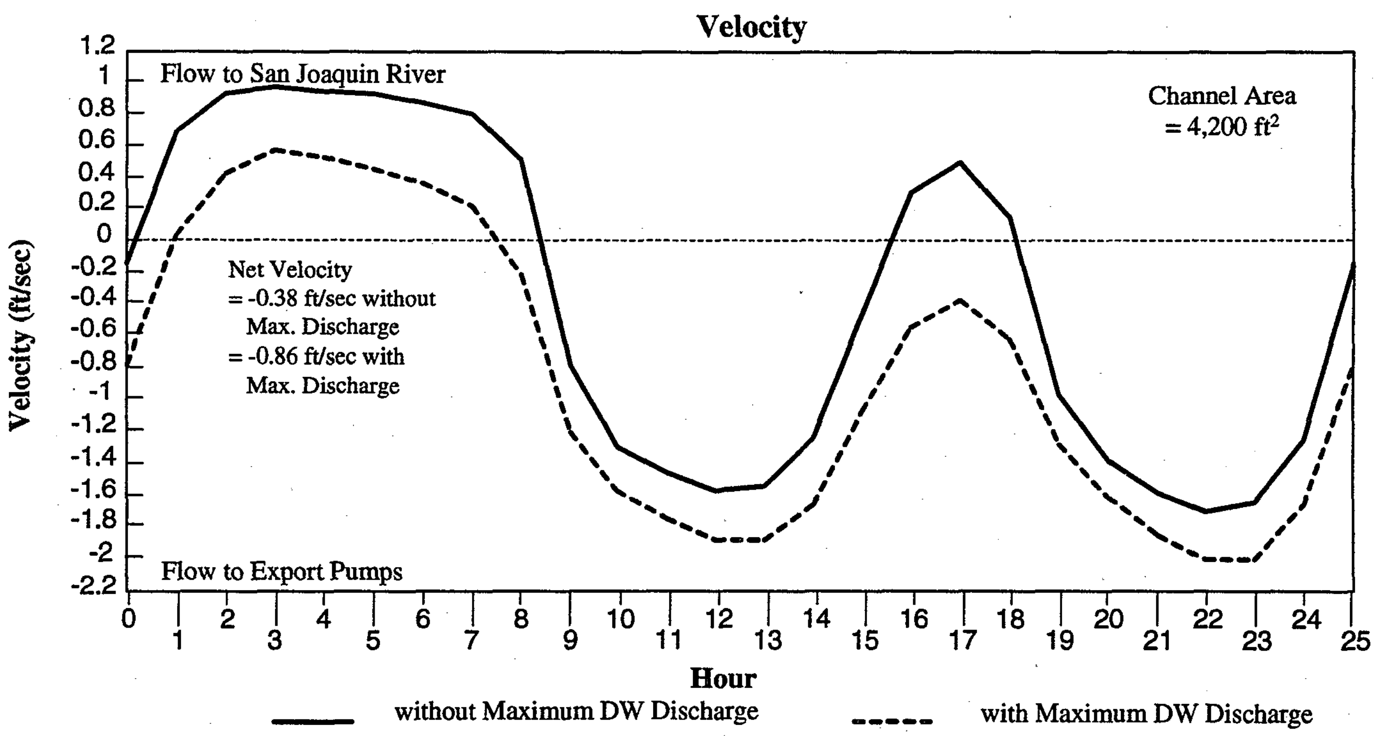


Figure B1-49.
Simulated Tidal Flow and Velocity in Middle River at Woodward Canal with and without Maximum DW Discharge of 6,000 cfs

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

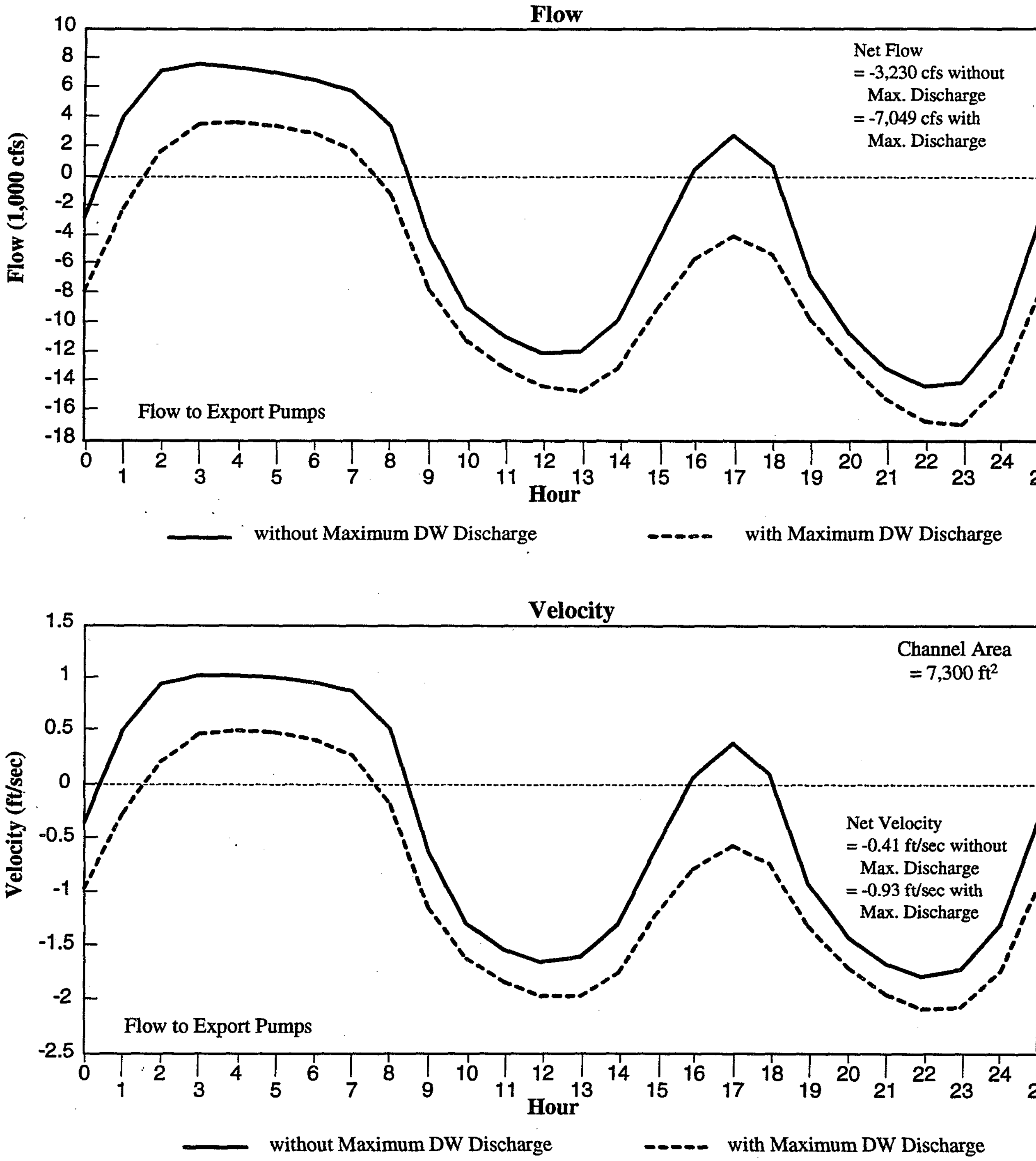


Figure B1-50.
Simulated Tidal Flow and Velocity in
Old River South of Woodward Canal
with and without Maximum DW Discharge of 6,000 cfs

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

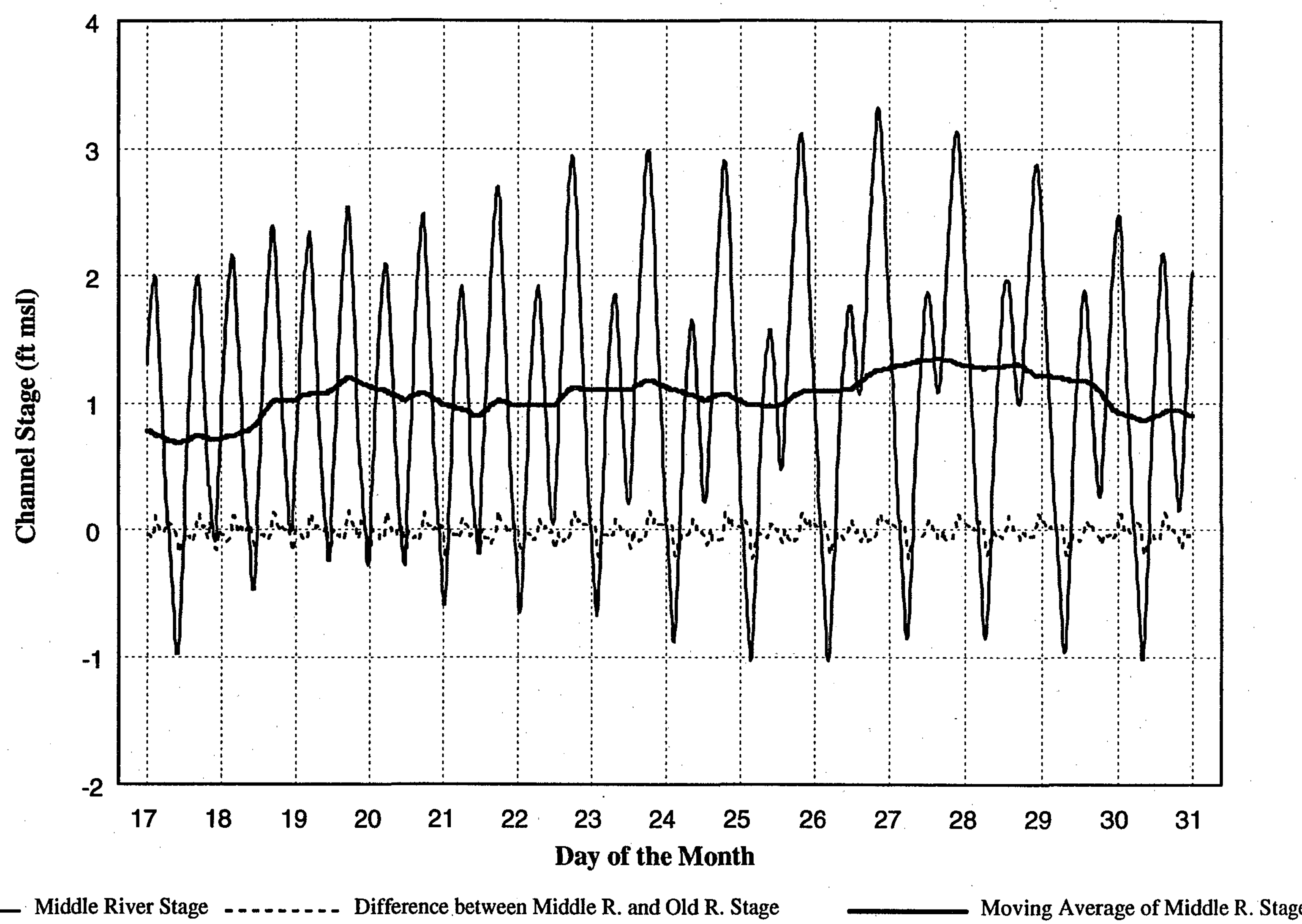


Figure B1-51.
Measured Tidal Stage (15-minute and 25-hour moving average) in Middle River at USGS Ultrasonic Velocity Meter Stations near Bacon Island during October 17-30, 1987

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

C-061621

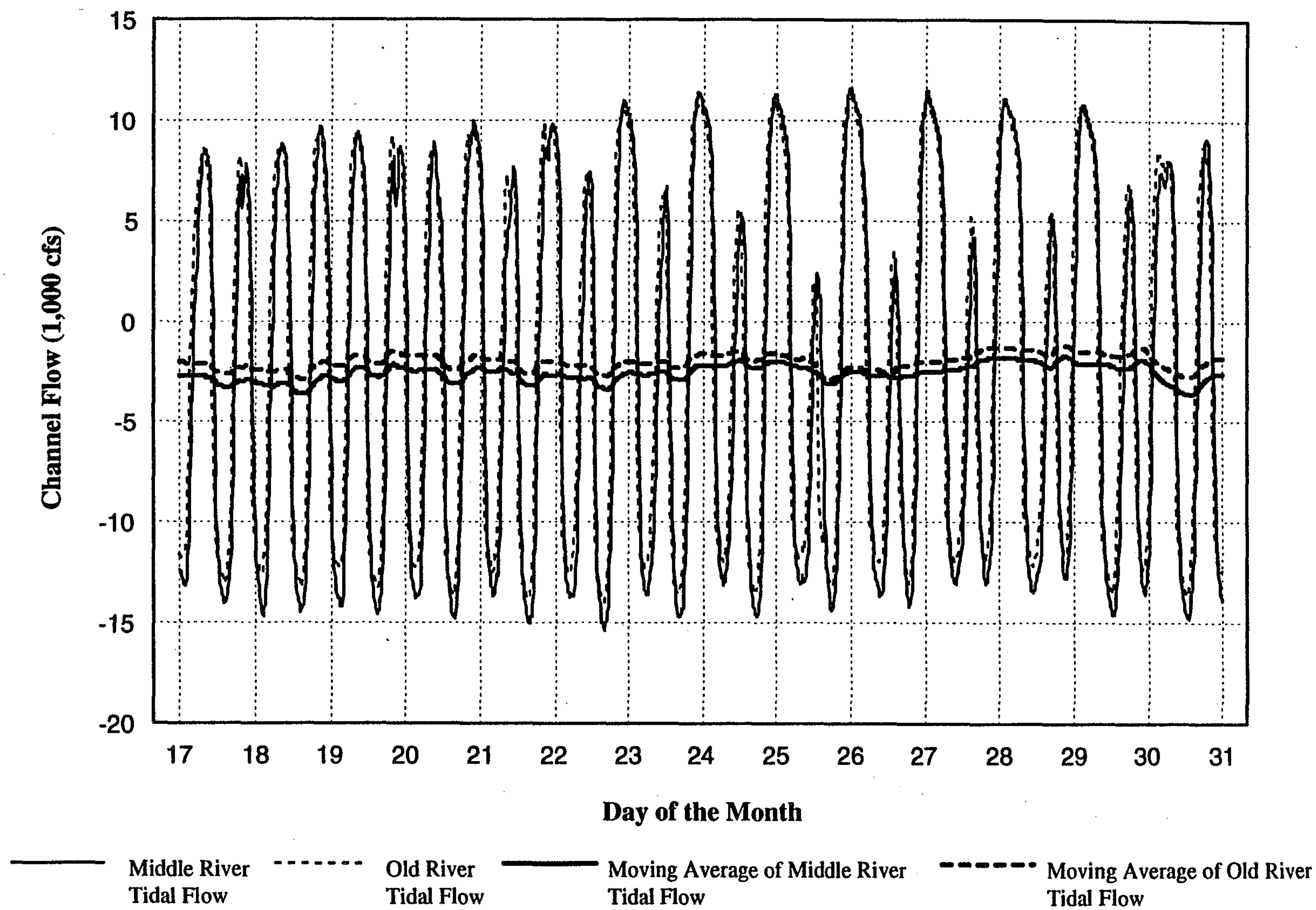


Figure B1-52.
Measured Tidal Flow (15-minute and 25-hour moving average) in Old River and Middle River at USGS UVM Stations near Bacon Island, October 17-30, 1987

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

C-061622