Appendix B

CALSIM II Modeling Studies of the Delta-Mendota Canal/California Aqueduct Intertie

DRAFT TECHNICAL MEMORANDUM

CH2MHILL

CALSIM II Modeling Studies of the Delta Mendota Canal/California Aqueduct Intertie

Introduction

The proposed action, known as the Delta Mendota Canal (DMC) and California Aqueduct Intertie (Intertie), consists of the construction and operation of a 400-cfs pumping plant and pipeline connections between the DMC and California Aqueduct. The Intertie alignment is proposed for DMC milepost 7.1, where the DMC and California Aqueduct are about 400 feet apart.

The Intertie provides operational flexibility between the DMC and the California Aqueduct. It does not result in any changes to authorized pumping capacity at Jones Pumping Plant or Banks Delta Pumping Plant.

The average daily pumping capacity at the Jones PP is limited to 4,600 cfs, which is the existing capacity of the upper DMC and its intake channel. However, due to conveyance limitations in the lower DMC and other factors, pumping at Jones PP is almost always less than 4,600 cfs. DMC conveyance capacity is affected by subsidence, canal siltation and deposition, the amount, timing, and location of water deliveries from the DMC, the facility design, and other factors. By linking the upper DMC with the California Aqueduct, the Intertie would allow year-round Jones pumping capacity up to 4,600 cfs, subject to all applicable export pumping restrictions for water quality and fishery protections. Jones PP capacity would remain limited to its existing authorized pumping capacity of 4,600 cfs.

For this analysis, the Intertie alternative has been compared to a No Action alternative representing a future level of development (2030 LOD). The assumptions and results of this comparison are presented in the sections below. In addition, a Virtual Intertie alternative was also developed by post-processing the results of the Intertie alternative. The assumptions, approach and results of the Virtual Intertie alternative are presented in the final section of this memorandum.

Overview of CALSIM II Studies

Two CALSIM II modeling studies were developed to analyze the Intertie using assumptions consistent with the OCAP Biological Assessment (BA) CALSIM II Study 8.0 (May 2008). The Future No Action alternative study was developed to represent a 2030 LOD using essentially the same hydrologic inputs and assumptions that are being used for the CALSIM II modeling developed for the OCAP BA.

The Intertie alternative study was developed to simulate the project. This study is at the same LOD as the Base study and includes the same CVPIA (b)(2) and EWA actions as the Base study.

The Virtual Intertie alternative was not simulated in CALSIM II but was developed by post-processing the results of the Intertie alternative CALSIM II study.

Study Methodology and Assumptions

The current planning model used by DWR and USBR is CALSIM II, a general-purpose simulation model of the combined CVP/SWP systems as well as a host of smaller water supply entities with which the CVP/SWP systems interact. A geographically comprehensive model, CALSIM II includes the Sacramento River basin, the San Joaquin River basin, and the Delta, as well as portions of the Tulare Basin and Southern California. CALSIM II provides a platform for assessing changes in Delta water quality and water supply operations of the CVP and SWP projects. All water supply evaluations of the Intertie presented in this report utilized the CALSIM II model.

The sections that follow outline the hydrologic and operational assumptions behind the Intertie modeling analyses. These assumptions are consistent across both studies with the exception that the Intertie study includes the Intertie project and fixed CVPIA (b)(2) actions. The assumptions used in each alternative are summarized in Table 1.

Geographic Coverage

The valley floor drainage area of the Sacramento and San Joaquin Rivers, the upper Trinity River, and the San Joaquin Valley, Tulare Basin, and Southern California areas served by the Federal Central Valley Project (CVP) and the California State Water Project (SWP) are simulated in CALSIM II. The focus of CALSIM II is on the major CVP and SWP facilities, but operations of many other facilities are included to varying degrees.

Hydrology

CALSIM II includes a hydrology developed jointly by DWR and USBR. Water diversion requirements (demands), stream accretions and depletions, rim basin inflows, irrigation efficiencies, return flows, non-recoverable losses, and groundwater operation are all components that make up the hydrology used in CALSIM II. Sacramento Valley and tributary rim basin hydrologies are developed using a process designed to adjust the historical sequence of monthly stream flows to represent a sequence of flows at a future level of development. Adjustments to historic water supplies are determined by imposing future level land use on historical meteorological and hydrologic conditions. San Joaquin River basin hydrology is developed using fixed annual demands and regression analysis to develop accretions and depletions. The resulting hydrology represents the water supply available from Central Valley streams to the CVP and SWP at a future level of development.

Delta Water Quality

CALSIM II uses DWR's Artificial Neural Network (ANN) model to simulate the flow-salinity relationships for the Delta. The ANN model correlates DSM2 model-generated salinity at key locations in the Delta with Delta inflows, Delta exports, and Delta Cross Channel operations. The ANN flow-salinity model estimates electrical conductivity at the following four locations for the purpose of modeling Delta water quality standards: Old River at Rock Slough, San Joaquin River at Jersey Point, Sacramento River at Emmaton, and

Sacramento River at Collinsville. In its estimates, the ANN model considers antecedent conditions up to 148 days, and considers a "carriage-water" type of effect associated with Delta exports.

CVP/SWP Delivery Logic

The CALSIM II delivery logic uses runoff forecast information, which incorporates uncertainty and standardized rule curves (i.e. Water Supply Index versus Demand Index Curve), to estimate the water available for delivery and carryover storage. Updates of delivery levels occur monthly from January 1 through May 1 for the SWP and March 1 through May 1 for the CVP as water supply parameters become more certain. The south-of Delta SWP delivery is determined based upon water supply parameters and operational constraints. The CVP system wide delivery and south-of-Delta delivery are based similarly upon water supply parameters and operational constraints with specific consideration for export constraints.

CVPIA 3406(b)(2) Water

CALSIM II incorporates procedures for dynamic modeling of CVPIA 3406(b)(2) water and the Environmental Water Account (EWA), under the CALFED Framework and Record of Decision (ROD). Per the October, 1999 Decision and the subsequent February, 2002 Decision, CVPIA 3406(b)(2) accounting procedures are based on system conditions under operations associated with SWRCB D-1485 and D-1641 regulatory requirements. Similarly, the operating guidelines for selection of actions and allocation of assets under the EWA are based on system conditions under operations associated with SWRCB D-1641 regulatory requirements. This requires sequential layering of multiple system requirements and simulations.

CVPIA 3406(b)(2) allocates 800 TAF (600 TAF in Shasta critical years) of CVP project water to targeted fish actions. The full amount provides support for SWRCB D-1641 implementation. To simulate the 3406 (b)(2) accounting, the model uses metrics calculated in the (b)(2) simulation step. The metrics measure the flow increases and export decreases from D1485 to D1641 WQCP Costs, and from D1485 to (b)(2), total (b)(2) costs. The following assumptions were used to model the May 2003 3406 (b)(2) Department of the Interior decision.

1. **Allocation of (b)(2) water** is 800,000 acre-feet per year (af/yr), 700,000 af/yr in 40-30-30 Dry Years, and 600,000 af/yr in 40-30-30 Critical years

2. **Upstream flow metrics** are calculated at Clear Creek, Keswick, Nimbus, and Goodwin Reservoirs where (b)(2) water can be used to increase flow for fishery purposes. The assumptions used in CalSim II for taking an upstream action at one of the previously mentioned reservoirs are:

   - **October-January**

     - Clear Creek Releases: Action is on if Trinity Beginning of Month Storage >600,000 af.

     - Keswick Releases: Action is on if Shasta Beginning-of-Month Storage > 1,900,000 af.

  - Nimbus Releases: Action is on if Folsom Beginning-of-Month Storage > 300,000 af.
  - For all releases, if the 200,000-af target is projected to be violated the model will try to reduce the magnitude of the actions in December and/or January.

- **February-September**
  - Clear Creek Releases: Action is on if Trinity Beginning-of-Month Storage >600,000 af.
  - Keswick Releases: Action is on if Shasta Beginning-of-Month Storage > 1,900,000 af and if remaining (b)(2) account > projected coming WQCP costs.
  - Nimbus Releases: Action is on if Folsom Beginning-of-Month Storage > 300,000 af and if remaining (b)(2) account > projected coming WQCP costs.

3. **The export metric** is the change in total CVP pumping (Jones + CVP Banks) from the base case (D1485). Assumptions used in CalSim II for taking a delta action are:
   - Winter Actions (December through February) and Pre-Vernalis Adaptive Management Plan (VAMP) (April Shoulder) actions are off.
   - VAMP Actions: Always taken and done at a 2:1 (Vernalis flow to CVP pumping ratio) ratio if non-VAMP Vernalis flows are greater than 8,600 cubic feet per second (cfs).
   - May Shoulder: Action turned on if the remaining (b)(2) is greater than or equal to the discounted remaining WQCP cost + anticipated Clear Creek cost (25,000 af). DISCOUNT = If the annual WQCP cost > 500,000 af, the difference is subtracted from the remaining WQCP cost.
   - June Ramping: Action turned on if the remaining (b)(2) is greater than or equal to the discounted remaining WQCP cost + anticipated Clear Creek cost (20,000 af).

Both May Shoulder and June Ramping are further restricted to stay within the remaining (b)(2)account – remaining WQCP costs.

Environmental Water Account

These modeling studies utilize the "Limited EWA" assumption included in OCAP BA Study 8.0. The action strategy for the Limited EWA includes the VAMP (Action 3) and Post-VAMP (Action 5) actions. Both actions occur in every year in both alternatives. No other actions are taken. The following assumptions are used for each of these actions.

VAMP Export *Restriction* (April 15 – May 15):

- a *restriction* on total Delta exports to a target level during the VAMP-period, where the target depends on San Joaquin River flow conditions. Action applies only to SWP exports because CVP exports are already restricted to the same target level through the B2 action strategy included in the baseline operation relative to EWA.

VAMP May-Shoulder Export *Restriction* (May 16 – May 31):

- an extension of the VAMP-period export restriction into the May 16-31 period. SWP export is constrained to the target level. CVP exports are similarly restricted unless they were already constrained by the analogous B2 “Post-VAMP” action.

Table 1. CALSIM II Intertie Studies Assumptions

		Future No Action Alternative	Intertie Alternative
Planning horizon		2030	Same
Period of Simulation		82 years (1922-2003)	Same
HYDROLOGY			
Level of development (Land Use)		2030 level[a]	Same
Sacramento Valley (excluding American R.)			
	CVP	CVP Land-use based, Full build out of CVP contract amounts	Same
	SWP (FRSA)	Land-use based, limited by contract amounts	Same
	Non-project	Land-use based	Same
	Federal refuges	Firm Level 2 water needs	Same
American River			
	Water rights	2025	Same
	CVP (PCWA American River Pump Station)	CVP (PCWA modified)[b]	Same
San Joaquin River[c]			
	Friant Unit	Limited by contract amounts, based on current allocation policy	Same
	Lower Basin	Land-use based, based on district level operations & constraints	Same
	Stanislaus River	Draft Transitional Operations Plan	Same
South of Delta			
	(CVP/SWP project facilities)	CVP Demand based on contracts amounts	Same
	Contra Costa Water District	195 TAF CVP contract supply and water rights[d]	Same
	SWP Demand - Table A	Full Table A	Same
	SWP Demand - North Bay Aqueduct (Table A)	77 TAF/Yr	Same
	SWP Demand - Article 21 demand	Up to 314 TAF/month from December to March, total of demands up to 214 TAF/month in all other months[e]	Same
	Federal refuges	Firm Level 2 water needs	Same
FACILITIES			
Systemwide		Existing facilities	Same
Sacramento Valley			

		Future No Action Alternative	Intertie Alternative
	Red Bluff Diversion Dam	Diversion Dam operated July - August (diversion constraint)	Same
	Colusa Basin	Existing conveyance and storage facilities	Same
	Upper American River	PCWA American River pump station[f]	Same
	Sacramento River Water Reliability	American/Sacramento River Diversions[m]	Same
	Lower Sacramento River	Freeport Regional Water Project (Full Demand)[g]	Same
Delta Region			
	SWP Banks Pumping Plant	South Delta Improvements Program Permanent Barriers (Stage 1). 6,680 cfs capacity in all months and an additional 1/3 of Vernalis flow from Dec 15 through Mar 15 (addit. 500 cfs Jul - Sep)	Same
	CVP C.W. Bill Jones (Jones) Pumping Plant	4,200 cfs + deliveries upstream of DMC constriction	4,600 cfs capacity in all months (allowed for by the Delta-Mendota Canal–California Aqueduct Intertie)
	City of Stockton Delta Water Supply Project (DWSP)	DWSP WTP 30 mgd	Same
	Contra Costa Water District	Existing pump locations[h]	Same
South of Delta (CVP/SWP project facilities)			
	South Bay Aqueduct (SBA)	SBA Rehabilitation: 430 cfs capacity from junction with California Aqueduct to Alameda County FC&WSD Zone 7 diversion point	Same
REGULATORY STANDARDS			
Trinity River			
	Minimum flow below Lewiston Dam	Trinity EIS Preferred Alternative (369-815 TAF/year)	Same
	Trinity Reservoir end-of-September minimum storage	Trinity EIS Preferred Alternative (600 TAF as able)	Same
Clear Creek			
	Minimum flow below Whiskeytown Dam	Downstream water rights, 1963 USBR Proposal to USFWS and NPS, and USFWS discretionary use of CVPIA 3406(b)(2)	Same
Upper Sacramento River			

		Future No Action Alternative	Intertie Alternative
	Shasta Lake	NMFS 2004 BiOp: 1.9 MAF end of Sep. storage target in non-critical years	Same
	Minimum flow below Keswick Dam	Flows for SWRCB WR 90-5 temperature control, and USFWS discretionary use of CVPIA 3406(b)(2)	Same
Feather River			
	Minimum flow below Thermalito Diversion Dam	2006 Settlement Agreement (700 / 800 cfs)	Same
	Minimum flow below Thermalito Afterbay outlet	1983 DWR, DFG Agreement (750-1,700 cfs)	Same
Yuba River			
	Minimum flow below Daguerre Point Dam	Yuba Accord Adjusted Data[j]	Same
American River			
	Minimum flow below Nimbus Dam	American River Flow Management [l]	Same
	Minimum Flow at H Street Bridge	SWRCB D-893	Same
Lower Sacramento River			
	Minimum flow near Rio Vista	SWRCB D-1641	Same
Mokelumne River			
	Minimum flow below Camanche Dam	FERC 2916-029, 1996 (Joint Settlement Agreement) (100-325 cfs)	Same
	Minimum flow below Woodbridge Diversion Dam	FERC 2916-029, 1996 (Joint Settlement Agreement) (25-300 cfs)	Same
Stanislaus River			
	Minimum flow below Goodwin Dam	1987 USBR, DFG agreement, & USFWS discretionary use of CVPIA 3406(b)(2)	Same
	Minimum dissolved oxygen	SWRCB D-1422	Same
Merced River			
	Minimum flow below Crocker-Huffman Diversion Dam	Davis-Grunsky (180-220 cfs, Nov-Mar), Cowell Agreement	Same

		Future No Action Alternative	Intertie Alternative
	Minimum flow at Shaffer Bridge	FERC 2179 (25-100 cfs)	Same
Tuolumne River			
	Minimum flow at Lagrange Bridge	FERC 2299-024, 1995 (Settlement Agreement) (94-301 TAF/year)	Same
San Joaquin River			
	Maximum salinity near Vernalis	SWRCB D-1641	Same
	Minimum flow near Vernalis	SWRCB D-1641, and Vernalis Adaptive Management Plan per San Joaquin River Agreement	Same
Sacramento River–San Joaquin River Delta			
	Delta Outflow Index (Flow and Salinity)	SWRCB D-1641	Same
	Delta Cross Channel gate operation	SWRCB D-1641	Same
	Delta exports	SWRCB D-1641, USFWS discretionary use of CVPIA 3406(b)(2)	Same
OPERATIONS CRITERIA: RIVER-SPECIFIC			
Upper Sacramento River			
	Flow objective for navigation (Wilkins Slough)	3,250 - 5,000 cfs based on CVP water supply condition	Same
American River			
	Folsom Dam flood control	Variable 400/670 flood control diagram (without outlet mods)	Same
	Flow below Nimbus Dam	American River Flow Management [l]	Same
	Sacramento Area Water Forum "Replacement" Water	"Replacement" water is not implemented	Same
Stanislaus River			
	Flow below Goodwin Dam	Draft Transitional Operations Plan	Same
San Joaquin River			
	Flow at Vernalis	D1641[q]	Same
OPERATIONS CRITERIA: SYSTEMWIDE			
CVP water allocation			

		Future No Action Alternative	Intertie Alternative
	CVP Settlement and Exchange	100% (75% in Shasta critical years)	Same
	CVP refuges	100% (75% in Shasta critical years)	Same
	CVP agriculture	100%-0% based on supply (South-of-Delta allocations are reduced due to D-1641 and 3406(b)(2) allocation-related export restrictions)	Same
	CVP municipal & industrial	100%-50% based on supply (South-of-Delta allocations are reduced due to D-1641 and 3406(b)(2) allocation-related export restrictions)	Same
SWP water allocation			
	North of Delta (FRSA)	Contract specific	Same
	South of Delta (including North Bay Aqueduct)	Based on supply; equal prioritization between Ag and M&I based on Monterey Agreement	Same
	Sharing of responsibility for in-basin-use	1986 Coordinated Operations Agreement (FRWP EBMUD and 2/3 of the North Bay Aqueduct diversions are considered as Delta Export, 1/3 of the North Bay Aqueduct diversion is considered as in-basin-use)	Same
	Sharing of surplus flows	1986 Coord. Ops Agreement	Same
	Sharing of Export/Inflow Ratio	Equal sharing of export capacity under SWRCB D-1641; use of CVPIA 3406(b)(2) restricts only CVP and/or SWP exports	Same
	Sharing of export capacity for lesser priority and wheeling related pumping	Cross Valley Canal wheeling (max of 128 TAF/year), CALFED ROD defined Joint Point of Diversion (JPOD)	Same
Study assumptions from above apply		**Future No action Alternative**	**Intertie Alternative**
CVPIA 3406(b)(2): Per May 2003 Dept. of Interior Decision			
	Allocation	800 TAF, 700 TAF in 40-30-30 dry years, and 600 TAF in 40-30-30 critical years	Same
Study assumptions from above apply		**Future No action Alternative**	**Intertie Alternative**
CALFED Environmental Water Account / Limited Environmental Water Account			
	Actions	VAMP (Apr 15 - May 16) export restriction on SWP; If Stored assets and Purchases from the Yuba are sufficient, Post (May 16-31) VAMP export restriction on SWP [j,k]	Same

		Future No Action Alternative	Intertie Alternative
	Assets	Purchase of Yuba River Stored Water under the Lower Yuba River Accord (average of 48 TAF/yr), use of 50% of any CVPIA 3406(b)(2) releases pumped by SWP, additional 500 CFS pumping capacity at Banks in Jul-Sep	Same
	Debt	No Carryover Debt	Same
WATER MANAGEMENT ACTIONS (CALFED)			
Water Transfers			
	Water transfers	Not included	Same
	Phase 8[i]	Not included	Same
	Refuge Level 4 water	Not included	Same

Notes:

[a] The Sacramento Valley hydrology used in the CalSim II model reflects 2020 land-use assumptions associated with Bulletin 160-98. The San Joaquin Valley hydrology reflects draft 2030 land-use assumptions developed by Reclamation. Development of 2030 land-use assumptions are being coordinated with the California Water Plan Update for future models.

[b] PCWA demand is set at 35 TAF/yr.

[c] The new CalSim II representation of the San Joaquin River has been included in this model package (CalSim II San Joaquin River Model, Reclamation, 2005). Updates to the San Joaquin River have been included since the preliminary model release in August 2005. The model reflects the difficulties of on-going groundwater overdraft problems. The 2030 level of development representation of the San Joaquin River Basin does not make any attempt to offer solutions to on-going groundwater overdraft problems. In addition, a dynamic groundwater simulation is not yet developed for San Joaquin River Valley. Groundwater extraction/ recharge and stream-groundwater interaction are static assumptions and may not accurately reflect a response to simulated actions. These limitations should be considered in the analysis of results.

[d] Los Vaqueros Reservoir storage capacity is 100 TAF.

[e] It is assumed that the demand for full Table A will be independent of other water sources. Article 21 demand assumes MWD demand of 100 TAF (Dec-Mar), Kern demand of 180 TAF (Jan-Dec), and other contractor demand of 34 TAF (Jan-Dec).

[f] PCWA American River pumping facility upstream of Folsom Lake is under construction.

[g] Mokelumne River flows reflect EBMUD supplies associated with the Freeport Regional Water Project.

[h] The CCWD Alternate Intake Project (AIP), an intake at Victoria Canal, which operates as an alternate Delta diversion for Los Vaqueros Reservoir is not included.

[i] This Phase 8 requirement is assumed to be met through Sacramento Valley Water Management Agreement Implementation.

[j] OCAP BA 2004 modeling used available hydrology at the time which was data developed based on 1965 Yuba County Water Agency -Department of Fish of Game Agreement. Since the OCAP BA 2004 modeling, Yuba River hydrology was revised. Interim D-1644 is assumed to be fully implemented with or without the implementation of the Lower Yuba River Accord. This is consistent with the future no-action condition being assumed by the Lower Yuba River Accord EIS/EIR study team. For studies with the Lower Yuba River Accord, an adjusted hydrology is used.

[k] It is assumed that either VAMP, a functional equivalent, or D-1641 requirements would be in place in 2030.

[l] The flow components of the proposed American River Flow Management are included and applied using CVPIA 3406(b)(2). The American River Flow Management is assumed to be the new minimum instream flow.

	Future No Action Alternative	Intertie Alternative

[m] OCAP BA assumes the flexibility of diversion location but does not assume the Sacramento Area Water Forum Water Forum "replacement water" in drier water year types.

The Intertie study presented in this report was developed by adding a 400-cfs Intertie between the upper DMC and the CA as shown in Figure 1. To more closely represent projected facility operations, water is only routed through the Intertie once the upper DMC capacity is maximized. Simulation of the Intertie enables CVP water pumped at Jones PP to be wheeled through the CA and subsequently returned to CVP control in O'Neill Forebay. From the O'Neill Forebay, the water can be delivered directly to CVP SOD contractors (including wildlife refuges) or stored in San Luis storage for subsequent delivery. Estimates of Jones capacity that include the potential for delivery to upper DMC demands were modified to reflect the impact of Intertie capacity.

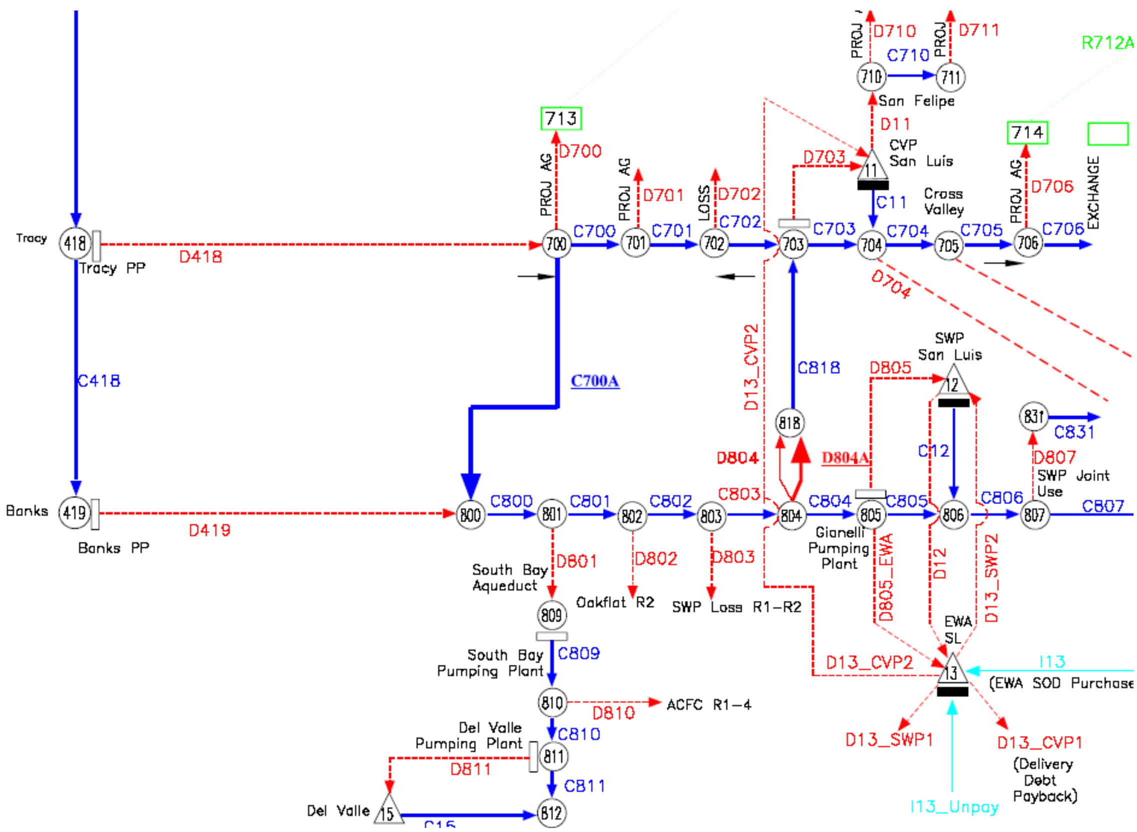

Figure 1: Detail of the CALSIM II Schematic showing Jones PP, Banks PP, and the Intertie (represented in the model with arcs C700A and D804A).

The SWP and CVP share water available in the Delta under the Coordinated Operating Agreement (COA). Under current operating conditions, the CVP is not always able to take all of the water it is entitled to due to pumping limitations, including those that arise due to the upper DMC conveyance limitation. When this is the case, the SWP is permitted to capture the unused CVP water, in addition to their share, if pumping capacity is available and other operating criteria are satisfied. The CVP water pumped by the SWP is referred to as unused federal share under COA. The Intertie project enables the CVP to recapture some of the CVP water that was previously abandoned to the SWP due to conveyance limitations.

Comparison of Intertie Alternative with Future No Action

Intertie Use

The Intertie is assumed to be operable in all months of the year up to full capacity, but actual use is limited to periods in which there is CVP water that could not be conveyed under existing capacities. The long-term average annual Intertie use is 76 TAF/yr. The months of highest use are September through March (Figures 2 and 3). July and August also show Intertie use. The Intertie facility enables Jones PP to be operated at its maximum capacity in months that the upper DMC restrictions would not have otherwise enabled this to occur. This increase in maximum Jones PP operable capacity is shown in the Figure 4. The Intertie facility use appears to be rather well distributed across all hydrologic years as can be construed from Figure 5. The facility is used in all years of the study, which can be explained by noting that even in the driest sequence of years, there are a number of months of surplus flows that can be captured through the use of the Intertie.

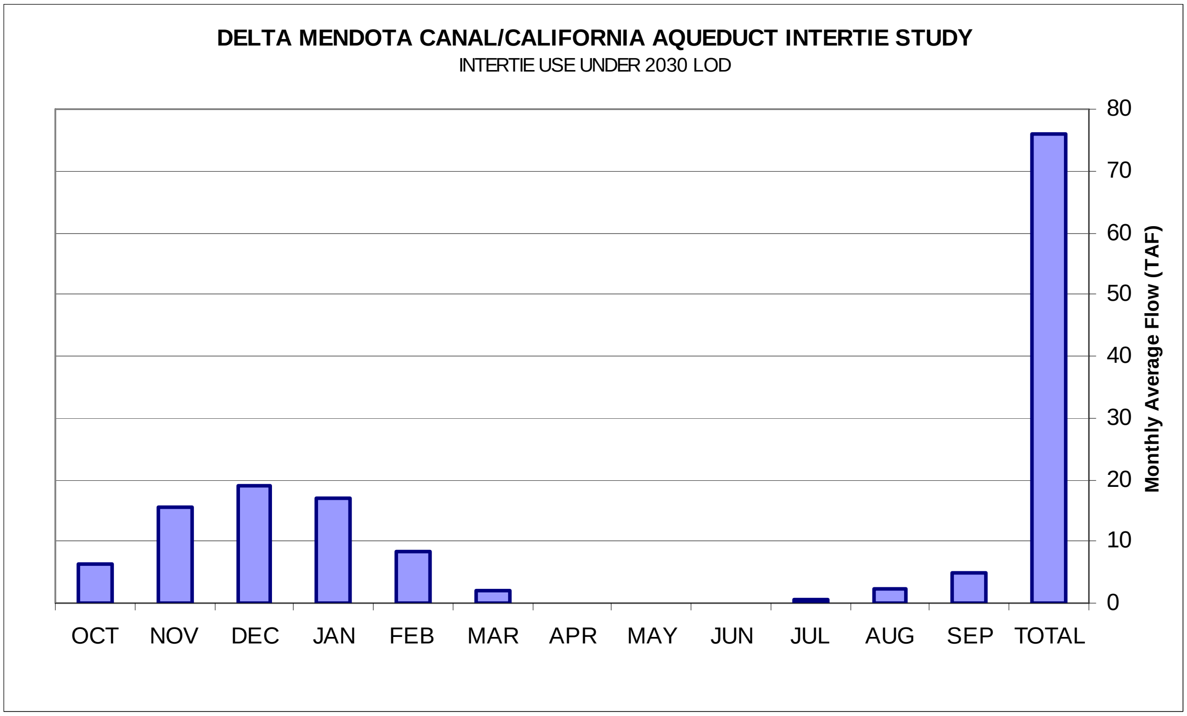

Figure 2: Monthly average Intertie flows (taf) under 2030 LOD.

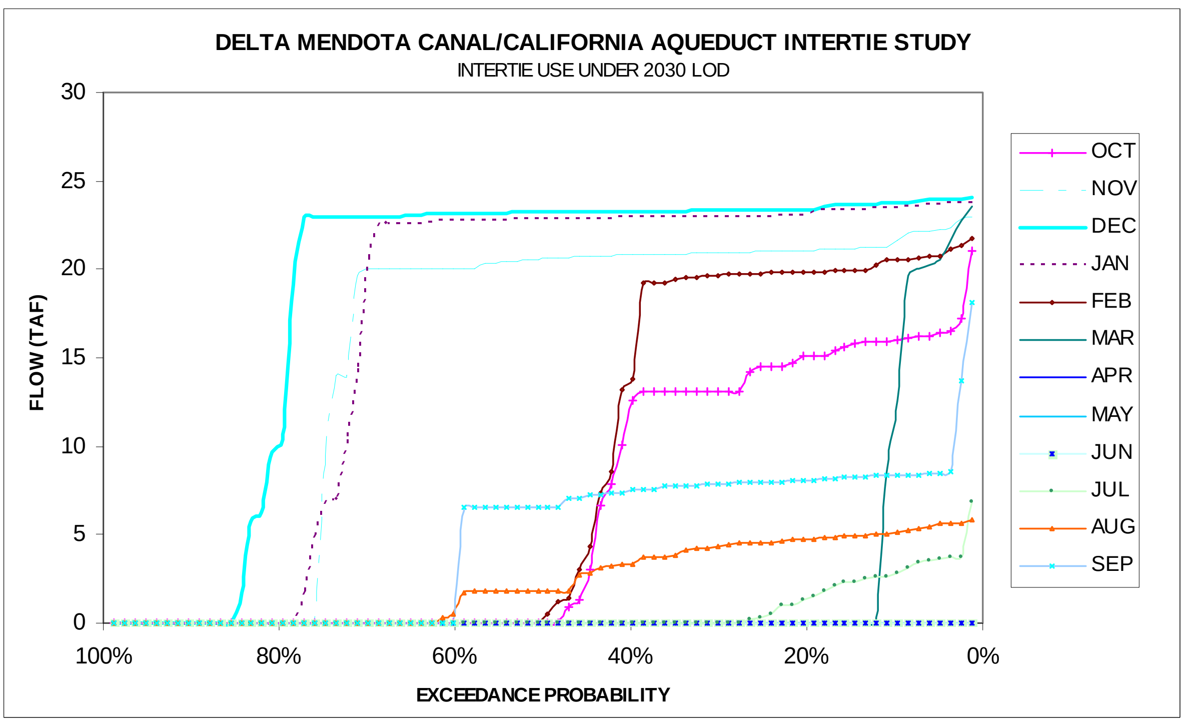

Figure 3: Exceedance probability of Intertie use (taf) in each month under the 2030 LOD

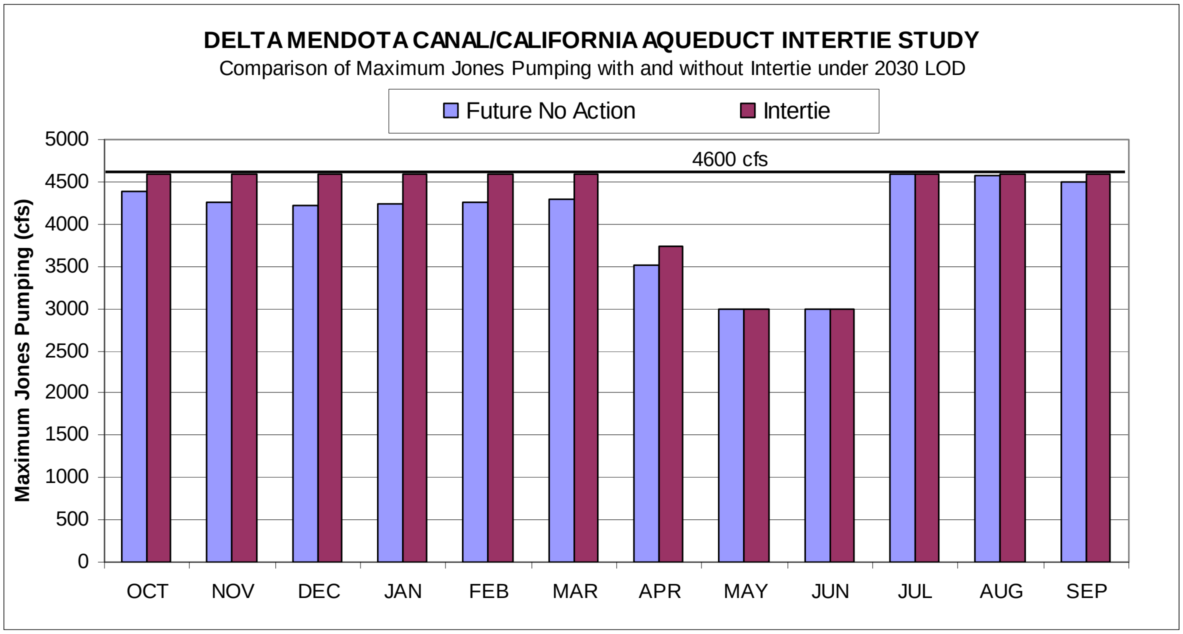

Figure 4: Monthly maximum Jones pumping (cfs) under 2030 LOD.

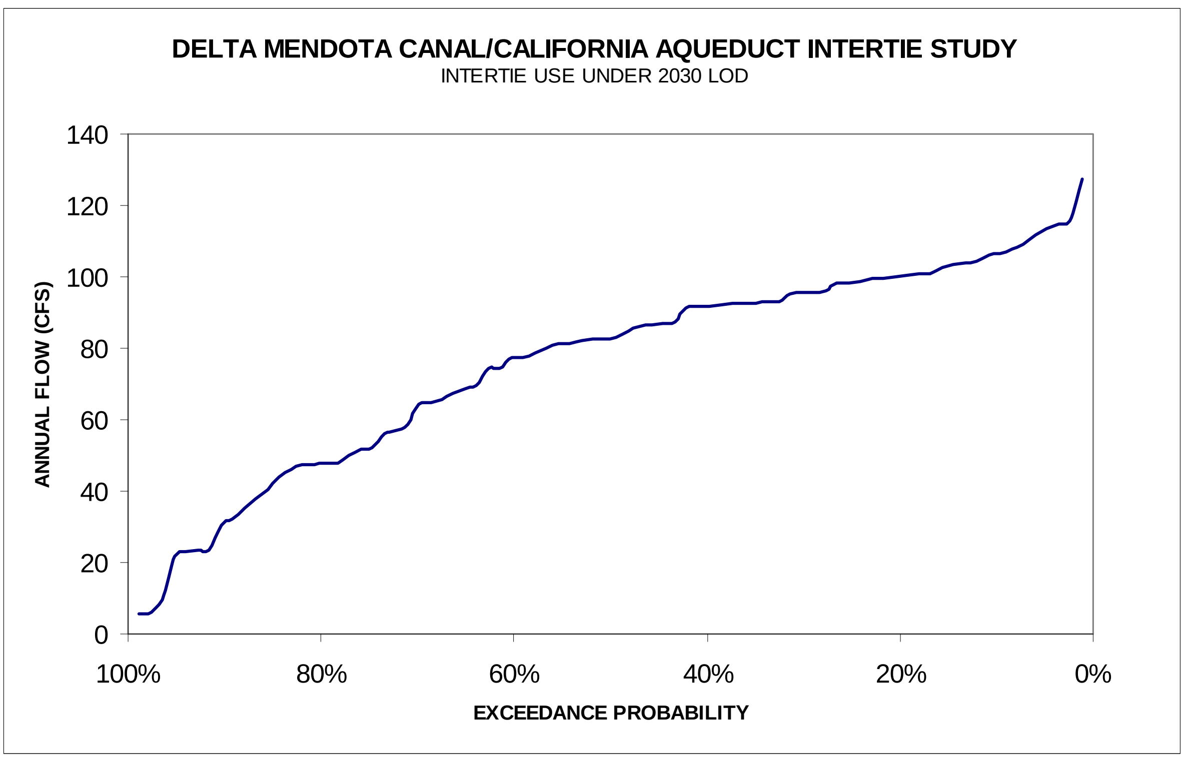

Figure 5: Exceedance probability of annual Intertie use (taf/yr) under 2030 LOD.

Water Supply Impacts

The restored CVP export capacity provided by the Intertie results in changes to deliveries, and these are summarized by Table 2 and Figures 6 and 7. The average annual CVP delivery benefit from the Intertie is approximately 35 taf/yr. The plots in Figures 5 and 6 show annual changes in CVP and SWP total deliveries for the Intertie study compared to the Future No Action (2030 LOD Base). Note that the CVP delivery increase is less than the actual Intertie usage. The reason for this difference is that the Intertie reduces the need for the CVP use of Banks PP (termed joint point of diversion, JPOD). Under the No Action Alternative, the CVP is permitted to use available Banks PP capacity to export water under JPOD. This water is only available if the SWP cannot deliver or store the water in SWP south of Delta facilities and capacity remains at Banks PP. Under the Intertie Alternative, CVP water is first pumped at Jones PP, and since greater conveyance capability now exists here, less is required through JPOD.

Average annual SWP SOD deliveries over the entire 82-year period are approximately the same in the two alternatives, with a reduction of about 7 taf/year in Table A deliveries during the dry period of 1928-1934.

Table 2: Change in water supply deliveries with Intertie under 2030 LOD (taf/year)

2030 LOD	**DRY PERIOD AVERAGE (1928-34)**			**82-YEAR AVERAGE (1922-2003)**		
	BASE	ALTERNATIVE	CHANGE	BASE	ALTERNATIVE	CHANGE
CVP DELIVERY NOD	2026	2029	3	2403	2407	5
CVP DELIVERY SOD (INCL.CVC)	1534	1541	7	2494	2525	31
CVP DELIVERY TOTAL	3560	3569	9	4897	4932	35
SWP DELIVERY TABLE A	1547	1540	-7	3007	3008	1
SWP DELIVERY ARTICLE 21	366	377	12	286	283	-3
SWP DELIVERY TOTAL	1913	1917	4	3293	3291	-2

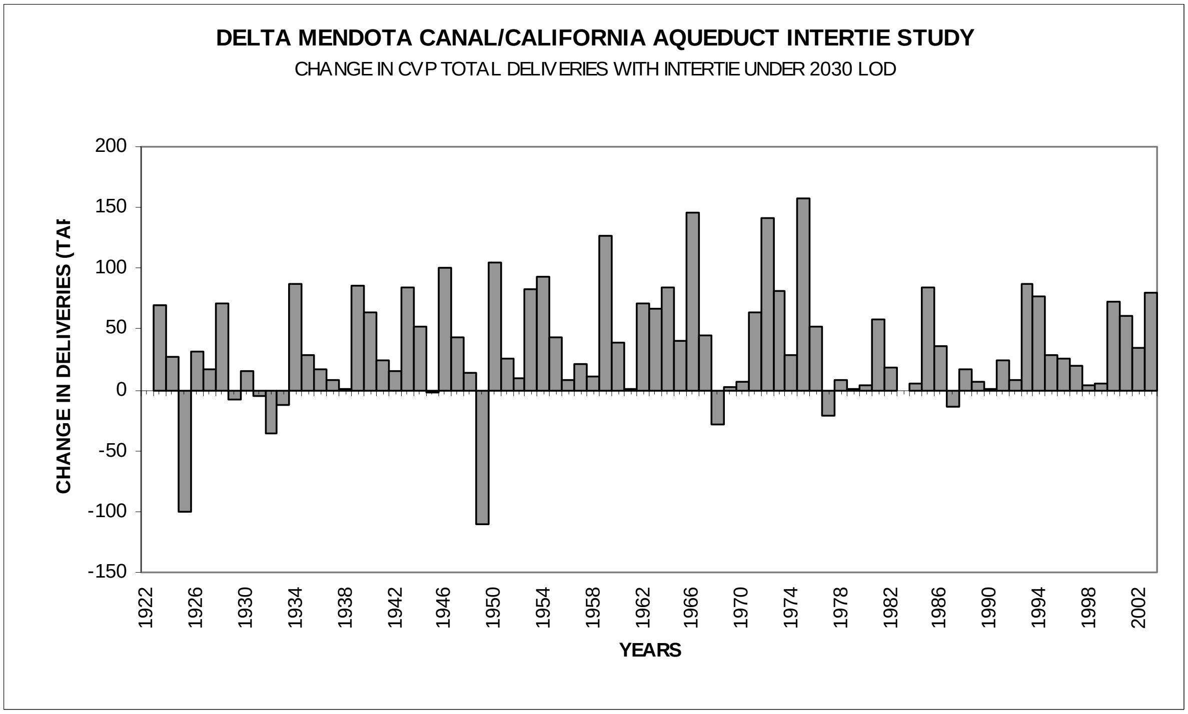

Figure 6: Change in CVP total deliveries with Intertie 2030 LOD.

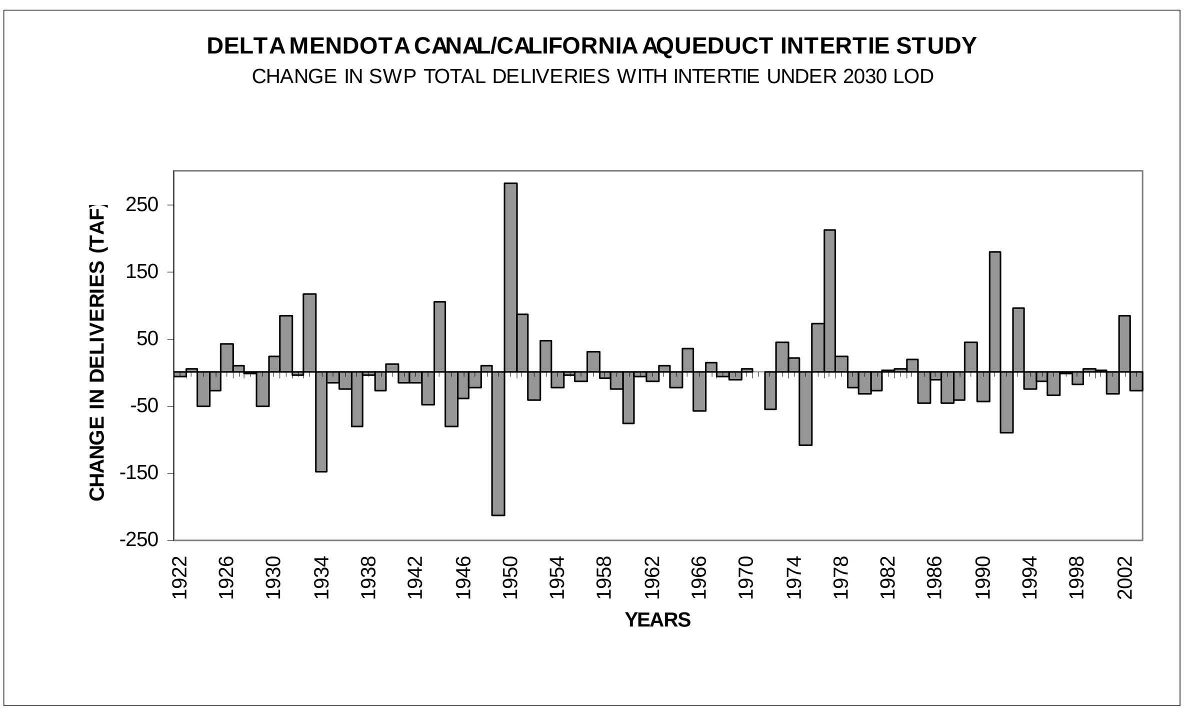

Figure 7: Change in SWP SOD total deliveries with Intertie under 2030 LOD.

Export Impacts

Figure 8 shows the average changes to Jones pumping by month for each of the five 40-30-30 Sacramento Valley water types. Jones pumping shows increases in October through January and to a lesser extent in June through September. Noteworthy is the decrease in March pumping at Jones due to the restored ability to fill CVP San Luis earlier in the year. This implies that the CVP has restored some operational flexibility that may allow the project to operate more effectively around periods of export restrictions. The study shows substantial benefit of the Intertie in most water year types. In critical years, as expected due to low Delta flows and low allocations, there is less benefit in Jones pumping due to the Intertie. Figure 9 shows the relative changes in Jones and Banks exports for each year in the study. Average annual Banks pumping is approximately the same in the Intertie alternative as in the Future No Action alternative.

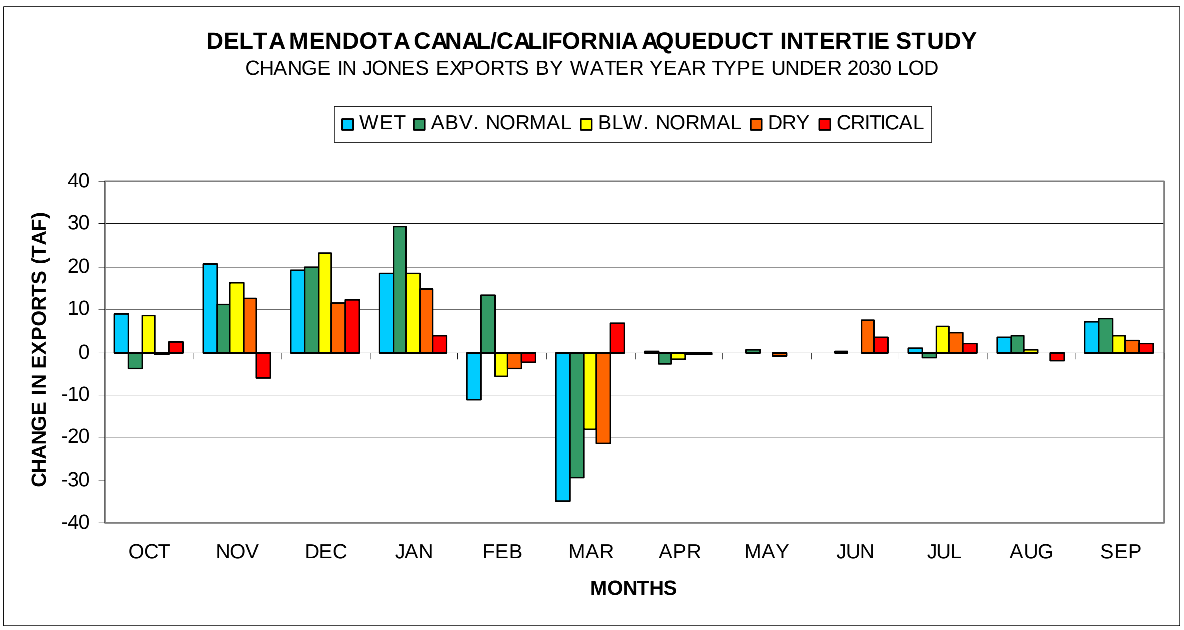

Figure 8: Monthly change in Jones exports with Intertie by water year type under 2030 LOD.

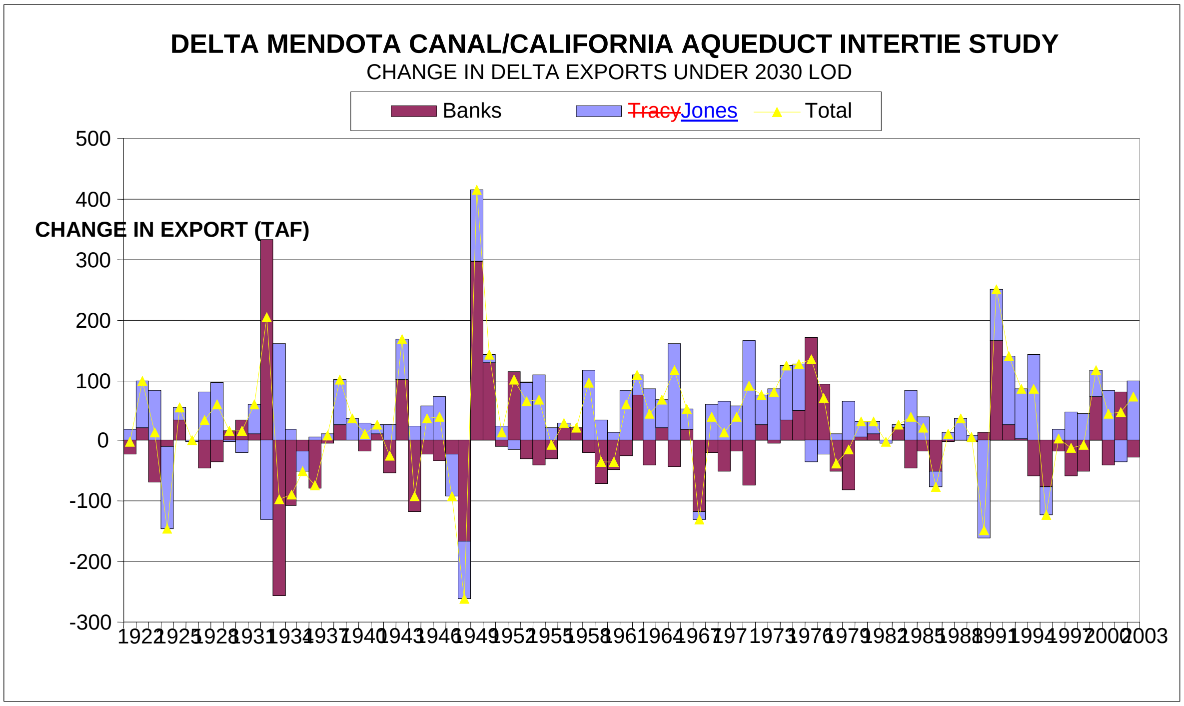

Figure 9: Changes in annual Delta exports with Intertie under 2030 LOD.

San Luis Reservoir Operations

The Intertie conveyance allows water to reach San Luis during the winter months filling cycle where capacity was previously constrained. Figure 10 compares the average end-of-March and end-of-August storage values for the Intertie study to the Future No Action study (2030 LOD Base). The studies show overall increases in CVP San Luis storage levels during the filling period. Increases in March CVP San Luis storage due to the Intertie occur in approximately 50% of all years. August CVP San Luis storage is somewhat reduced in a number of wet years with high carryover storage (Figure 11). The reduction in August storage is largely due to more effective delivery allocation scheduling caused by earlier filling. In many of these years, earlier filling of CVP San Luis (before May) allows higher allocations to be made for CVP SOD contractors. The higher allocations, which continue throughout the delivery year, cause more water to be moved from CVP San Luis storage for delivery.

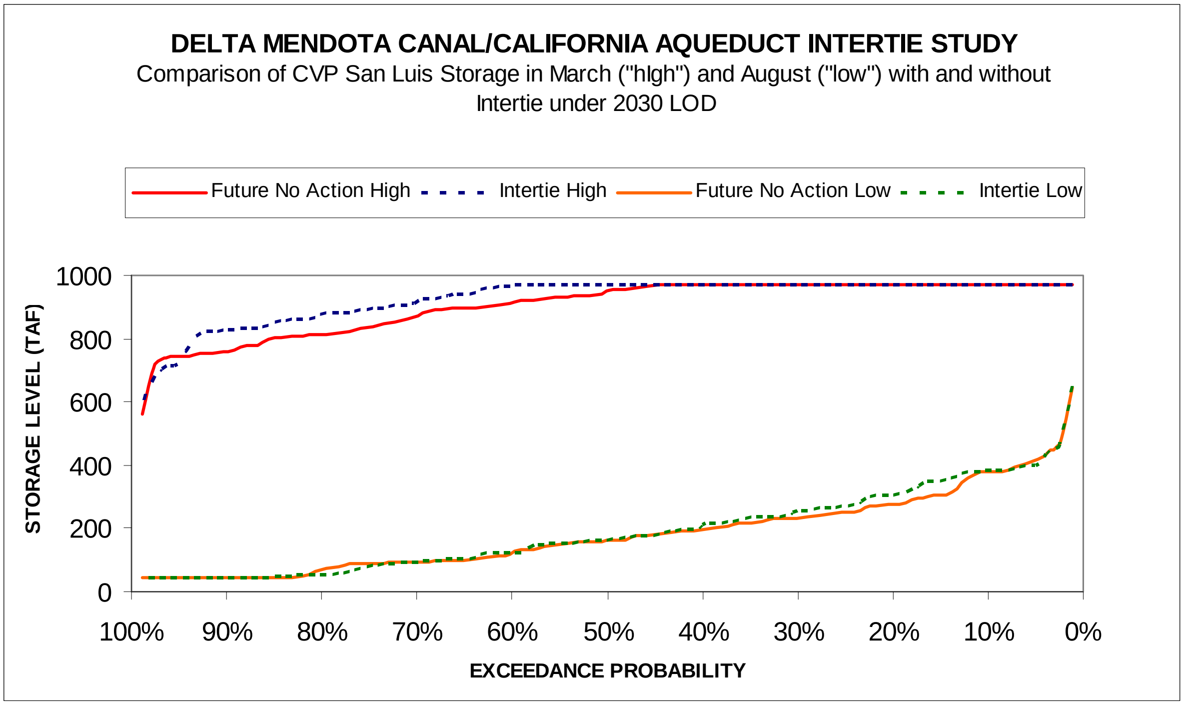

Figure 10: Comparison of CVP San Luis storage in March (“high”) and August (“low”) under 2030 LOD.

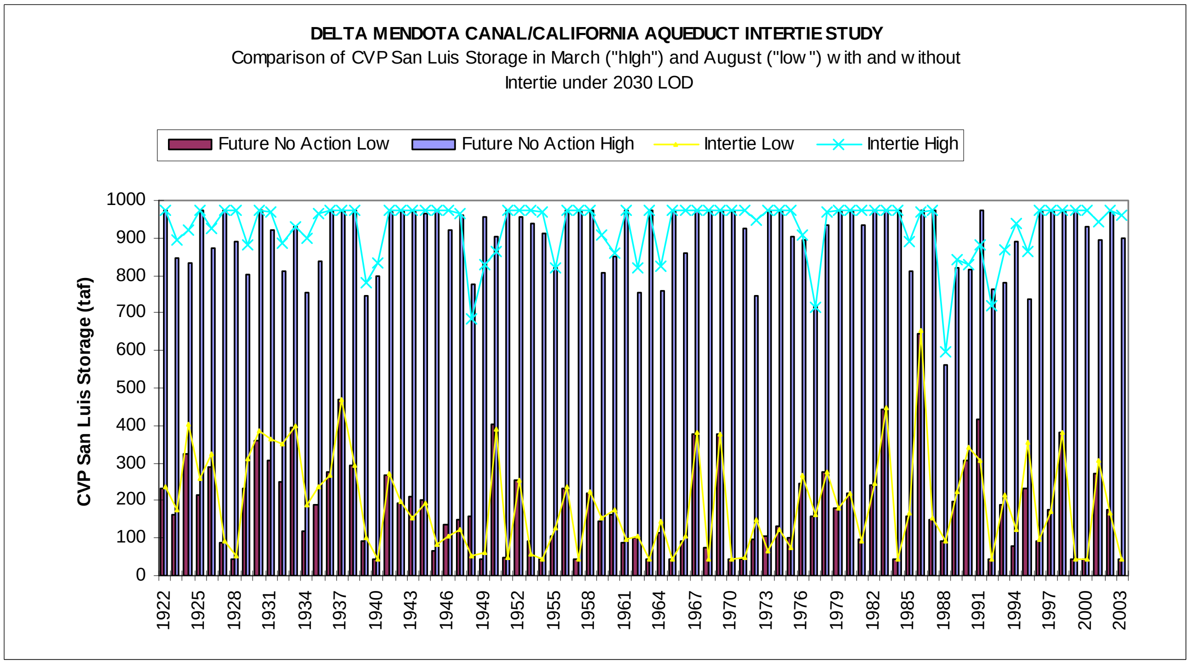

Figure 11: Comparison of CVP San Luis storage in March ("high") and August ("low") under 2030 LOD.

North of Delta Storage Impacts

Figures 12 through 15 compare the carryover storage conditions in Trinity, Shasta, Folsom, and Oroville Reservoirs in the Intertie and Future No Action alternatives. The results are similar between the two alternatives except for some differences in Folsom Reservoir during dry periods caused by the need to make project releases to maintain a minimum pumping amount in Jones Pumping Plant.

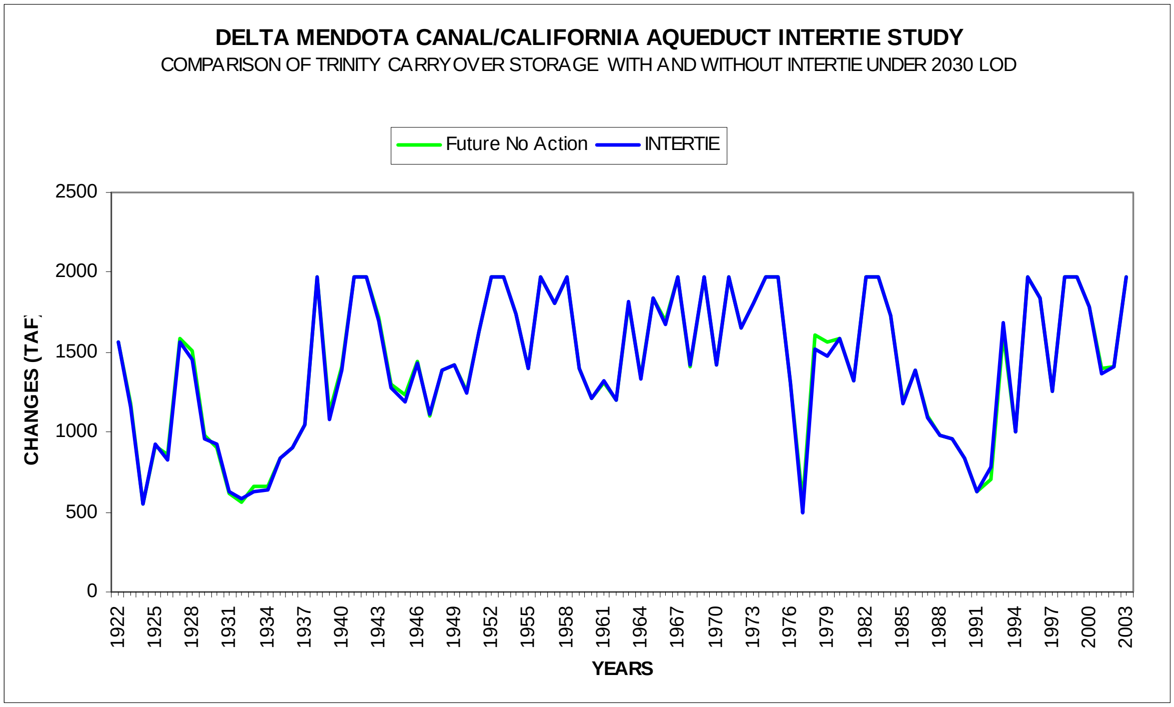

Figure 12: Trinity carryover storage under 2030 LOD.

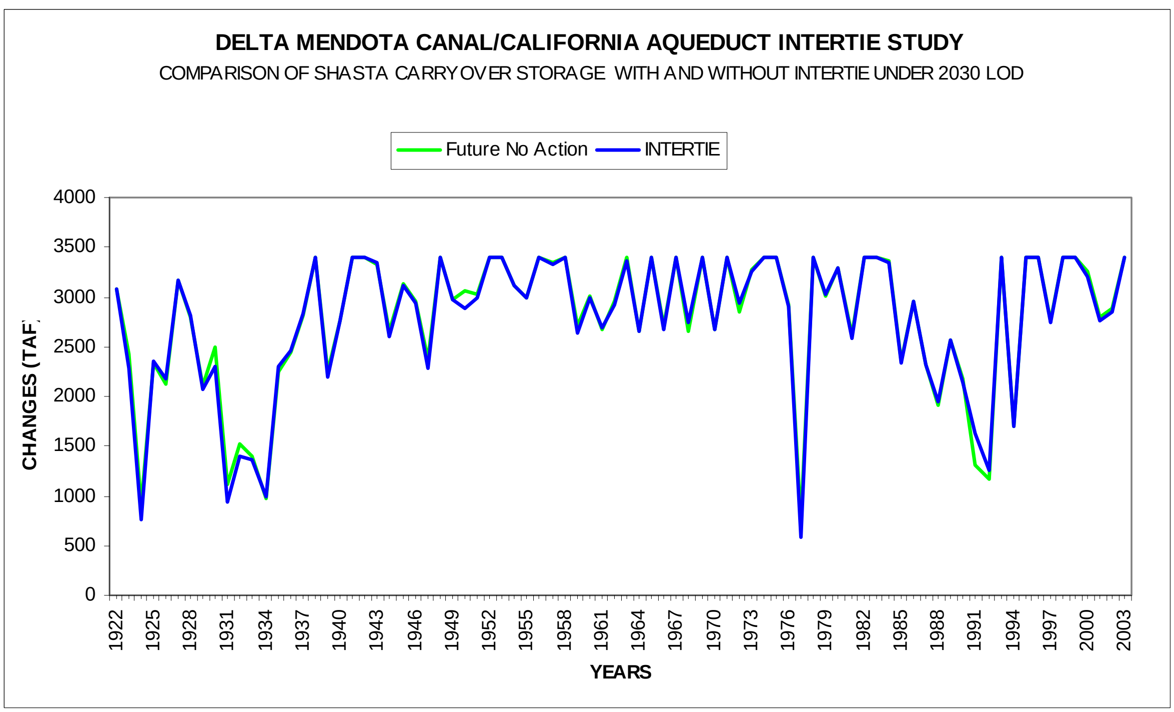

Figure 13: Shasta carryover storage under 2030 LOD.

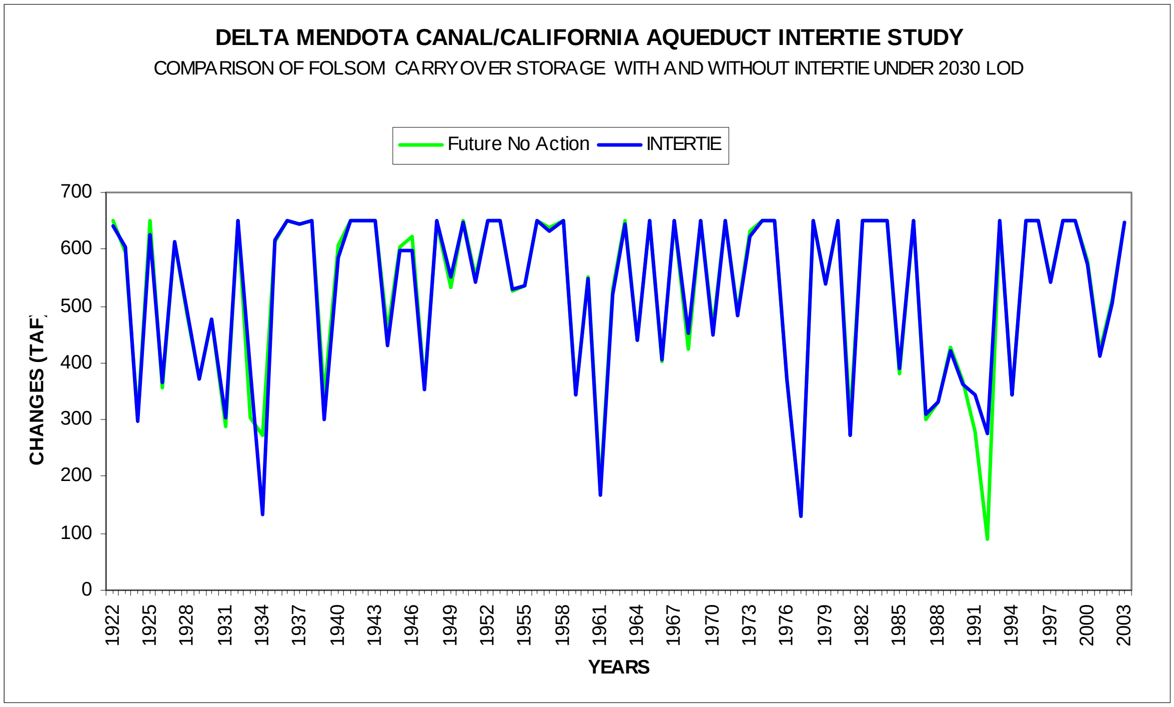

Figure 14: Folsom carryover storage under 2030 LOD.

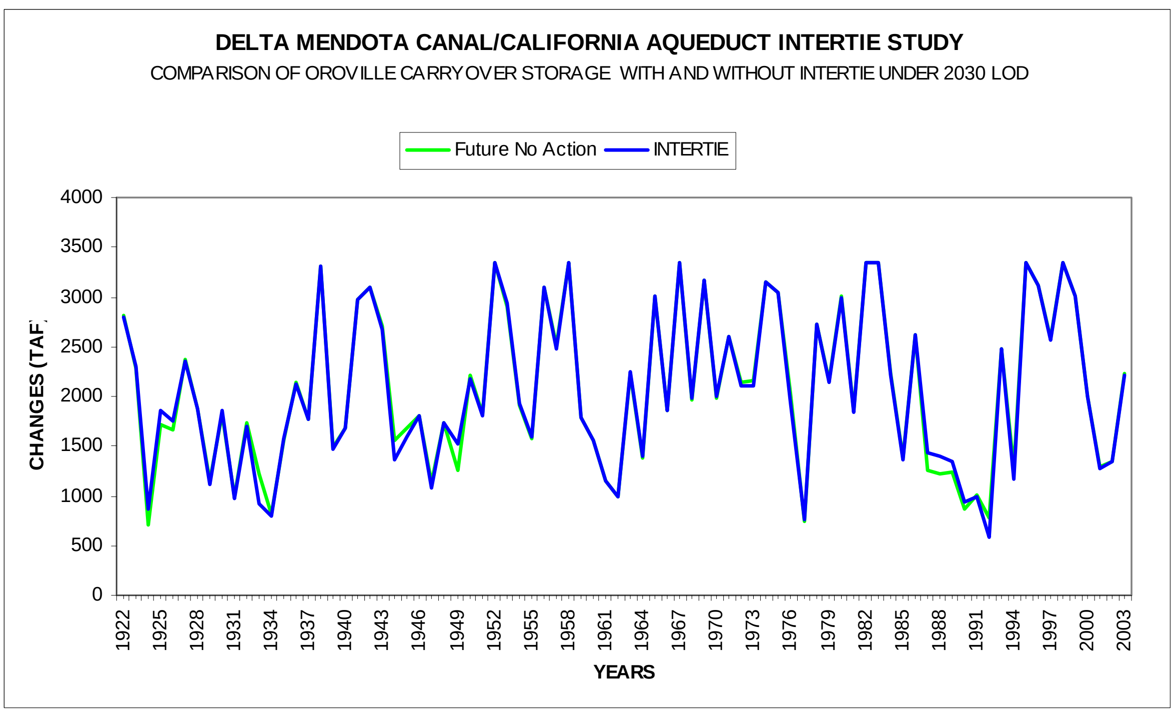

Figure 15: Oroville carryover storage under 2030 LOD.

Delta Outflow Impacts

The Delta outflow reflects a combination of required flows for water quality and flow standards as well as higher flows during wet periods. The water supply benefits of the Intertie project are largely realized through greater capture of Delta flows that are greater than the required quantities during the October through March period. As a result, these "surplus" Delta outflows decrease by an average of 43 taf/yr. The increased pumping in the winter, however, does cause a minor increase in the "required" Delta outflows in the spring. The required Delta outflows increase by an average of 10 taf/yr and are predominantly due to additional flow requirements for the X2 standard. Total Delta outflow (the sum of required and surplus outflows) decreases by an average of 33 taf/yr. Changes to surplus Delta outflows reflect the source of most of the additional exports for the Intertie study. Figure 16 shows the changes in annual Delta outflow for the Intertie study and the changes in total Delta exports.

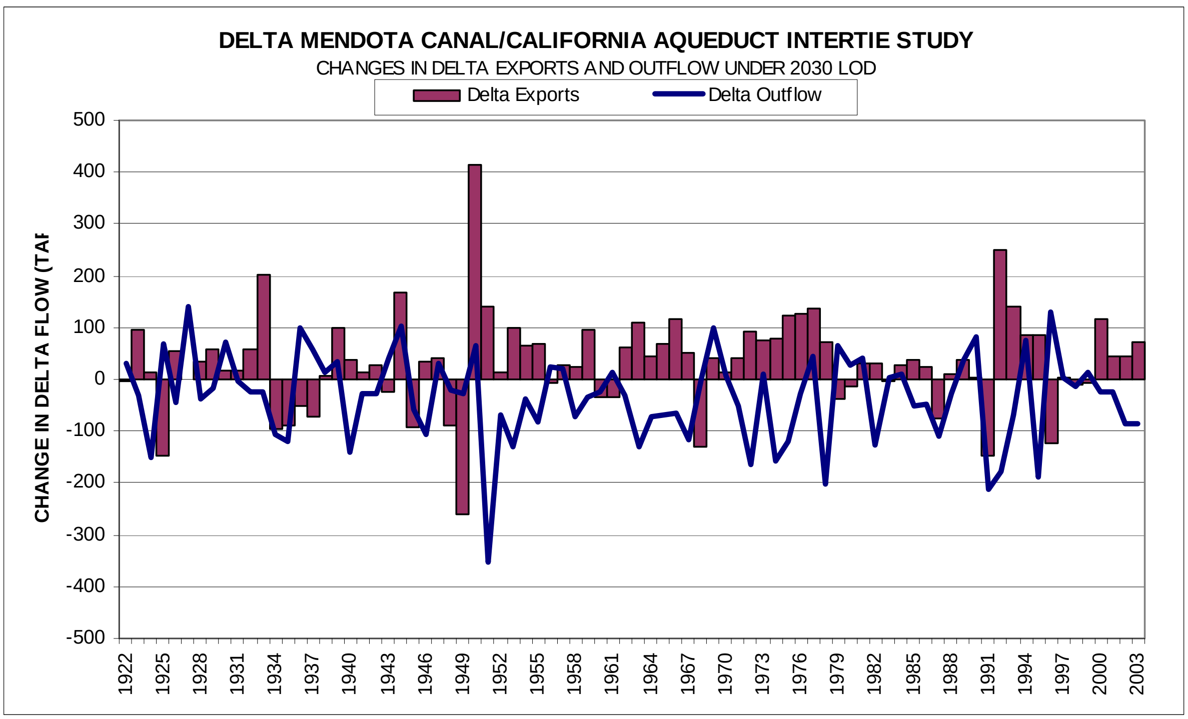

Figure 16: Changes in Delta exports and outflow with Intertie (taf/yr) under 2030 LOD.

CVPIA (b)(2) Impacts

In order to operate to a relatively consistent environmental condition, the fish protective actions and the costs associated with them simulated in the Future No Action alternative were fixed in the Intertie alternative. This is shown graphically in Figure 17. Figures 18 and 19 show the exceedance probability of the costs of satisfying the CVP WQCP Delta requirements and the b(2) overall cost, respectively, in the Future No Action and Intertie alternatives.

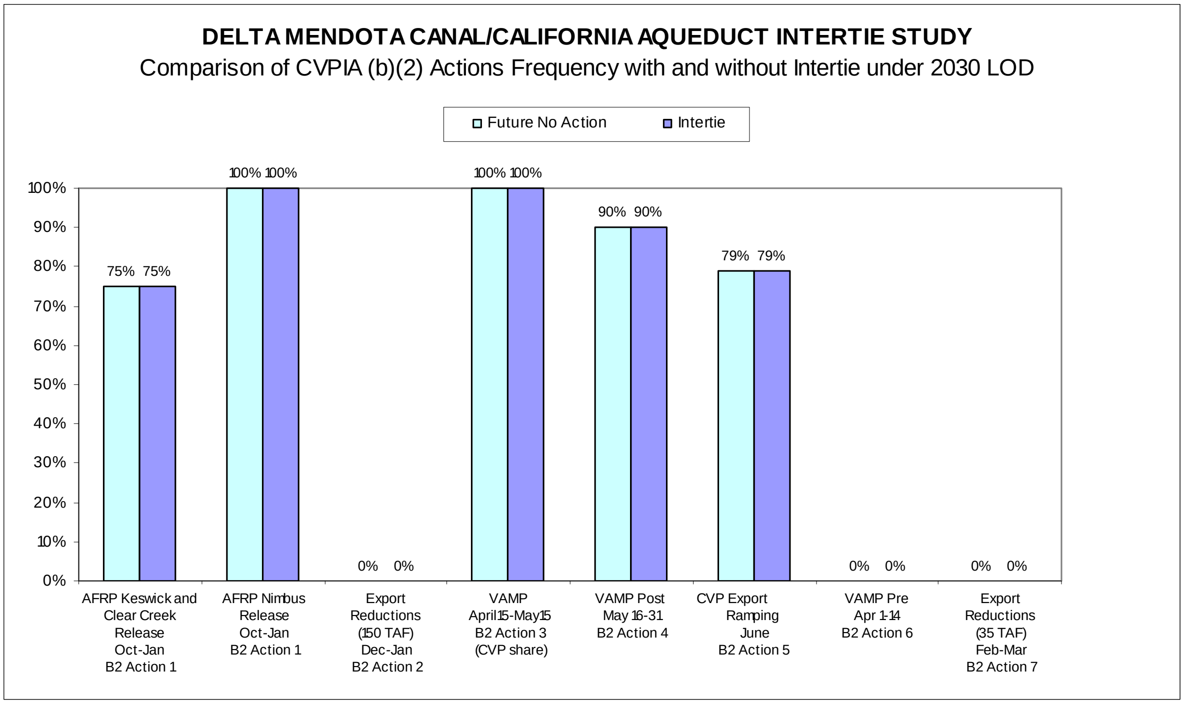

Figure 17: Comparison of frequency of CVPIA (b)(2) actions taken in 2030 LOD Base and Intertie studies.

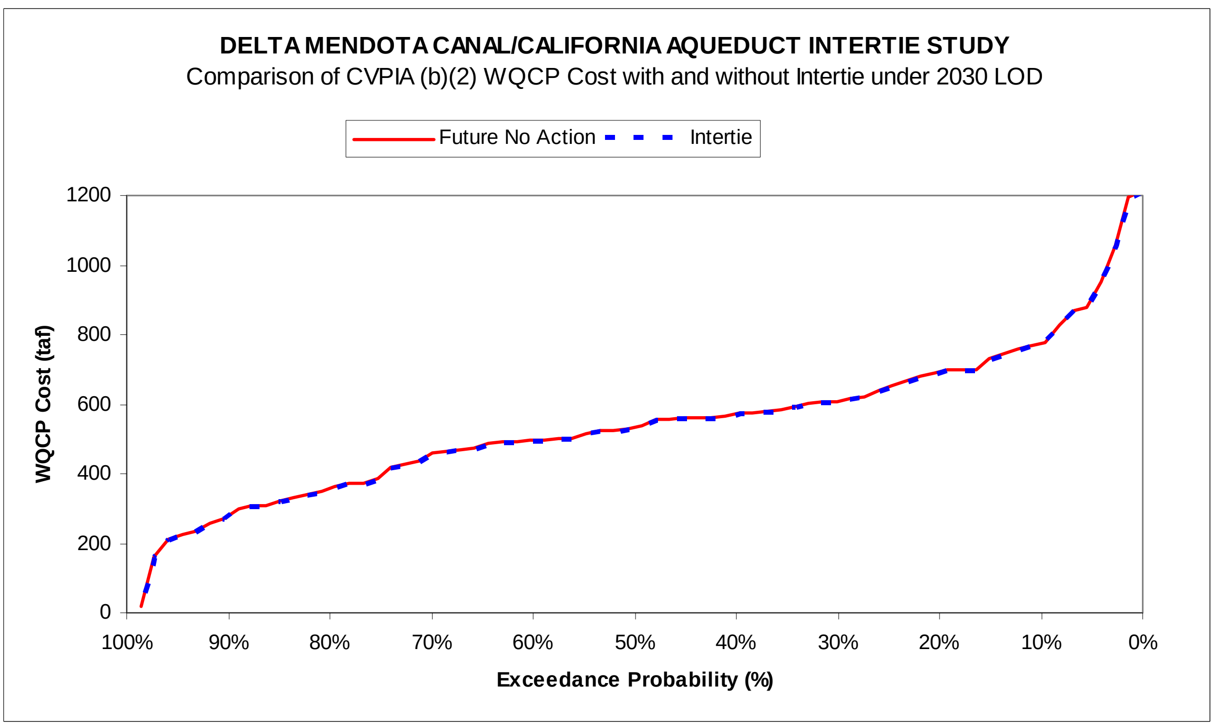

Figure 18: Comparison of the (b)(2) WQCP costs between 2030 LOD Base and Intertie studies.

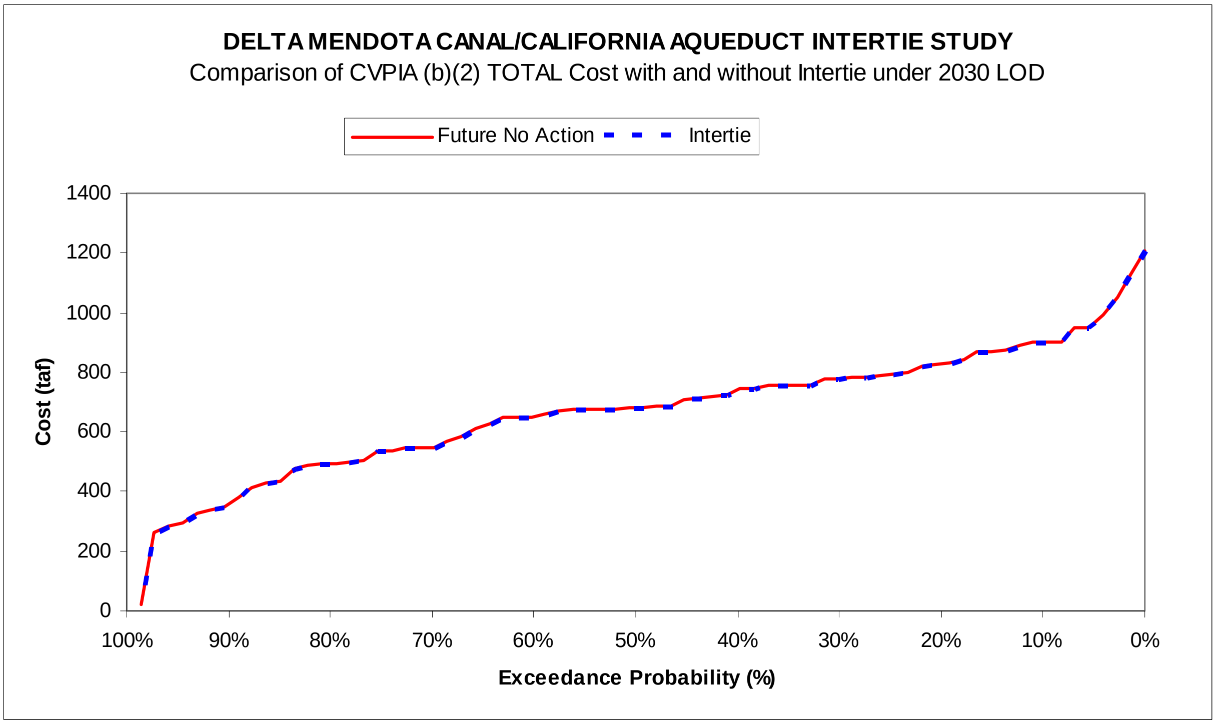

Figure 19: Comparison of the total cost of (b)(2) actions taken between 2030 LOD Intertie and Base studies.

CALSIM II Modeling Limitations for the Intertie Analysis

The CALSIM II model was used to analyze the Intertie project by simulating SWP and CVP operations over an 82-year period that approximated future level of development conditions with historic climatic conditions. Like all models CALSIM II has limitations that need to be kept in mind when interpreting its results. The following are some general limitations of CALSIM II that are identified in Chapter 9 of the OCAP BA document and are applicable to the analysis performed for the USBR Intertie project:

- The main limitation of the CALSIM II model is the time step. Mean monthly flows do not define daily variations that could occur in the rivers from dynamic conditions. As a result, the model will not capture the peak flows that may occur on a daily time step, though monthly changes may be overestimated to some extent. This may have an effect on the evaluation of the Intertie project because the Intertie operates primarily in the winter months when the largest daily flows typically occur. However, monthly results are still useful for general comparison of alternatives.
- CALSIM II is most appropriately used in comparative mode, where only the difference between two simulations is of importance and the errors and uncertainties that exist in both simulations are largely removed (or significantly reduced) when measuring the change between simulations. The results in individual months or years may not directly compare between the two model runs due to changing

antecedent conditions and operational targets. Multi-year averages or other statistics are most suitable for comparing results between alternatives.

- CALSIM II cannot completely capture the policy-oriented operations and coordination of the 800,000 af of dedicated CVPIA 3406 (b)(2) water and the CALFED EWA. The CALSIM II model is set up to run each step of the 3406(b)(2) on an annual basis and because the WQCP and Endangered Species Act (ESA) actions are set on a priority basis that can trigger actions using 3406(b)(2) water or EWA assets, the model will exceed at times the dedicated amount of 3406(b)(2) that is available. Moreover, the 3406(b)(2) and EWA operations in CALSIM II are just one set of plausible actions aggregated to a monthly representation and modulated by year type. However, they do not fully account for the potential weighing of assets versus cost or the dynamic influence of biological factors on the timing of actions. The monthly time-step of CALSIM II also require day-weighted monthly averaging to simulate minimum in-stream flow levels. This averaging can either under- or over-estimate the amount of water needed for these actions.
- CALSIM II uses simplified rules and guidelines to simulate SWP and CVP delivery allocation. Therefore the results may not reflect how the SWP and CVP would actually operate under extreme hydrologic conditions (very wet or very dry). The allocation process in the modeling is weighted heavily on storage conditions and inflow to the reservoirs and does not project inflow from contributing streams when making an allocation. This curve-based approach does cause some variation in results between studies that would be closer with a more robust approach to the allocation process.
- There are a number of rule-curves embedded in CALSIM II and it is these rule curves that drive the water balance between the reservoirs, determine how much water to carryover until the following year, and allocate the amount of water for delivery. It is difficult to produce a rule curve in CALSIM II that produces good realistic results in the full spectrum of year types. CALSIM II rule curves often produce sub-optimal with respect to Project operations in the driest years. Some results imply that the projects would operate the reservoirs to unrealistically low levels in these dry year outliers. In reality the Projects could and would operate to higher reservoir elevations in these extremely dry years.

There are also some additional limitations that are specific to the Intertie analysis:

- The effects of the Intertie are fairly small compared to the overall flows that enter and leave the Delta. Because of this, it may be difficult to discern all of the possible effects of the Intertie in the CALSIM II results.
- The demands on the Delta Mendora Canal upstream of the constriction to 4,200 cfs are based on the best available information developed from historic patterns, but may different than that expected in the future. Demand pattern predictions are complex and are affected by crop types, irrigation technologies, local rainfall, and district-scale water management. Changes in the demand patterns could have some effect on the timing and magnitude of Intertie usage in each month, but are expected to be relatively small and uncertain. The overall Intertie usage shown in the model results should be reasonably accurate for comparative purposes of project evaluation.

Virtual Intertie Alternative Analysis

Under the Virtual Intertie alternative, the CVP would use the SWP Banks Pumping Plant to convey CVP water to San Luis Reservoir. The permitted pumping capacity at Banks would not change from the No Action Alternative. Under the No Acton Alternative, available CVP water for export that cannot be pumped at Jones due to the conveyance limitations is treated as unused federal share under the Coordinated Operations Agreement and can be exported by the SWP at Banks. This water, often stemming from upstream CVP instream flow or temperature releases cannot be recovered by the CVP. In addition, due to Banks Pumping Plant priorities, pumping for Article 21 deliveries is made at a higher priority than CVP pumping in Banks.

In the Virtual Intertie alternative it is assumed that the CVP would be given up to 400 cfs of priority capacity in Banks to pump water that cannot be pumped at Jones due to conveyance limitations in the Delta Mendota Canal. This water would be pumped at a higher priority than SWP pumping of Article 21 water or other pumping of the water that is released from CVP project reservoirs for b(2) and other environmental purposes. This additional capacity can occur during any month but is restricted to 400 cfs minus the total diversions off of the Delta-Mendota Canal upstream of the constriction to 4,200 cfs (D701 and D702). Typically this occurs during the period from September through March when Jones Pumping Plant cannot pump at capacity. Thus, the Virtual Intertie alternative allows that the CVP to pump some of the water that is currently lost due to limitations on pumping at Jones Pumping Plant in the No Action Alternative.

The analysis has been performed by post-processing the results of the Intertie CALSIM II study. The post-processing routine attempts to pump the additional flow that occurred in Jones Pumping Plant in the Intertie alternative through Banks Pumping Plant instead and computes losses that are accrued to the CVP and SWP (as compared to the Intertie alternative) when there is insufficient capacity to pump the entire Intertie flow.

Pumping Priorities

The following pumping priorities are assumed for Banks Pumping Plant in the Virtual Intertie alternative (along with associated labels used in the computations below):

1. EWA priority pumping (D419_EWA_Priority)
2. SWP pumping of SWP water for Table A (D419_EXP1_TA)
3. CVP pumping of the Intertie Increment (Intertie_Increment)
3. SWP pumping of SWP water for Article 21 ((D419_EXP1_ART21)
4. SWP pumping of CVP water for Table A (D419_EXP2_TA)
5. SWP pumping of CVP water for Article 21 (D419_EXP2_ART21)
6. EWA JPOD pumping (D419_EWA_Other)
7. CVP JPOD pumping (D419_CVP)

These priorities are the same as in the No Action and Intertie alternatives except for the inclusion of the Intertie Increment.

Analysis Approach

The Virtual Intertie alternative has been post-processed using the results of the CALSIM II study for the Intertie alternative. The following assumptions are used to perform the calculations:

- The desired pumping quantities in Banks for each flow component in each month are computed from the results of the Intertie alternative. The following shows the computation for each component using the Intertie alternative CALSIM II outputs (all computed in cfs):
    - D419_EXP1_TA = MIN(*D419_SWP – SWP_IN_TOTAL*, *D419_EXP1*)
    - D419_EXP1_ART21 = *D419_EXP1* – D419_EXP1_TA
    - D419_EWA_Priority = IF(*D419_EWA*<500, *D419_EWA*, 500) from July-September
    - D419_EWA_Other = *D419_EWA* – D419_EWA_Priority
    - D419_CVP = *D419_CVP*
    - D419_EXP2_TA = *D419_SWP – SWP_IN_TOTAL* - D419_EXP1_TA
    - D419_EXP2_ART21 = *D419_EXP2* – D419_EXP2_TA
    - Intertie Increment = Max (*D418* – 4200 – *D701* – *D702*, 0)

    (Note: variables from the Intertie CALSIM II study are shown in italics)
- The maximum allowed pumping (before makeup) in Banks is assumed to be the lesser of the Banks Permit Capacity and the actual Banks pumping in the Intertie Alternative (D419) plus the Intertie Increment. This assumption reflects that, because Jones pumping goes down by the same amount that Banks pumping goes up, there is no increase in total Delta exports and therefore no additional Delta restrictions on Banks pumping.
- If the total desired Banks pumping was greater than the Banks permit capacity in any month, the components of pumping are reduced in the following order until the final Banks pumping equaled the permit capacity:
    - D419_CVP
    - D419_EWA_Other
    - D419_EXP2_ART21
    - D419_EXP2_TA
    - D419_EXP1_ART21
    - Intertie_Increment
    - D419_EXP1_TA
    - D419_EWA_Priority
- The loss for each component is computed as the difference between the desired and final pumping quantity for that component.
- The total SWP Table A loss (D419_EXP1_TA + D419_EXP2_TA) is tracked cumulatively each year starting in September. During each month from October through March, the SWP is permitted to make up the lost pumping by increasing pumping at Banks Pumping Plant. The makeup is determined using the following computations (all computed in cfs):
    - Banks Remaining Capacity = Permit Capacity – Banks Final Capacity (before makeup)
    - Makeup Pumping = Min(SWP Table A Cumulative Loss, Banks Remaining Capacity, Surplus Delta Outflow), where the Surplus Delta Outflow has been

computed taking into account the Required Delta Outflow, E/I Ratio, and Delta salinity controls. If Makeup Pumping occurs in any month from October through February, then this amount is subtracted from the Cumulative Loss when the computation is done in subsequent months.
    - The SWP Makeup pumping is added to the D419_EXP2_TA quantity for final reporting of results.
- The total CVP loss (Intertie_Increment + D419_CVP) is tracked cumulatively each year starting in September. During each month from October through March, the CVP is permitted to make up the lost pumping by increasing pumping in Jones Pumping Plant. The makeup is determined using the following computations (all computed in cfs):
    - Jones Remaining Capacity = 4,200 + D701+ D702 – (D418 – Desired Intertie Increment)
    - Makeup Pumping = Min(CVP Cumulative Loss, Jones Remaining Capacity, Surplus Delta Outflow), where the Surplus Delta Outflow has been computed taking into account the Required Delta Outflow, E/I Ratio, and Delta salinity controls. If Makeup Pumping occurs in any month from October through February, then this amount is subtracted from the Cumulative Loss when the computation is done in subsequent months.
    - Final Jones Pumping = D418 – Desired Intertie Increment + Makeup Pumping

Summary of Results

Table 3 summarizes the changes in CVP and SWP exports in the Virtual Intertie alternative as compared to the Intertie and No Action alternatives. The Virtual Intertie alternative increases average annual CVP exports by about 27 TAF/year as compared to the No Action alternative, which is 6 TAF/year less than the increase that occurs in the Intertie alternative. This reduction in benefits occurs because there is not enough capacity in Banks to pump all of the additional water than is pumped in the Intertie alternative at Jones.

The Virtual Intertie alternative increases Banks CVP pumping by about 58 TAF/year as compared to the No Action alternative, but Jones pumping is reduced by about 31 TAF/year because the CVP portion of San Luis Reservoir fills earlier in the year. SWP exports are decreased by about 13 TAF/year due to reduced available SWP pumping capacity at Banks under the CVP priority use assumed in this alternative. This reduction is greater than the reduction of 3 TAF/year in the Intertie alternative. The Virtual Intertie alternative results in lower CVP export benefits and greater decreases in SWP exports than the Intertie alternative.

Table 3: Summary of Average Annual Virtural Intertie Alternative Results (taf/year)

2030 LOD	**COMPARISON WITH INTERTIE**			**COMPARISON WITH NO ACTION**		
	VIRTUAL INTERTIE	INTERTIE	CHANGE	VIRTUAL INTERTIE	NO ACTION	CHANGE
CVP EXPORTS						
JONES PUMPING	2256	2322	-66	2256	2287	-31
BANKS PUMPING						
INTERTIE INCREMENT	61	0	61	61	0	61
JPOD	77	78	-1	77	80	-3
TOTAL	138	78	60	148	80	58
TOTAL CVP EXPORTS	2394	2400	-6	2394	2367	27
SWP EXPORTS						
BANKS PUMPING						
TABLE A	2996	2997	-1	2996	2993	3
ARTICLE 21	270	279	-9	270	286	-16
TOTAL	3266	3276	-10	3266	3279	-13

Appendix C

DSM2 Modeling Studies of the Delta-Mendota Canal/California Aqueduct Intertie

DRAFT TECHNICAL MEMORANDUM

DSM2 Modeling Studies of the Delta Mendota Canal/California Aqueduct Intertie

Introduction

The proposed Delta-Mendota Canal / California Aqueduct Intertie Project (Intertie) will allow for increased pumping through the Jones Pumping Plant. The proposed Intertie will restore DMC flow capacity above the 4,200 cfs capacity of the O'Neil pumping plant not available along the upper DMC during the winter months. The increase in flow through the Jones Pumping Plant will slightly alter the existing hydraulic patterns in the Delta and thus the distribution of salinity throughout the Delta. The Delta Simulation Model (DSM2) was used to predict changes in Delta water quality associated with changes in Delta inflows, exports, and outflows associated with the Intertie. Electrical Conductivity (EC) was used as a surrogate for salinity.

Overview

DSM2 is a branched one-dimensional hydrodynamic and water quality simulation model used to predict conditions in the Sacramento-San Joaquin Delta. The model was developed by the California Department of Water Resources (DWR) and is frequently used to ascertain impacts associated with projects in the Delta, such as changes in exports, diversions, or channel geometries associated with dredging in Delta channels. For this analysis, CH2M HILL conducted two 16-year DSM2 simulations representing Future No Action conditions and conditions with implementation of the Intertie alternative at the future 2030 Level-of-Development. Simulations were made for water years 1975 to 1991, with the first year of model predictions discarded to allow for model spin-up from specified initial conditions. This standard 16-year simulation period (water year 1976-1991) is routinely used for impact analyses of in-Delta projects.

Model-predicted EC were compared in graphical and tabular format at 11 selected locations throughout the Delta to quantify any changes in salinity for the Intertie alternative. These locations include: Martinez, Collinsville, Emmaton, Rio Vista, Antioch, Jersey Point, Rock Slough, Brandt Bridge, Old River at State Highway 4, Clifton Court Forebay, Jones Pumping Plant, and Old River at Tracy Road Bridge. Model output was generated at additional locations, but not all output locations were included in this comparative analysis. All model results have been archived and are available for additional analysis.

The DSM2 simulations used daily boundary conditions derived from monthly hydrologic data supplied by CALSIM II model results from simulations with consistent Future No Action and Intertie assumptions. The CALSIM II model simulations and results are discussed in a separate memorandum.

Methodology

This section discusses the methodology used in the DSM2 simulations. A discussion of hydrodynamic and water quality boundary conditions, as well as physical structures in the Delta, is included to provide information on how the simulations were developed. A complete discussion of results follows.

Boundary Conditions

DSM2 simulations were conducted with a revised astronomical tide elevation at Martinez that was developed by DWR as part of the Common Assumptions process to maintain consistency with the USBR OCAP Modeling. The new planning tide was adjusted to compensate for past sea level rise and was normalized to a 1993-level using the National Oceanic and Atmospheric Administration's National Ocean Service estimates of trends.

Sacramento River inflows to DSM2 were taken from CALSIM II channel C169. The monthly values obtained from CALSIM II were smoothed into a daily time series according to standard practice. Tools provided by DWR were used to smooth the Sacramento River flows. Other boundary condition flows, including inflows from Mokelumne, Calaveras, and Consumnes Rivers, flows in the Yolo Bypass, and exports through the North Bay Aqueduct and to Vallejo and Contra Costa Water Districts were taken directly from CALSIM II model output.

Export flows at Jones and Banks, as well as inflows from the San Joaquin River, were modified from time series data obtained directly from CALSIM II in order to incorporate flow changes associated with VAMP. Tools supplied by DWR were used to generate daily time series data at Jones, Banks, and Vernalis accounting for the VAMP period (April 15 to May 15). Mass balance checks were performed to insure the partial month flow representation maintained mass.

The Martinez EC boundary condition was calculated by standard methods taking into account the astronomical tide level and the net Delta outflow. DWR supplied programs for calculating this boundary condition. The EC boundary condition on the San Joaquin River at Vernalis was also adjusted from CALSIM II output in order to account for changes during the VAMP period. Tools developed and supplied by DWR were used to generate daily EC conditions at Vernalis. Sacramento River and Yolo Bypass EC boundary conditions were held constant at 175 μmhos/cm to maintain consistency with OCAP Modeling. Similarly, a constant value of 150 μmhos/cm was applied for the Mokelumne, Cosumnes, and Calaveras River inflows.

Delta Island Consumptive Use

Delta Island Consumptive Use (DICU) was consistent with CALSIM II. Diversions from the Delta, agricultural return flows, channel seepage, and water quality in the return flows were all taken from HEC-DSS files generated for full-period (water years 1922-2003) DSM2 simulations. A total water balance on all components of DICU was conducted to assure consistency with those values used in the CALSIM II runs. The DICU salinity used for discharge from Delta islands is an approximation of monthly salinity from three regions in the Delta. These monthly values are repeated each year in each region, regardless of the flow conditions. The DICU diversion salinity values change with channel salinity, so the constant monthly pattern of discharge salinity does not provide a salt balance for the Delta islands.

Gate Operations

DSM2 includes the operation of several tide gates, culverts, and weirs which influence the hydrodynamic patterns in the Delta. In addition to these standard fixed structures, South Delta Improvements Program (SDIP) permanent operable gates (stage 1) in the south Delta, such as those proposed at Grant Line Canal, Old River at Tracy Road Bridge, Middle River near Tracy Blvd, and Head of Old River near San Joaquin River, were modeled in this analysis. All permanent gate operations remained consistent with the OCAP Modeling assumptions. Modified Plan C operations (i.e., gates closed at high tide to allow only upstream tidal flows in Old and Middle River) were used for the permanent gates. Tools developed and supplied by DWR were used to generate the permanent gate operations based on flow in the San Joaquin River (i.e., gates were opened at higher SJR flows). Permanent gate operations were identical for the two DSM2 simulations.

Clifton Court Forebay operations were defined by Priority 3 operations to maintain consistency with the OCAP Modeling assumptions. The CCF gates were closed during the flood tide prior to the higher-high tide each day, to allow the high tide elevations to be protected in the south Delta channels.

Delta Cross Channel Gate

The operation of the Delta Cross Channel Gate in the DSM2 simulations was consistent with the OCAP Modeling assumptions. Delta Cross Channel Gate position was based on CALSIM II output, and was processed through programs written and supplied by DWR in order to generate a time series of daily gate operations.

Comparison of Intertie Alternative with Future No Action

Model predictions for EC concentration were analyzed at several locations throughout the Delta. All Delta EC measurements are made with a 15-minute interval to capture the tidal variations throughout each day. DSM2 output consists of 15-minute, hourly, daily, and monthly average flow and electrical conductivity (EC, a surrogate for salinity). Comparisons were made between monthly average EC values for the Future No Action and Intertie Alternative conditions at select locations throughout the Delta.

This section discusses changes made to DSM2 to simulate impacts associated with the Intertie Alternative at a 2030 Level-of-Development. Each major boundary condition is presented comparing the Future No Action conditions to the Intertie Alternative conditions. The impacts of these changes are then discussed.

Figures 1 through 4 below present a comparison of the major flow boundary conditions, including exports at CVP Jones and SWP Banks, and flows on the Sacramento and San Joaquin Rivers, respectively. In general, average exports at Jones increased as a result of the Intertie Alternative, while exports at Banks are similar to the Future No Action Scenario. Figure 5 presents the effect on Net Delta Outflow of these changes and those on the Sacramento and San Joaquin Rivers.

Since the Martinez EC boundary condition is calculated using NDO, and changes to NDO will affect the EC at Martinez and thus the EC throughout the majority of the Delta. Figures 6 and 7 summarize the changes in simulated EC throughout the Delta as a result of the Intertie. Figure 6 presents results in the southern Delta, including Old River at Rock Slough, San Joaquin River at Brandt Bridge, Clifton Court Forebay, Old River at Tracy Road Bridge, Los Vaqueros Intake and Jones Pumping Plant. Peak changes in EC in the South Delta are approximately 150 μmhos/cm. Figure 7 presents changes in EC at Martinez, Collinsville, Emmaton, Rio Vista, Antioch, and Jersey Point. Water Year 1991 changes in EC at Martinez approach 1500 μmhos/cm. However, the change in EC at Martinez decreases in magnitude as the water filters through the Delta. For example, at Jersey Point, the changes have been reduced by a factor of three. Still, the changes in Martinez EC have a far-reaching influence on EC throughout the Delta, including the South Delta.

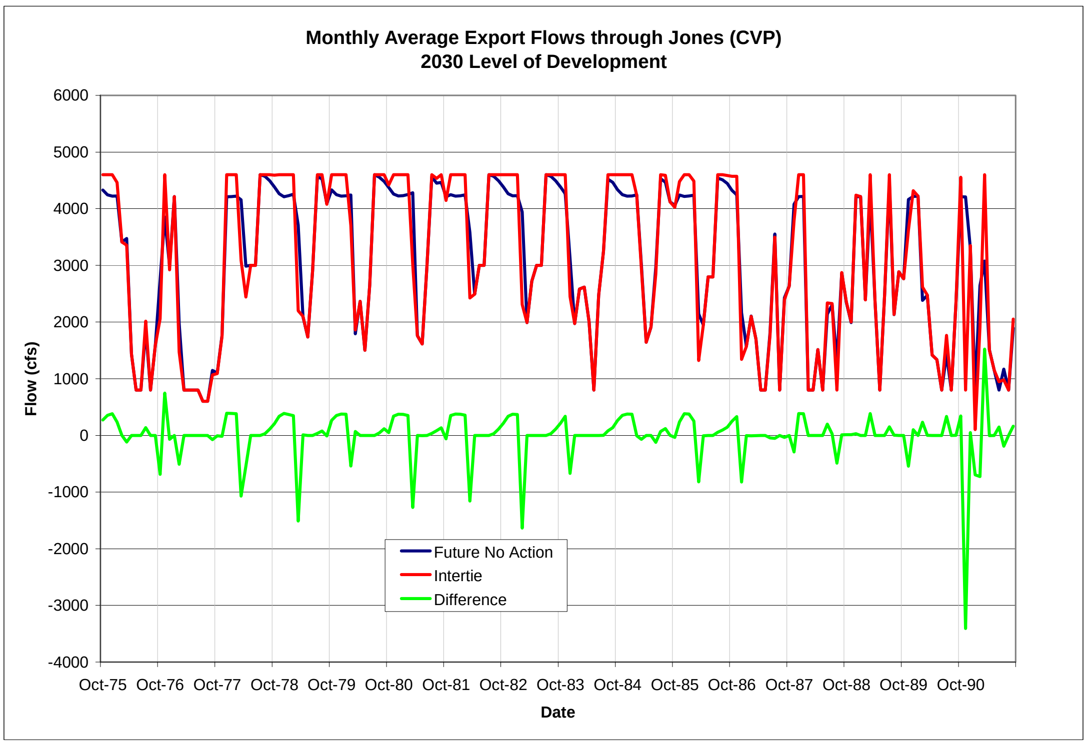

Figure 1. Comparison of Future No Action and Intertie Alternative Flows at Jones (2030 LOD)

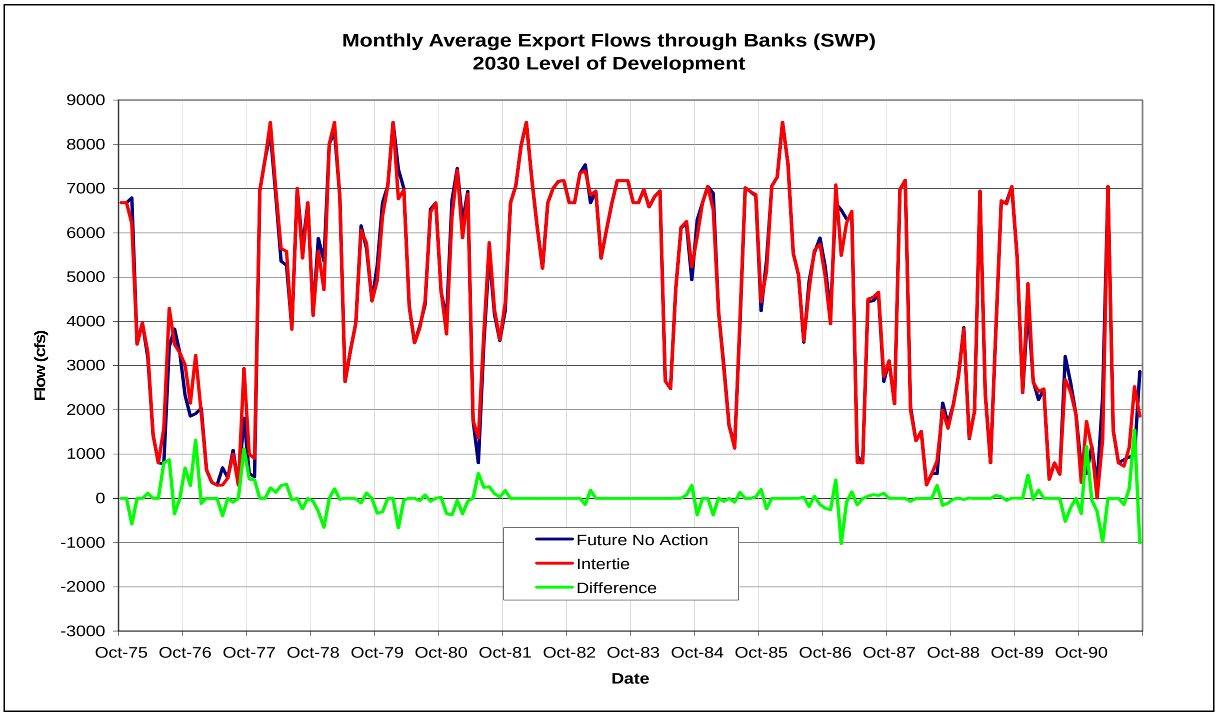

Figure 2. Comparison of Future No Action and Intertie Alternative Flows at Banks (2030 LOD)

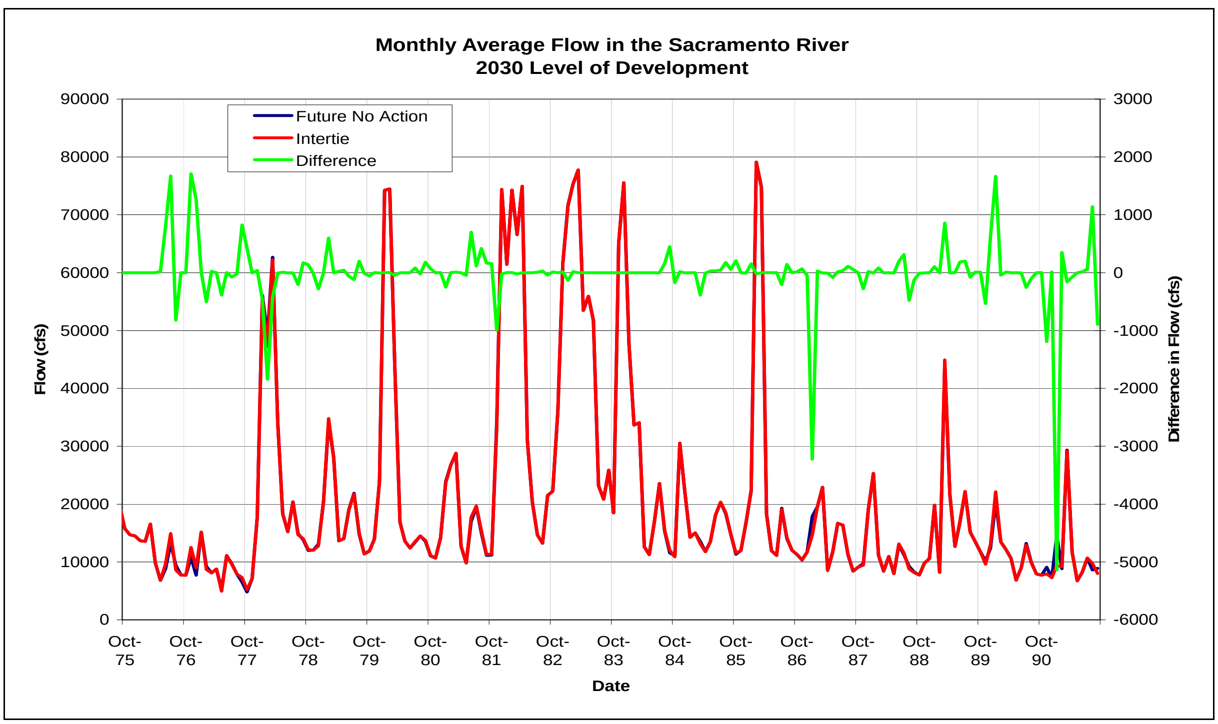

Figure 3. Comparison of Future No Action and Intertie Alternative Flows, Sacramento River (2030 LOD)

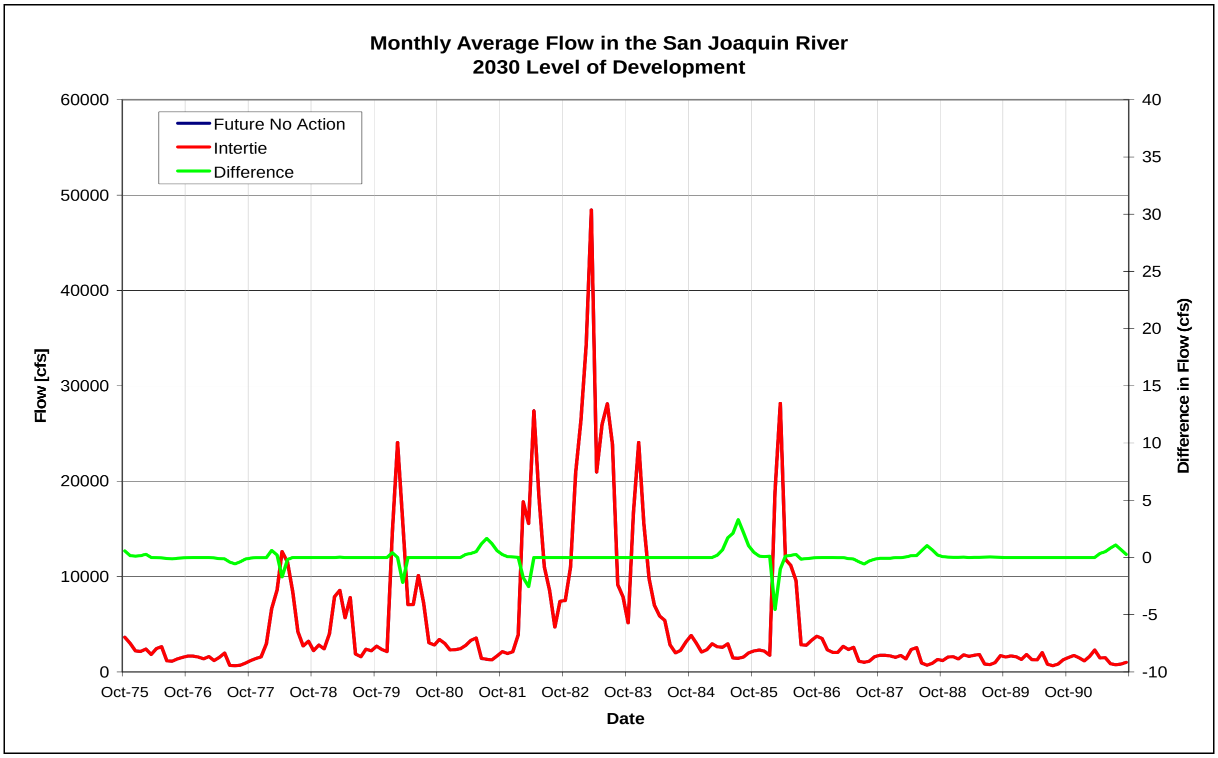

Figure 4. Comparison of Future No Action and Intertie Alternative Flows, San Joaquin River (2030 LOD)

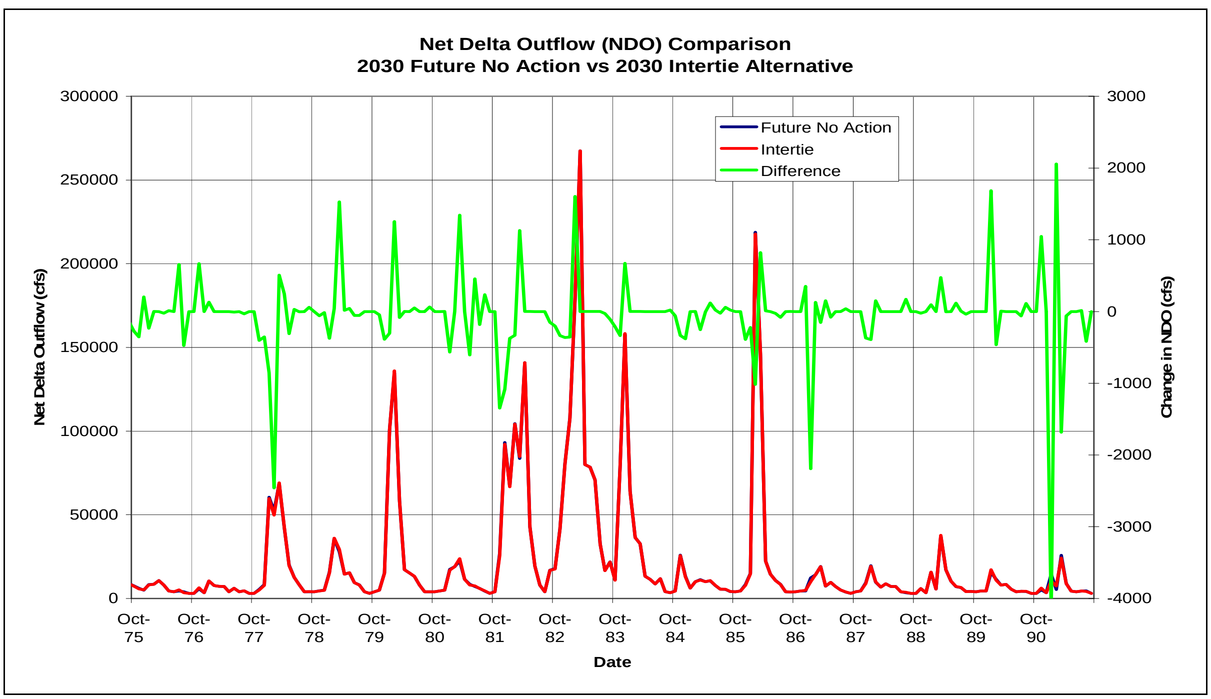

Figure 5. Comparison of Future No Action and Intertie Alternative Flows, Net Delta Outflow (2030 LOD)

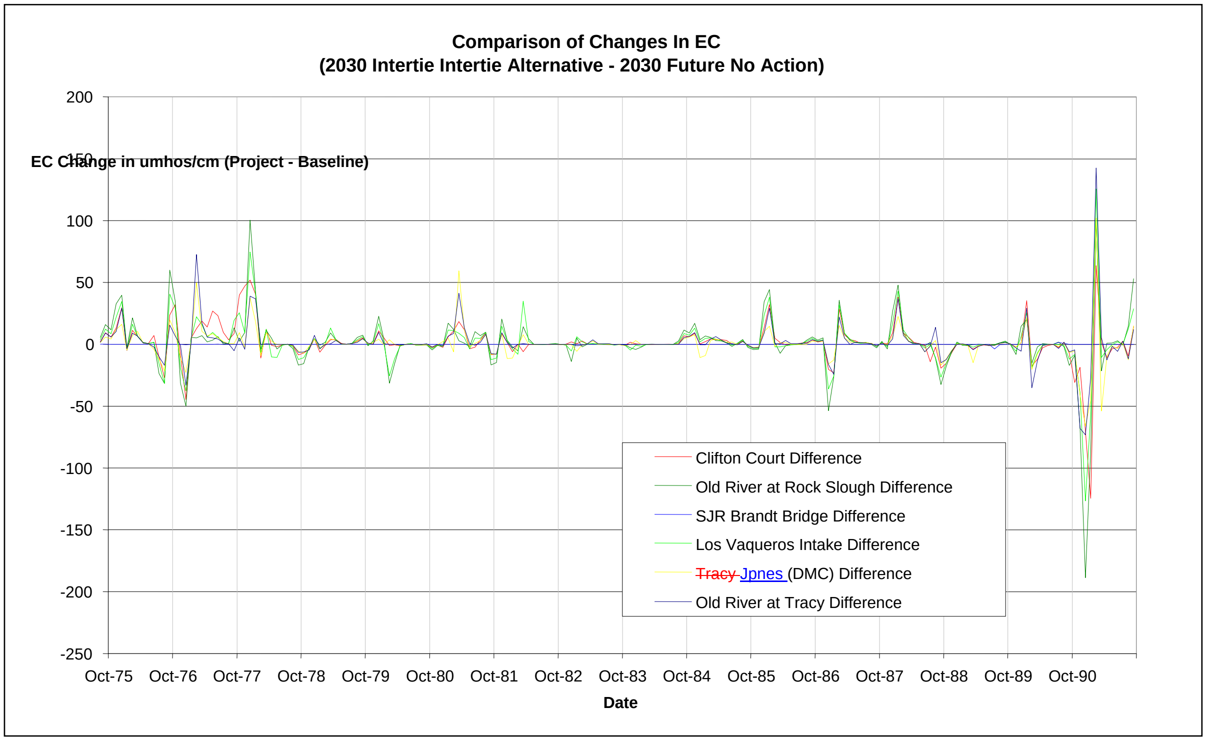

Figure 6. Comparison of EC Changes with Intertie Alternative, West Delta (2030 LOD)

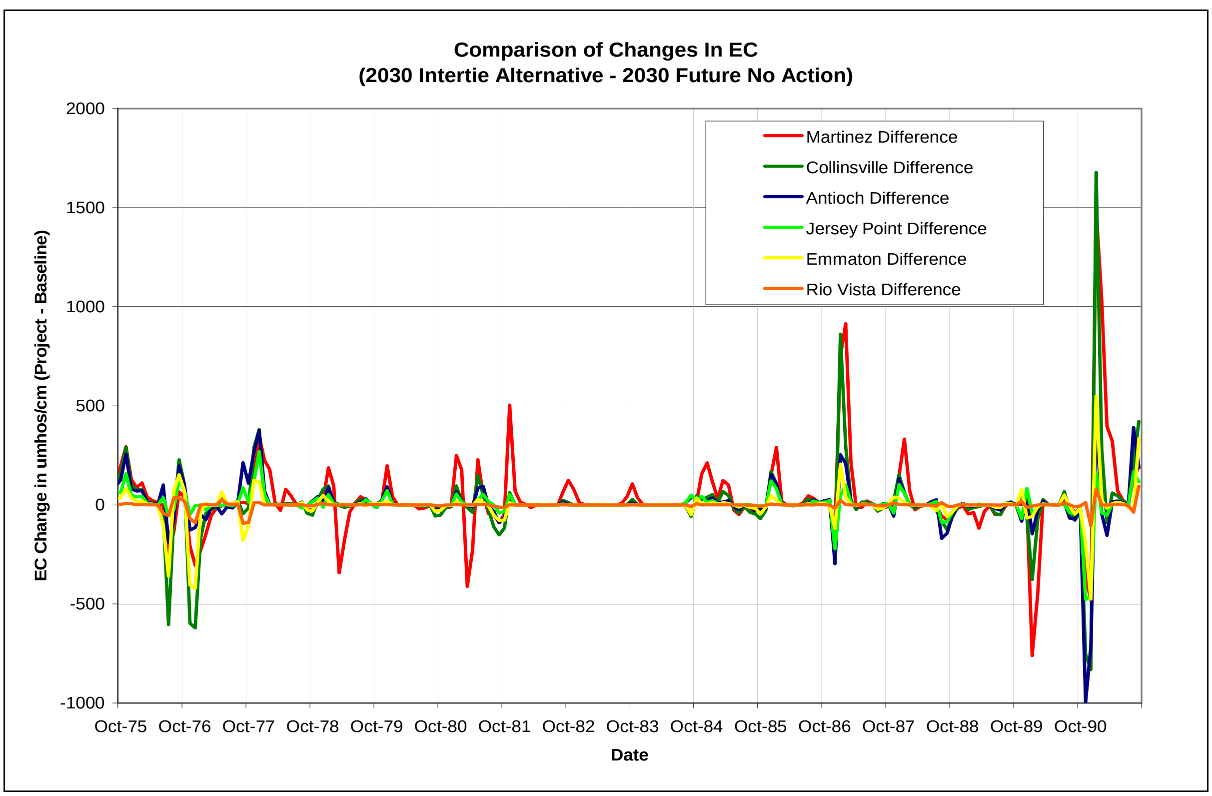

Figure 7. Comparison of EC Changes with Intertie Alternative, South Delta (2030 LOD)

Table 1 presents a summary of monthly EC values at select locations throughout the Delta. The statistics were computed on monthly average EC values from the 16-year simulation. The maximum, minimum, and average monthly EC values are presented for the Future No Action and Intertie Alternative simulations. A more in-depth analysis of variations in model results for the Intertie Alternative is presented in Appendix A. Time series comparison plots were generated with model results from water years 1976 through 1991. These plots, as well as summary tabulations of model results, are compiled in Appendix A.

Table 1. Summary of Monthly EC at Select Locations throughout Delta (2030 LOD)

	Future No Action			Intertie Alternative		
Location	**Maximum**	**Average**	**Minimum**	**Maximum**	**Average**	**Minimum**
Martinez	23,895	15,570	199	23,876	15,603	199
Collinsville	10,876	3,783	181	10,927	3,790	181
Emmaton	4,452	1,120	177	4,395	1,116	177
Rio Vista	1,128	290	137	1,039	288	138
Antioch	6,004	2,058	184	6,094	2,064	184
Jersey Point	3,084	1,065	182	3,087	1,071	182
Clifton Court	908	457	115	908	459	117
Old River at Rock Slough	1161	490	95	1196	491	98
SJR Brandt Bridge	961	552	159	961	552	159
Los Vaqueros Intake	956	476	112	985	478	113
Jones (DMC)	866	486	150	840	487	150
Old River at Tracy Road Bridge	891	501	133	908	502	133

Table 2 presents the seasonal trend in the average percent difference in EC between the Intertie Alternative and the Future No Action simulation at all locations. In general, the Intertie Alternative is shown to cause little or no changes in EC throughout the Delta, with the largest average changes occurring during the month of January. The greatest EC increases occur at Martinez, Collinsville, Emmaton and Antioch in January 1991. These EC increases are caused by a reduction in required Delta outflow and exports that occur because the antecedent EC at Rock Slough is lower in the Intertie alternative as compared to the Future No Action, resulting in a lower release from Lake Shasta in that month.

Figures 8 and 9 present the results demonstrating changes in predicted X2 position as a result of the Intertie. The data used to generate these figures are the results of the monthly Kimmerer-Monismith equation that calculates X2 position based on NDO and antecedent X2 conditions. Average changes in X2 position as a result of the Intertie Alternative are less than 0.4 kilometers. The four largest upstream movements of X2 were caused by reduced

Delta outflow in the previous months that were simulated by the CALSIM II model. Figure 9 presents a scatter plot allowing for the comparison of the change in X2 to the X2 position in the Future No Action simulation before the change. Table 3 presents a tabular summary of the data presented in Figure 8.

Table 2. Summary of DSM2 EC Results at Select Locations – Average Percent Difference in Monthly Average EC between Intertie Alternative and Future No Action Scenario in each month

	2030 (Intertie Alternative – Future No Action) %											
Location	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
Martinez	0.2	0.5	0.8	1.5	1.7	-0.5	-0.2	0.2	0.0	-0.1	0.0	0.0
Collinsville	0.5	0.3	0.4	5.1	2.1	-0.5	0.0	0.7	0.0	-0.5	-0.1	0.1
Emmaton	0.0	0.2	-0.5	5.8	1.3	0.0	0.1	0.7	-0.3	-1.0	-0.2	-0.1
Rio Vista	-0.7	-0.1	-1.7	2.4	0.2	0.0	0.0	0.5	-0.4	-0.8	0.0	-0.1
Antioch	0.9	-0.1	0.9	4.5	1.9	-0.4	0.2	0.9	0.5	-0.2	0.3	0.6
Jersey Point	0.8	0.3	1.1	3.9	1.4	0.2	0.3	0.6	0.6	0.1	0.4	0.7
Clifton Court	0.2	0.6	0.2	0.4	1.3	0.8	0.3	0.2	0.2	-0.1	-0.1	0.2
Old River at Rock Slough	0.1	0.3	-0.1	1.3	2.1	0.5	0.5	0.0	0.3	0.0	0.0	0.6
SJR Brandt Bridge	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Los Vaqueros Intake	0.3	0.1	0.1	1.1	1.9	1.2	0.2	-0.1	0.1	0.0	0.0	0.4
Jones (CVP)	0.0	-0.1	-0.4	-0.1	1.3	0.6	0.4	0.1	-0.1	-0.1	-0.2	0.1
Old River at Tracy road bridge	0.0	-0.3	-0.1	0.8	2.1	0.9	0.3	0.1	-0.1	-0.1	0.0	0.0

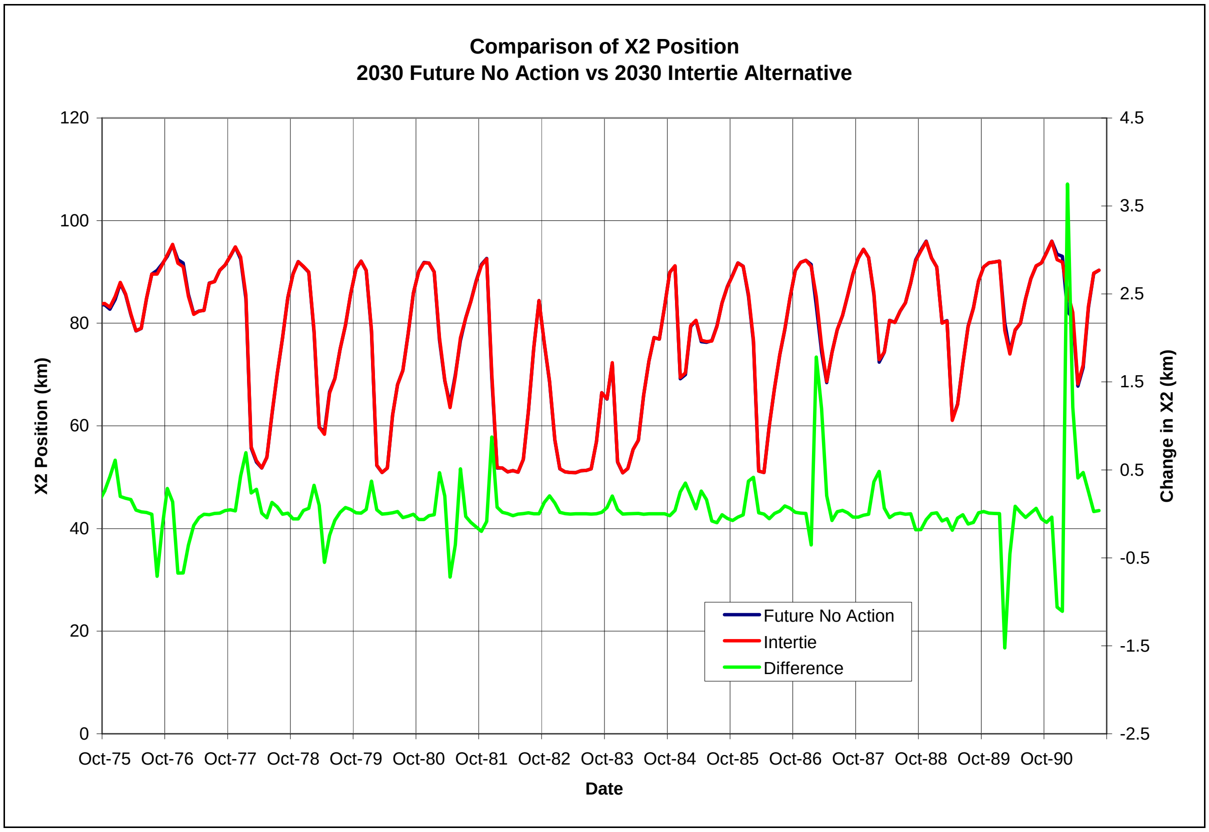

Figure 8. Comparison of X2 Changes with Intertie Alternative (2030 LOD)

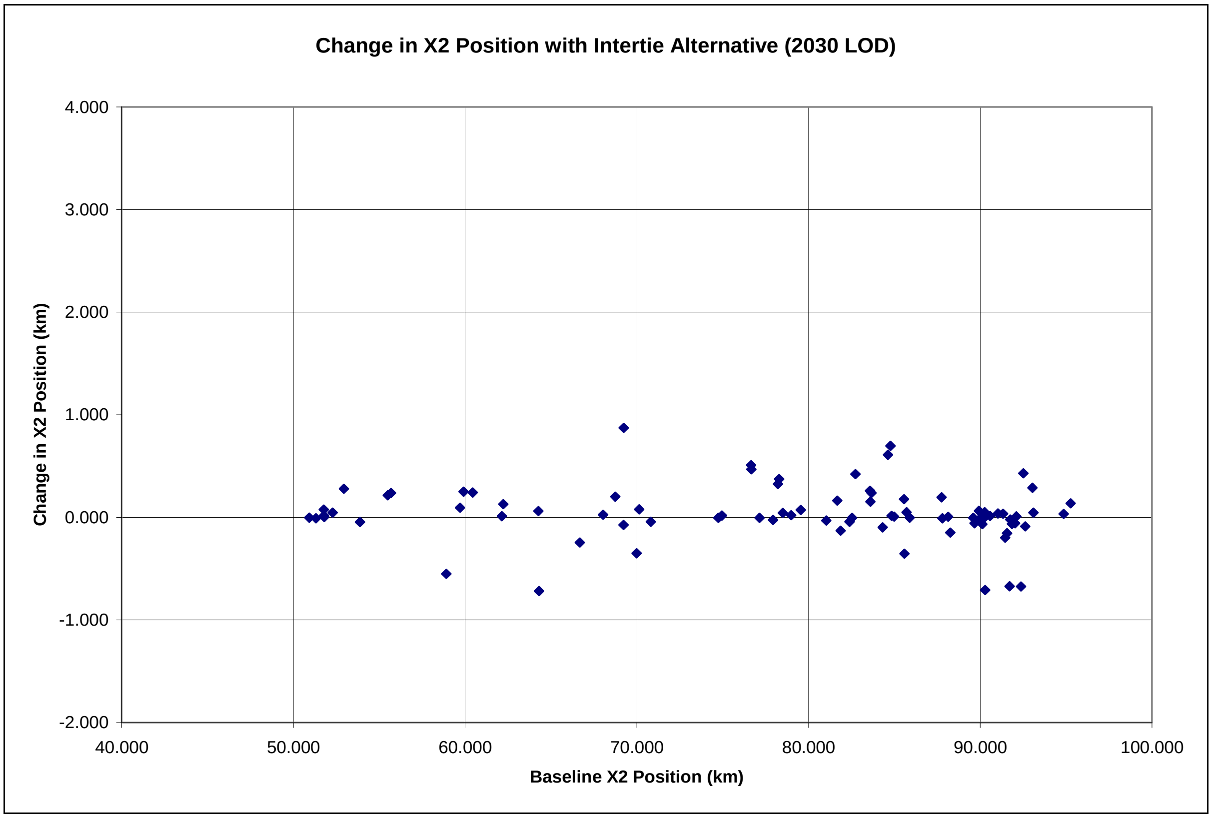

Figure 9. Change in X2 Position with Intertie Alternative, February through June (2030 LOD)

Table 3. Difference in X2 Predictions (in kilometers)
(2030 Intertie Alternative - 2030 Future No Action)

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	0.3	0.4	0.6	0.2	0.2	0.2	0.0	0.0	0.0	0.0	-0.7	-0.2
1977	0.3	0.1	-0.7	-0.7	-0.4	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.4	0.7	0.2	0.3	0.0	0.0	0.1	0.1	0.0	0.0
1979	-0.1	-0.1	0.0	0.1	0.3	0.1	-0.6	-0.2	-0.1	0.0	0.1	0.1
1980	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	-0.1	-0.1	0.0	0.0	0.5	0.2	-0.7	-0.4	0.5	0.0	-0.1	-0.1
1982	-0.2	-0.1	0.9	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.2	0.3	0.2	0.1	0.3	0.2	-0.1	-0.1	0.0	-0.1
1986	-0.1	0.0	0.0	0.4	0.4	0.0	0.0	-0.1	0.0	0.0	0.1	0.1
1987	0.0	0.0	0.0	-0.4	1.8	1.2	0.2	-0.1	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.4	0.5	0.1	0.0	0.0	0.0	0.0	0.0	-0.2
1989	-0.2	-0.1	0.0	0.0	-0.1	-0.1	-0.2	0.0	0.0	-0.1	-0.1	0.0
1990	0.0	0.0	0.0	0.0	-1.5	-0.5	0.1	0.0	0.0	0.0	0.1	-0.1
1991	-0.1	0.0	-1.1	-1.1	3.7	1.2	0.4	0.5	0.3	0.0	0.0	0.0
AVG	0.0	0.0	0.0	0.0	0.4	0.2	0.0	0.0	0.0	0.0	0.0	0.0
MAX	0.3	0.4	0.9	0.7	3.7	1.2	0.4	0.5	0.5	0.1	0.1	0.1
MIN	-0.2	-0.1	-1.1	-1.1	-1.5	-0.5	-0.7	-0.4	-0.1	-0.1	-0.7	-0.2

Conclusions

The Delta Simulation Model was used to predict changes in Delta water quality associated with changes in CALSIM II simulated flow patterns in the Delta caused by the DMC-CA Intertie Alternative. The comparative nature of this analysis is appropriate for impact studies, although the DSM2 model may not predict existing conditions with complete accuracy, the consistent nature in which the simulations were developed allows for an adequate estimate of Intertie Alternative impacts.

Table 2 presents a summary of average monthly percentage changes in EC at 12 locations throughout the Delta for the Intertie Alternative as compared to the Future No Action alternative. The average monthly changes in EC are less than 1% for all locations, and no change is observed at Rio Vista and San Joaquin River at Brandt Bridge locations.

Detailed monthly comparisons of differences in EC between the Intertie alternative and the Future No Action alternative are presented in Appendix A.

Limitations

DSM2 was used to analyze Delta hydrodynamic and water quality conditions in the Future No Action and Intertie alternatives. Like all models DSM2 has limitations that need to be kept in mind when interpreting its results. The following are some general limitations of DSM2, some of which are identified in Chapter 9 of the OCAP BA document and are applicable to the analysis performed for the USBR Intertie project.

DSM2 is a one-dimensional model. As such, it is only capable of simulating the flow in the longitudinal direction. Any detailed description such as vertical/lateral mixing, changing of the flow patterns due to bends or unusual expansion or contraction of the rivers are not simulated. DSM2 simulates reservoirs as constantly mixed reactors and each is essentially only a container that holds water. Any mixing of water in there occurs instantly and uniformly. Reservoirs are used for five locations in the model: Clifton Court Forebay, Franks Tract, Little Franks Tract, Mildred Island, and Discovery Bay.

The model at times may see very steep transitions in flow from month to month. Because of these transitions the hydrodynamic conditions may take a few simulation days to adjust to the new inflows. Given this transition period the results from DSM2-Hydro should not be used during the transitions between months. However, the hydrodynamic results do include periods up to the transition.

Finally, the Delta Island Consumptive Use (DICU) simulates the agriculture diversions and return flows. The DICU for the model is consistent with the total monthly volume in CalSim-II. Though the DICU for DSM2 is more spatially represented it still assumes a constant monthly flow rate.

Despite these limitations, DSM2 is appropriate and reasonable for comparative analyses such as the one presented here for the Intertie alternative. The relative changes in flow and EC conditions due to the Intertie alternative are simulated with reasonable accuracy. Further, since the Delta configuration does not change with or without the Intertie alternative and the Intertie alternative is found to cause little or no change to net salt transport in the Delta, DSM2 results presented in this analysis are valid.

Appendix A. Summary Tables of Differences in EC between Intertie Alternative and Future No Action Alternative (2030 Level-of-Development)

This appendix contains a plot of Net Delta Outflow and graphical and tabular summaries of differences in predicted EC between the Intertie alternative and the Future No Action alternative at the following locations in the Delta:

- Martinez
- Collinsville
- Emmaton
- Rio Vista
- Antioch
- Jersey Point
- Old River at Rock Slough
- San Joaquin River at Brandt Bridge
- Old River at State Highway 4 (Los Vaqueros Intake)
- Clifton Court Forebay
- Jones Pumping Plant (Head of Delta-Mendota Canal)
- Old River at Tracy Road Bridge

There are two summary tables for each location comparing the Intertie alternative to the Future No Action alternative. Each set of tables summarizes the actual difference in EC, and the percent difference in EC between two simulations on a monthly basis. Summary tables are generated for water years 1976 through 1991. These tables were generated to allow for the determination of seasonal differences in changes in EC throughout the Delta associated with the Intertie alternative.

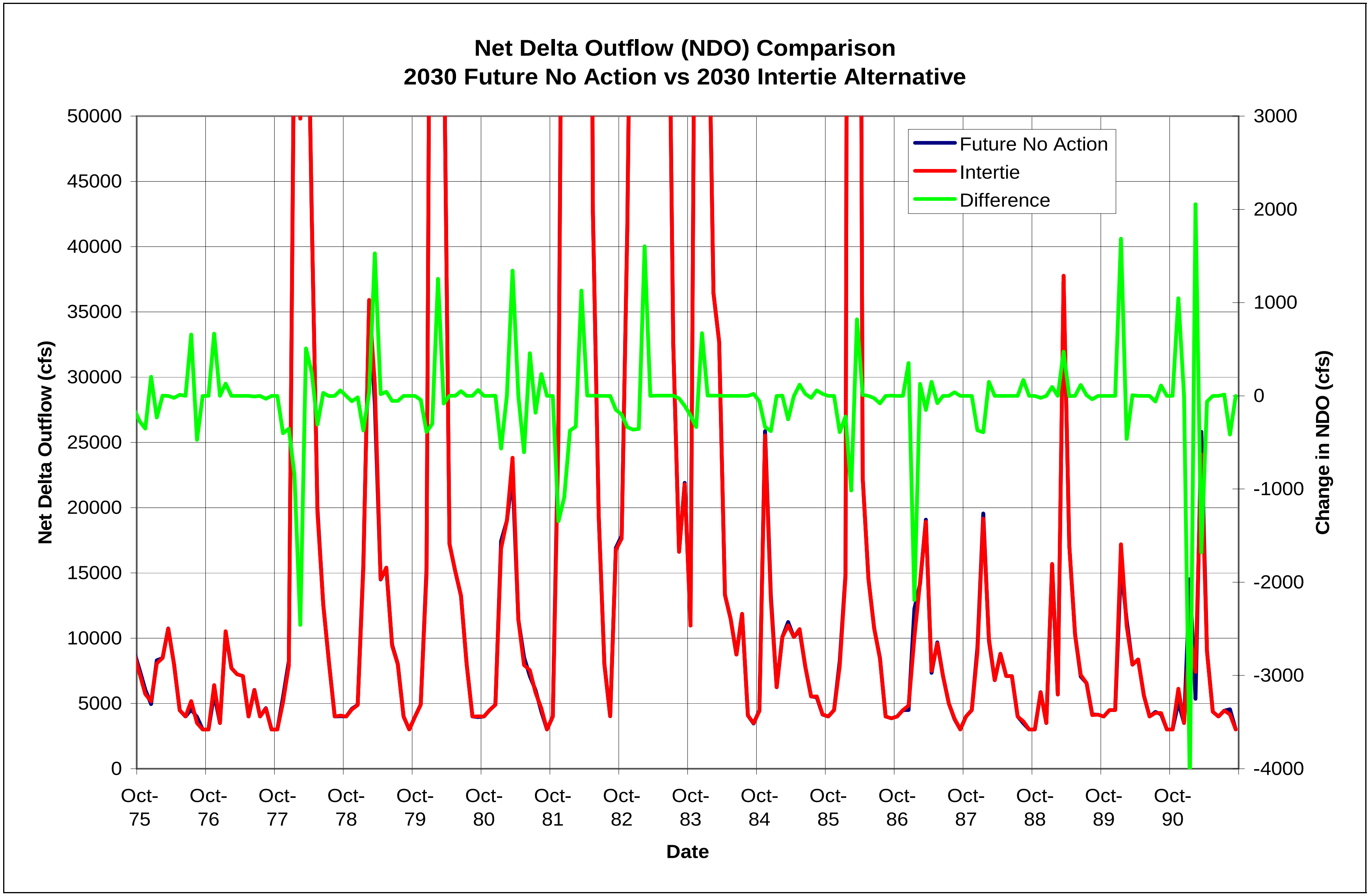

Figure A-1. Comparison of Baseline and Project Flows, Net Delta Outflow (2030 LOD)

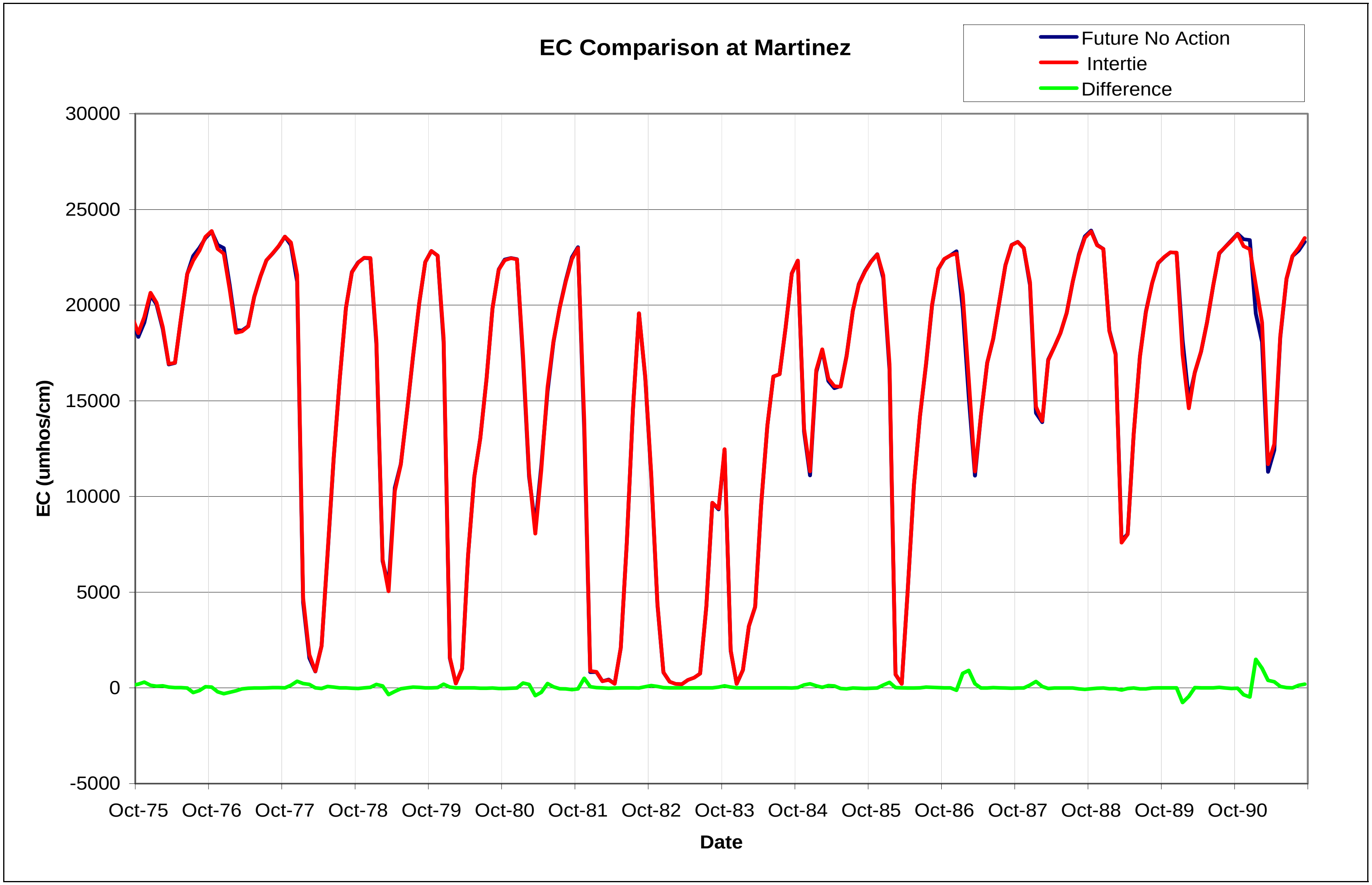

Figure A-2. EC Comparison at Martinez (2030 Conditions)

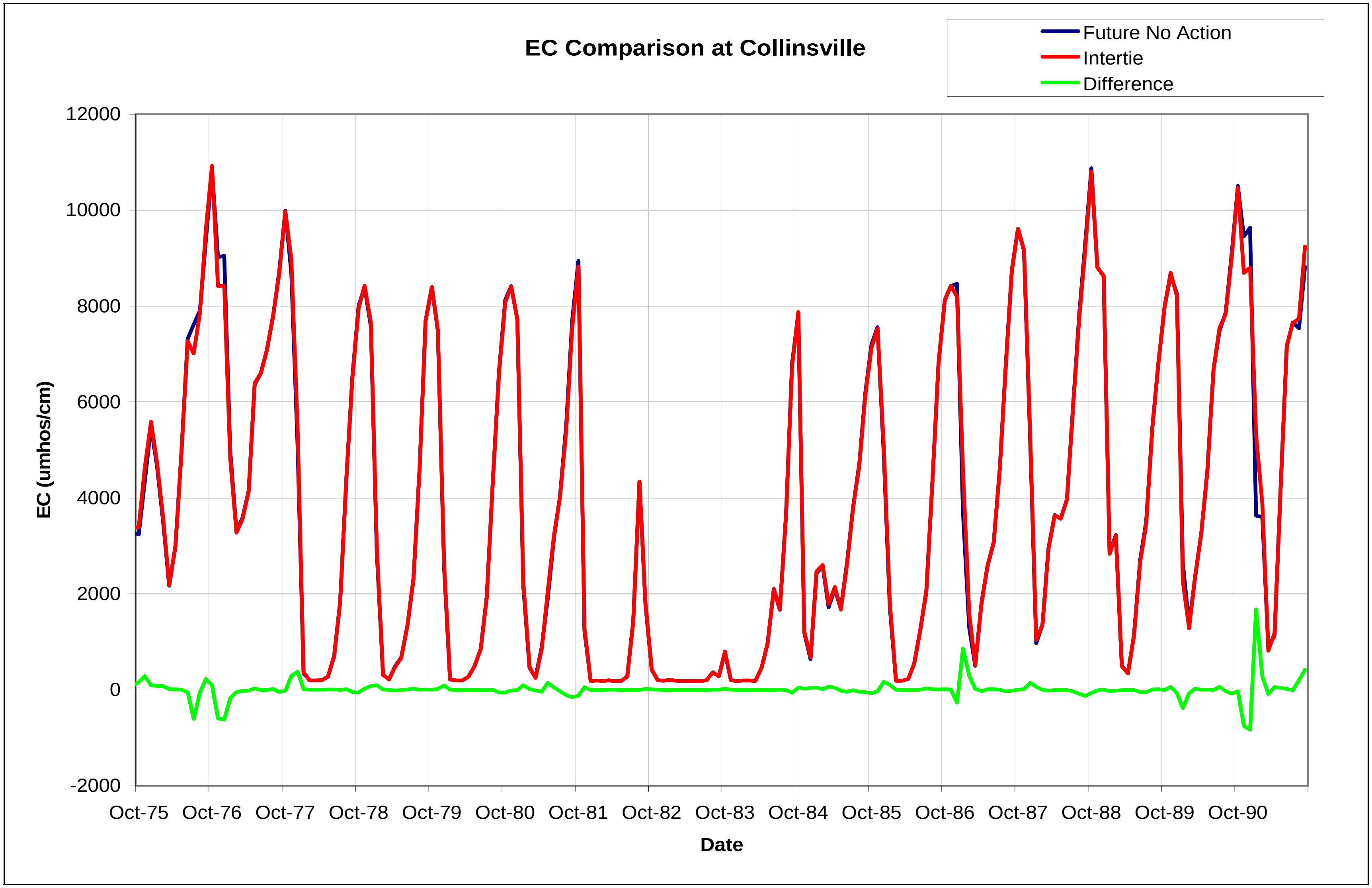

Figure A-3. EC Comparison at Collinsville (2030 Conditions)

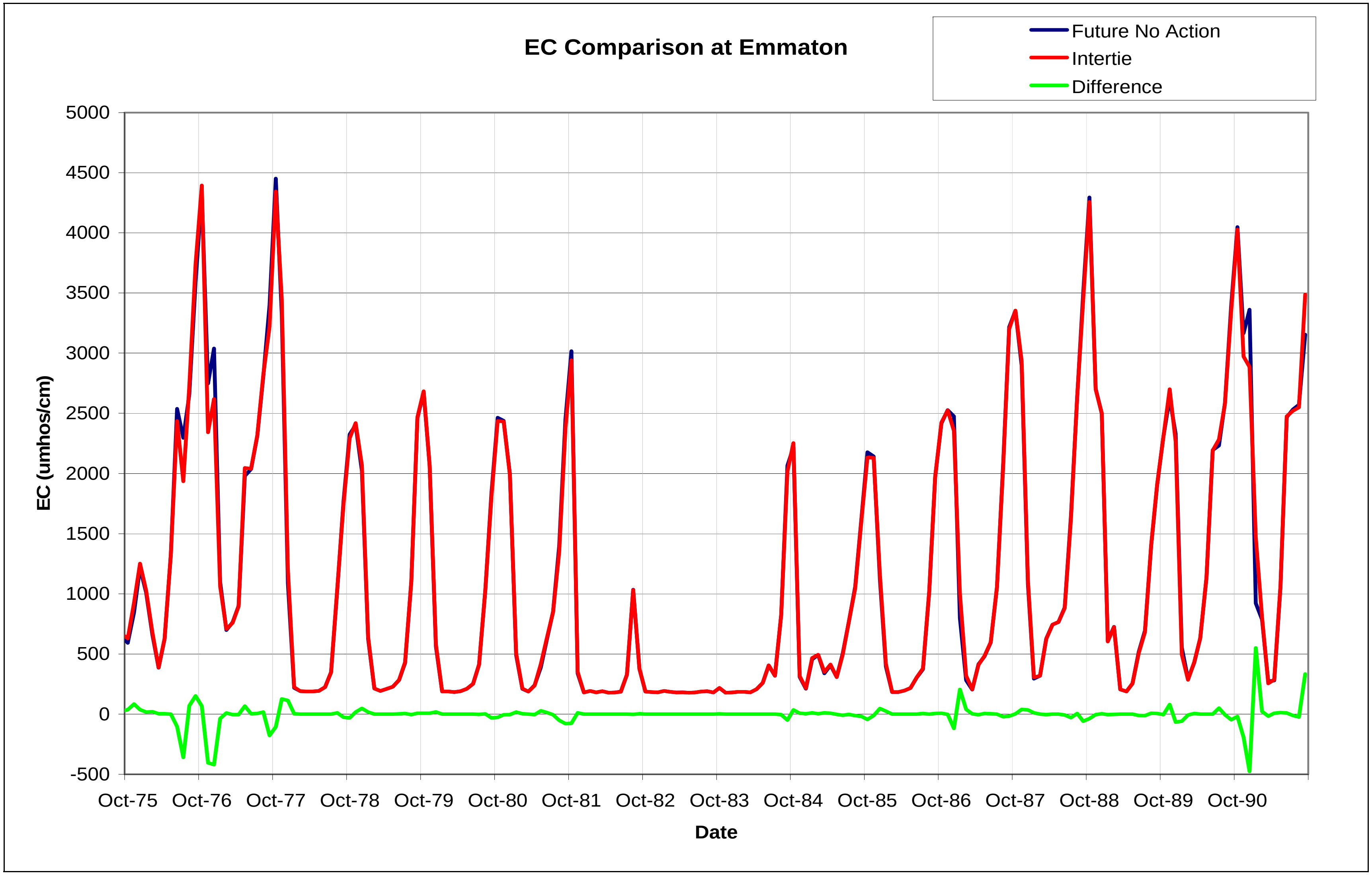

Figure A-4. EC Comparison at Emmaton (2030 Conditions)

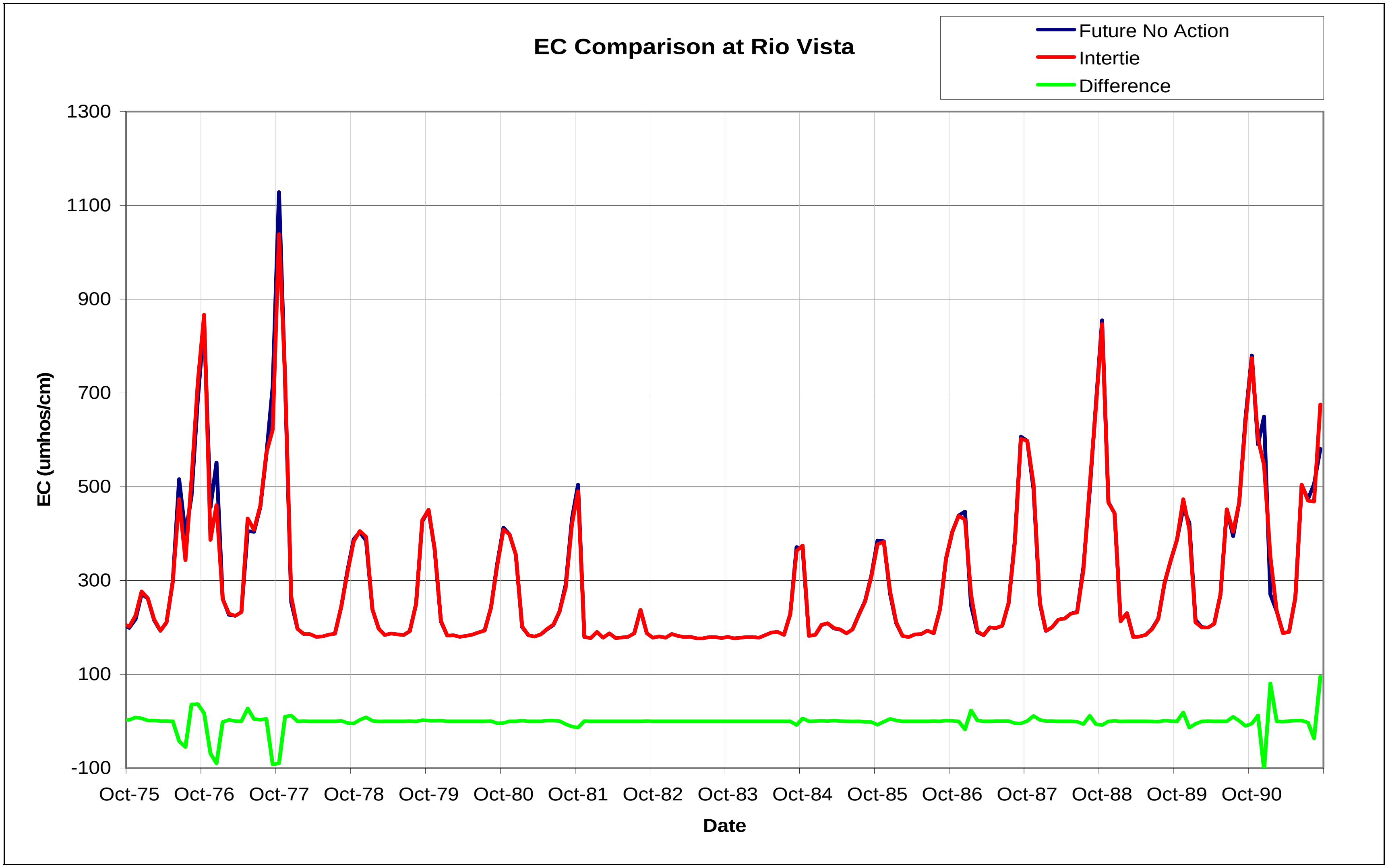

Figure A-5. EC Comparison at Rio Vista (2030 Conditions)

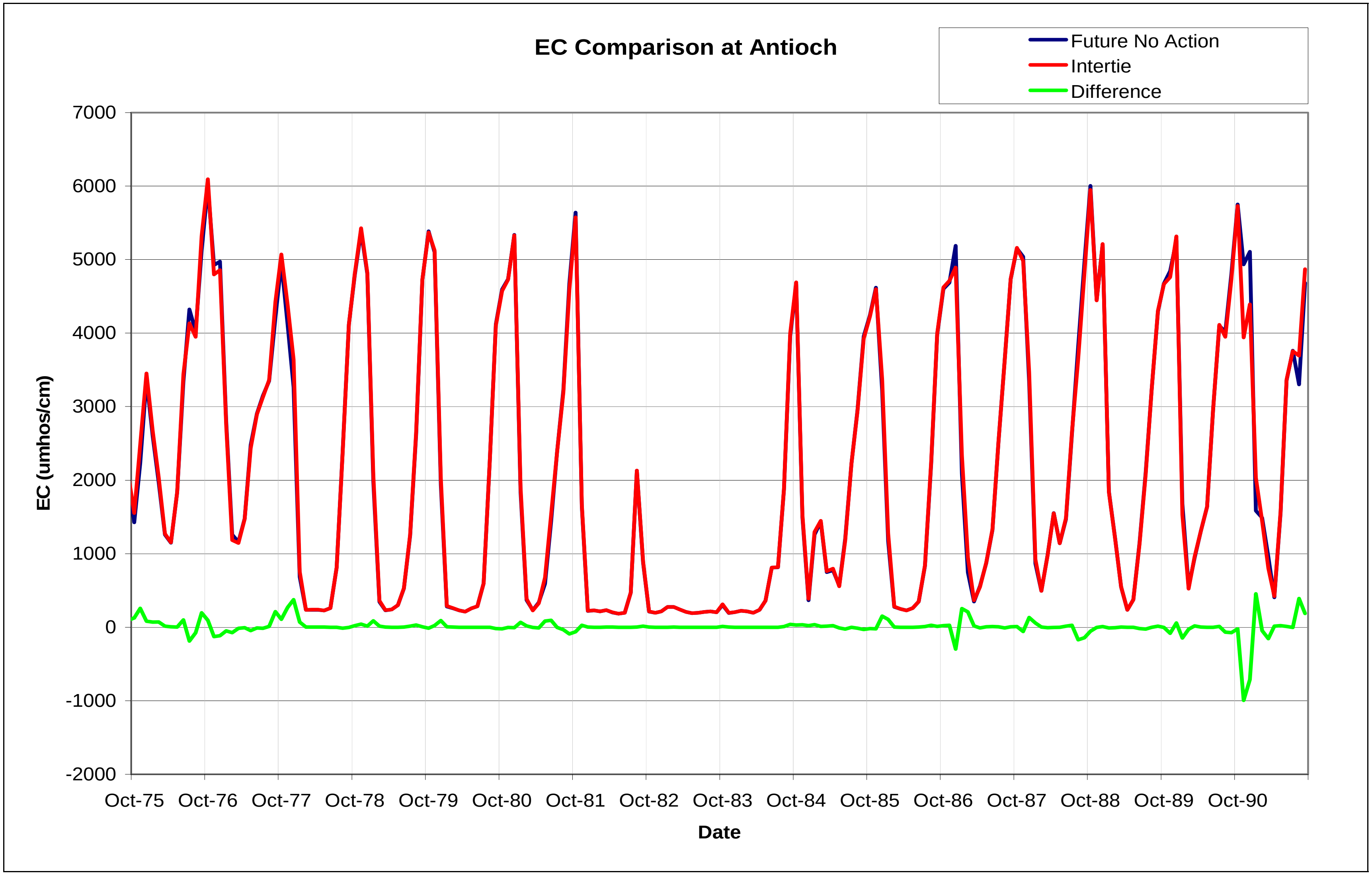

Figure A-6. EC Comparison at Antioch (2030 Conditions)

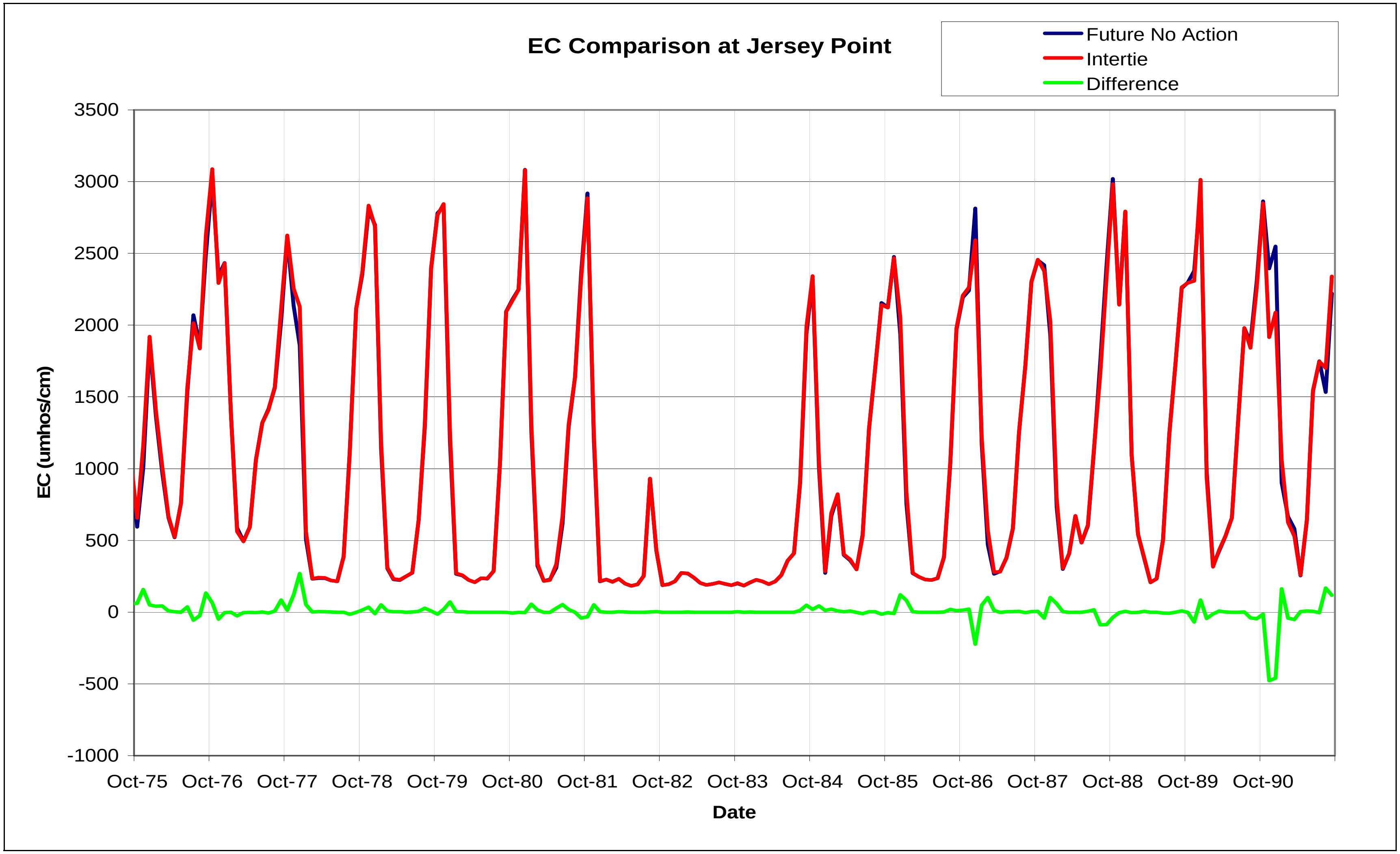

Figure A-7. EC Comparison at Jersey Point (2030 Conditions)

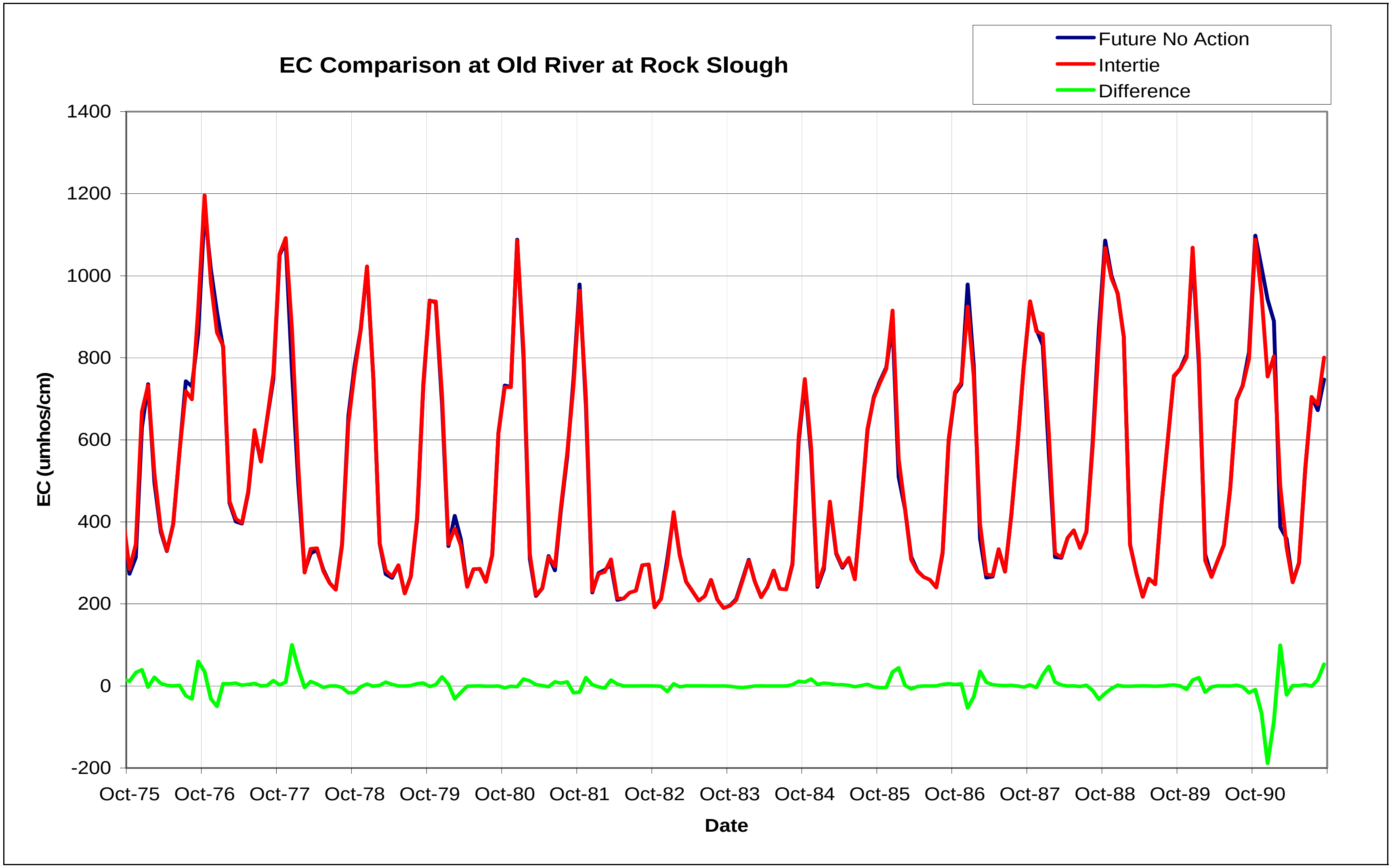

Figure A-8. EC Comparison at Old River near Rock Slough (2030 Conditions)

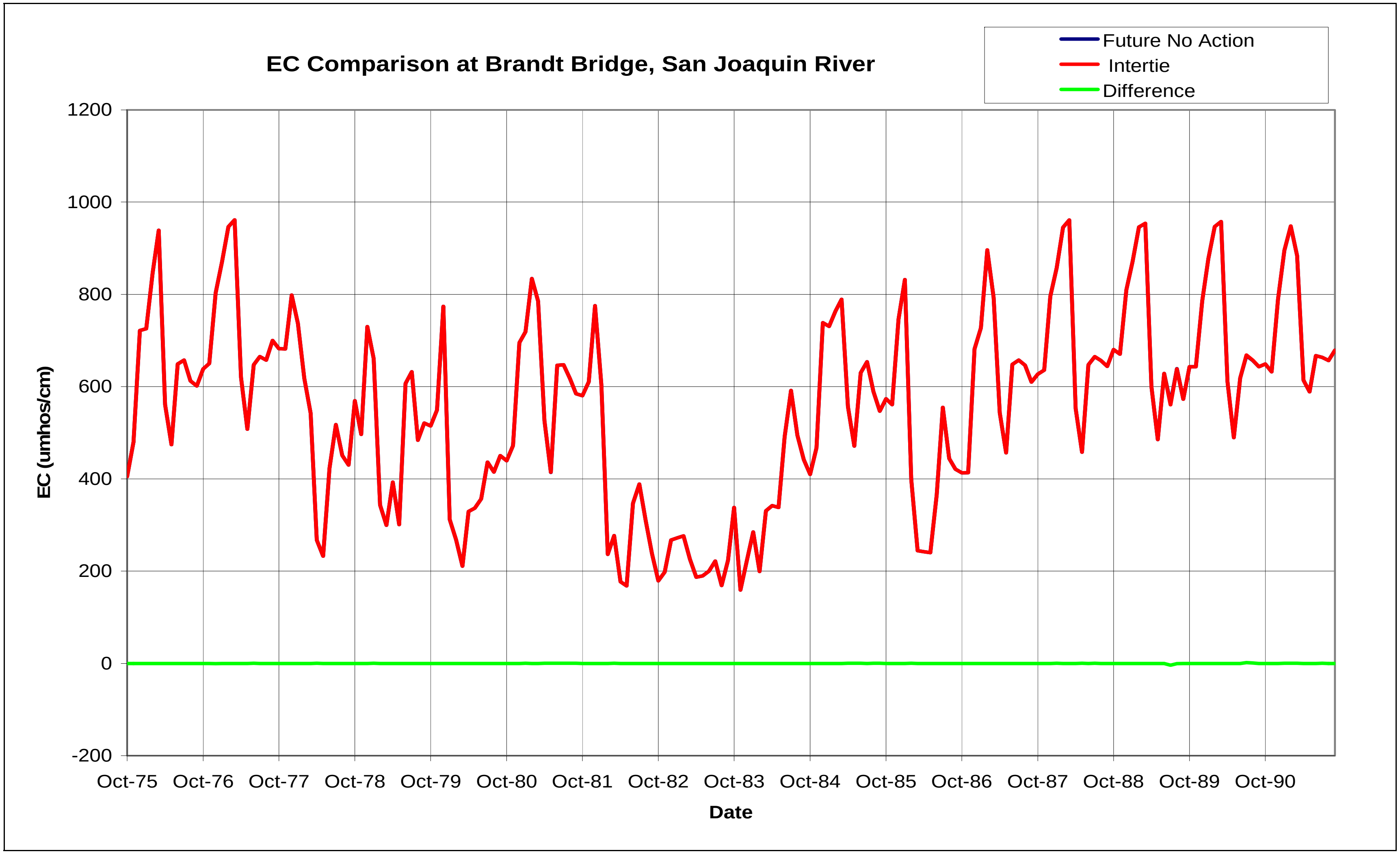

Figure A-9. EC Comparison at Brandt Bridge, San Joaquin River (2030 Conditions)

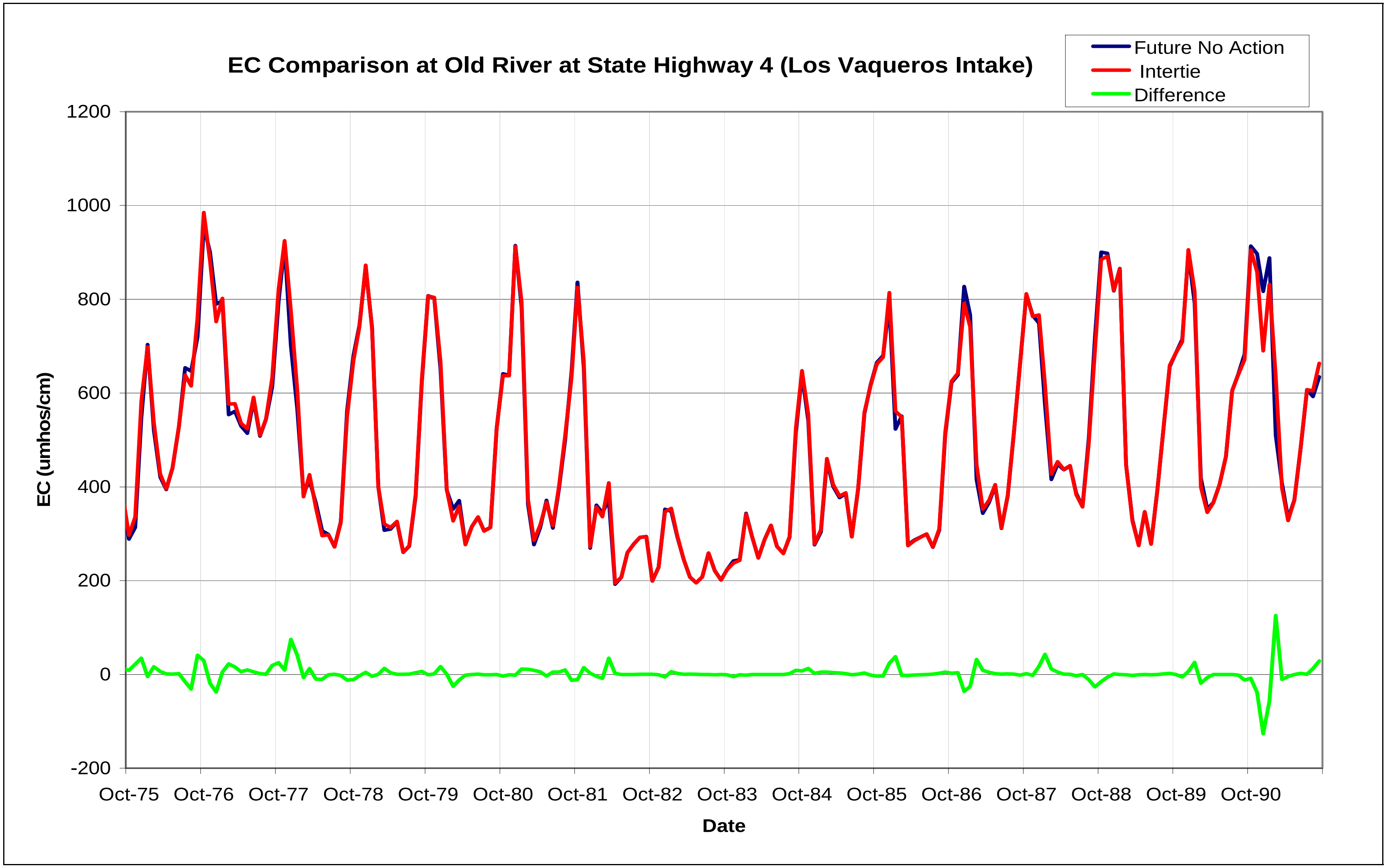

Figure A-10. EC Comparison at Old River, State Highway 4 / Los Vaqueros Intake (2030 Conditions)

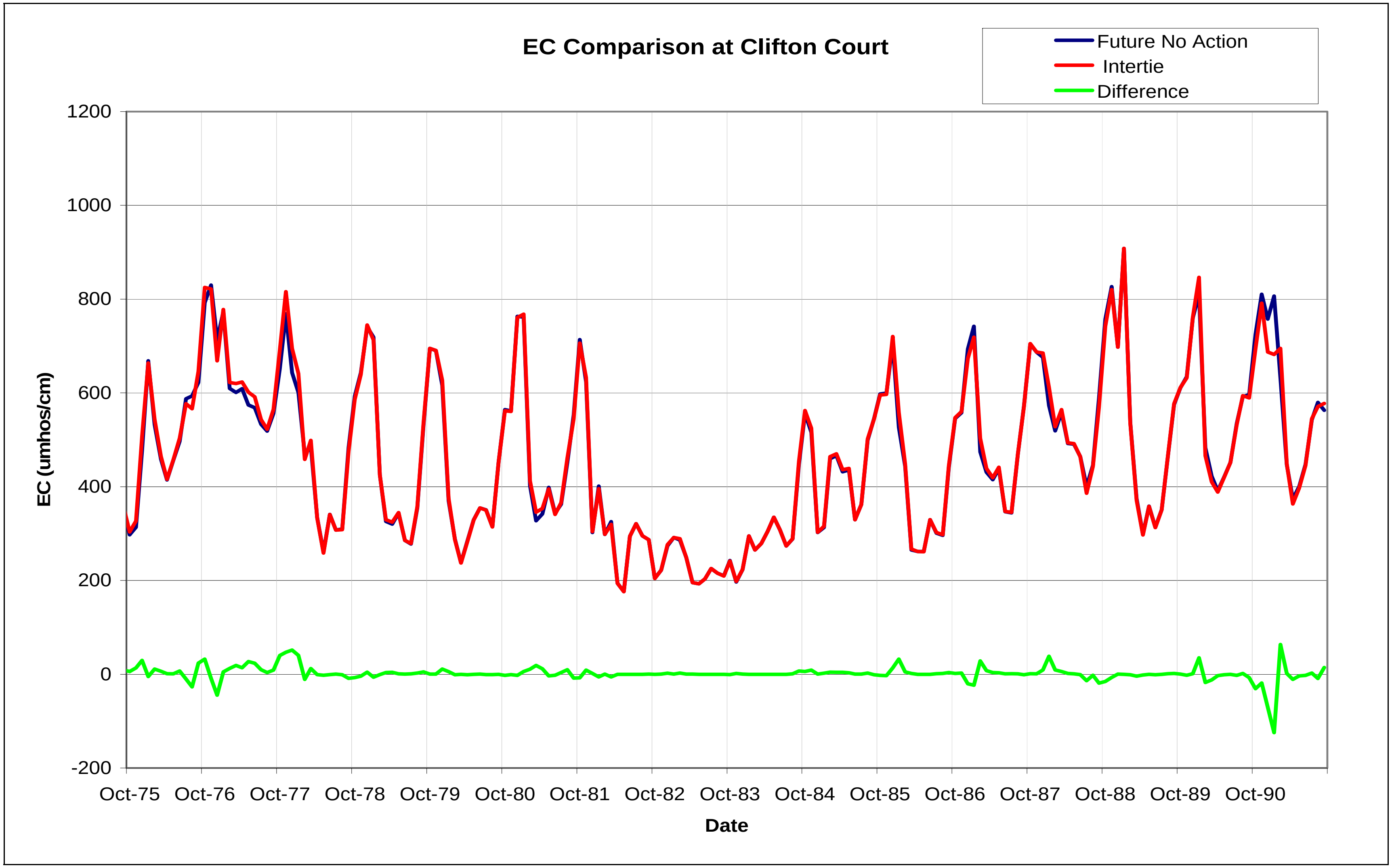

Figure A-11. EC Comparison at Clifton Court (2030 Conditions)

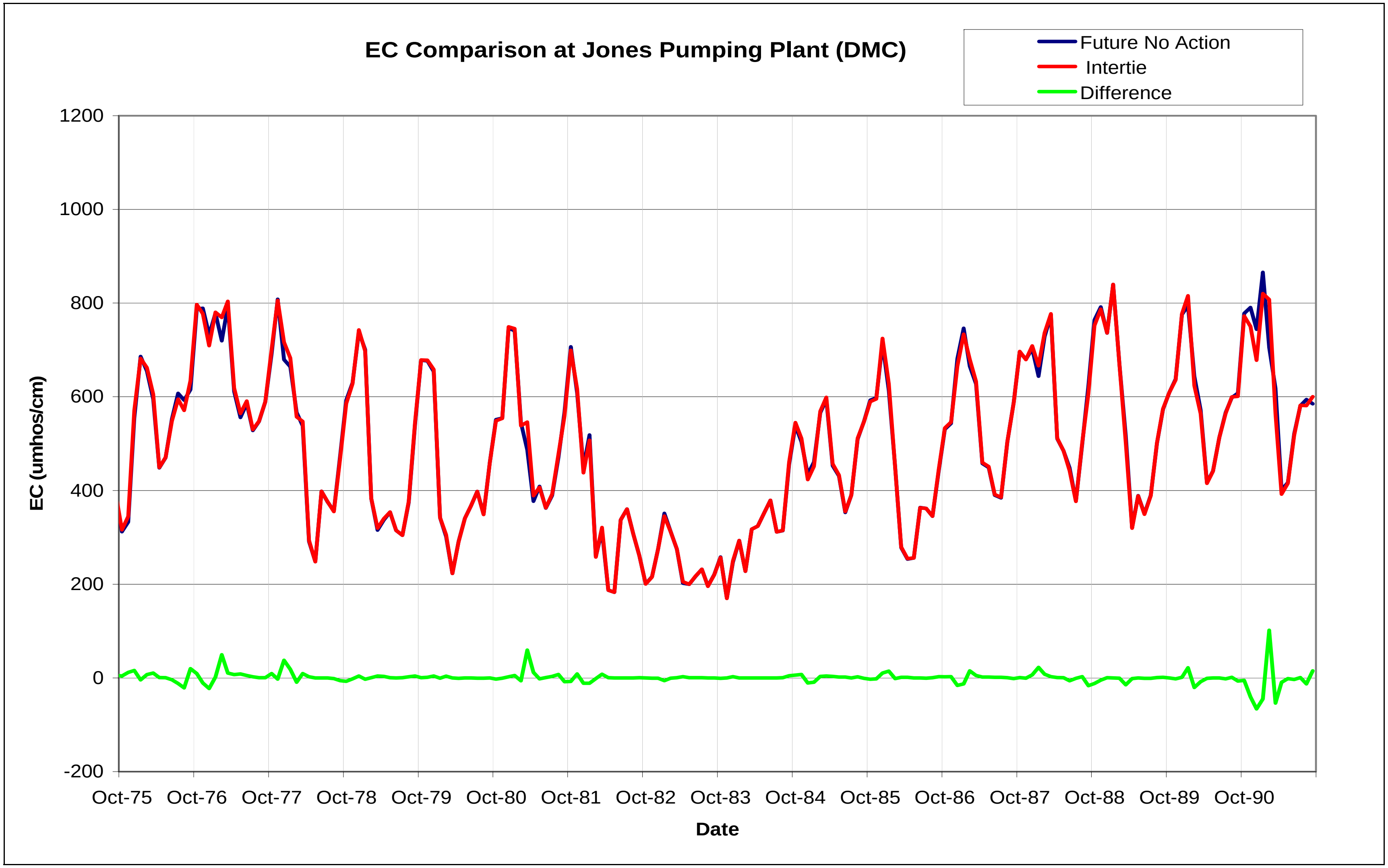

Figure A-12. EC Comparison at Jones Pumping Plant / Head of Delta-Mendota Canal (2030 Conditions)

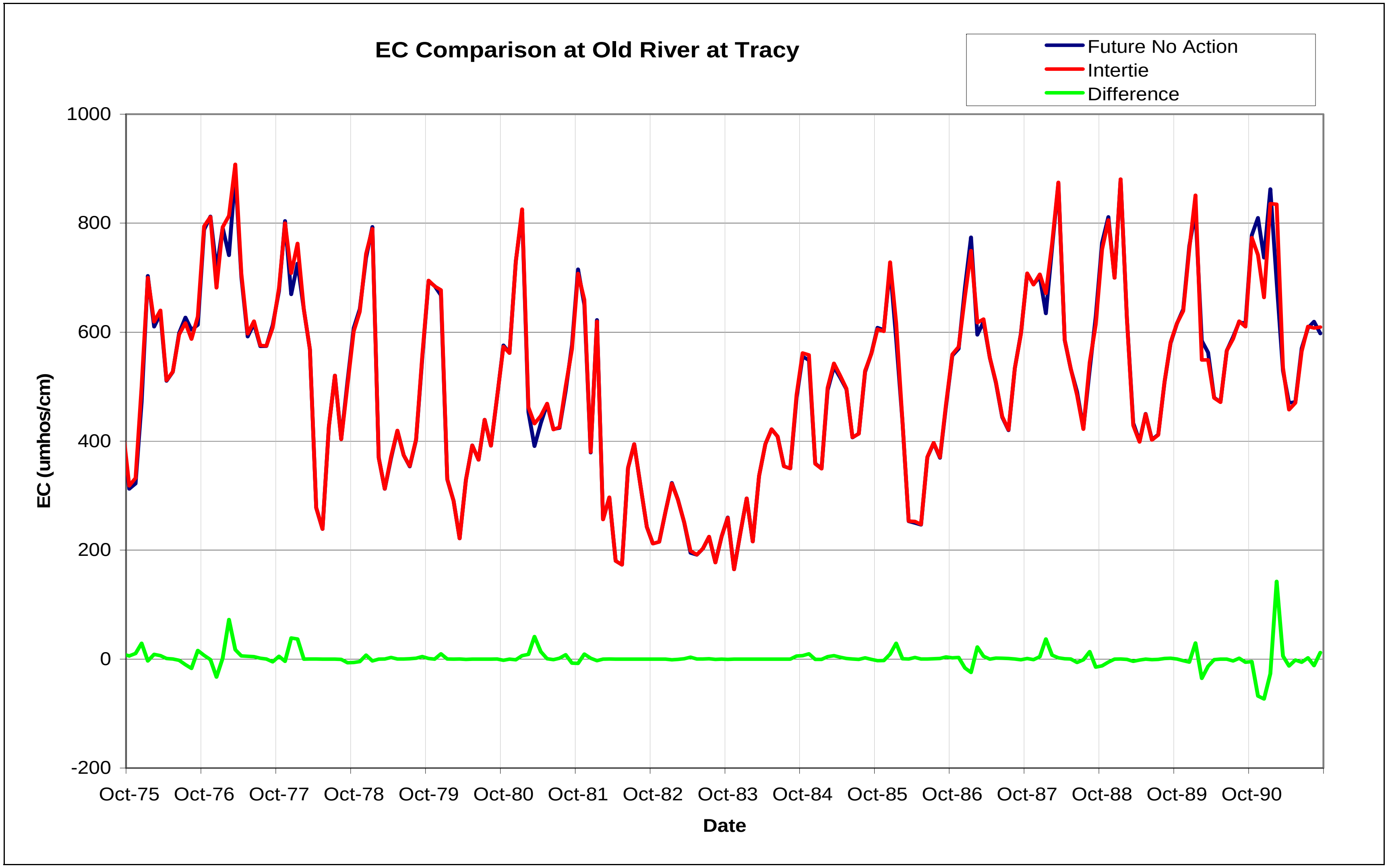

Figure A-13. EC Comparison at Old River at Tracy Road Bridge (2030 Conditions)

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action)
Martinez

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	197.0	294.0	130.0	87.0	111.0	39.0	21.0	11.0	-2.0	-241.0	-136.0	65.0
1977	37.0	-208.0	-306.0	-231.0	-147.0	-53.0	-18.0	-4.0	-1.0	2.0	12.0	13.0
1978	7.0	138.0	348.0	225.0	178.0	8.0	-28.0	79.0	45.0	0.0	1.0	-22.0
1979	-28.0	7.0	27.0	187.0	95.0	-343.0	-179.0	-37.0	9.0	41.0	25.0	9.0
1980	4.0	18.0	198.0	43.0	0.0	3.0	2.0	0.0	-21.0	-15.0	-4.0	-25.0
1981	-30.0	-15.0	-9.0	249.0	178.0	-412.0	-228.0	228.0	51.0	-45.0	-51.0	-90.0
1982	-48.0	504.0	69.0	13.0	3.0	-13.0	-1.0	0.0	0.0	0.0	-1.0	66.0
1983	124.0	80.0	12.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	41.0
1984	106.0	35.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-10.0
1985	12.0	157.0	212.0	116.0	31.0	123.0	101.0	-26.0	-49.0	-11.0	-20.0	-32.0
1986	-23.0	-11.0	150.0	290.0	17.0	0.0	-5.0	-1.0	10.0	45.0	33.0	11.0
1987	6.0	3.0	-122.0	754.0	914.0	212.0	-11.0	-11.0	20.0	6.0	-12.0	-16.0
1988	-8.0	-4.0	145.0	332.0	72.0	-26.0	-7.0	-2.0	-1.0	-3.0	-58.0	-74.0
1989	-41.0	-18.0	-4.0	-46.0	-39.0	-118.0	-34.0	-3.0	-49.0	-50.0	-4.0	10.0
1990	4.0	4.0	4.0	-760.0	-446.0	20.0	3.0	1.0	1.0	23.0	-10.0	-36.0
1991	-19.0	-363.0	-480.0	1493.0	1032.0	396.0	321.0	71.0	22.0	4.0	138.0	192.0
AVG	18.8	38.8	23.4	172.1	124.9	-10.3	-3.9	19.1	2.2	-15.3	-4.9	6.4
MAX	197.0	504.0	348.0	1493.0	1032.0	396.0	321.0	228.0	51.0	45.0	138.0	192.0
MIN	-48.0	-363.0	-480.0	-760.0	-446.0	-412.0	-228.0	-37.0	-49.0	-241.0	-136.0	-90.0

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action)
Martinez

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	1.1	1.5	0.6	0.4	0.6	0.2	0.1	0.1	0.0	-1.1	-0.6	0.3
1977	0.2	-0.9	-1.3	-1.1	-0.8	-0.3	-0.1	0.0	0.0	0.0	0.1	0.1
1978	0.0	0.6	1.6	5.0	11.4	0.9	-1.3	1.1	0.4	0.0	0.0	-0.1
1979	-0.1	0.0	0.1	1.0	1.4	-6.4	-1.7	-0.3	0.1	0.2	0.1	0.0
1980	0.0	0.1	1.1	2.8	0.0	0.3	0.0	0.0	-0.2	-0.1	0.0	-0.1
1981	-0.1	-0.1	0.0	1.5	1.6	-4.9	-2.0	1.5	0.3	-0.2	-0.2	-0.4
1982	-0.2	3.7	8.4	1.6	0.9	-3.0	-0.5	0.0	0.0	0.0	0.0	0.4
1983	1.1	1.8	1.5	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4
1984	0.9	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.1	1.2	1.9	0.7	0.2	0.8	0.6	-0.2	-0.3	-0.1	-0.1	-0.1
1986	-0.1	0.0	0.7	1.7	2.4	0.0	-0.1	0.0	0.1	0.3	0.2	0.1
1987	0.0	0.0	-0.5	3.8	6.0	1.9	-0.1	-0.1	0.1	0.0	-0.1	-0.1
1988	0.0	0.0	0.7	2.3	0.5	-0.2	0.0	0.0	0.0	0.0	-0.3	-0.3
1989	-0.2	-0.1	0.0	-0.2	-0.2	-1.5	-0.4	0.0	-0.3	-0.3	0.0	0.0
1990	0.0	0.0	0.0	-4.2	-3.0	0.1	0.0	0.0	0.0	0.1	0.0	-0.2
1991	-0.1	-1.5	-2.1	7.6	5.7	3.5	2.6	0.4	0.1	0.0	0.6	0.8
AVG	0.2	0.5	0.8	1.5	1.7	-0.5	-0.2	0.2	0.0	-0.1	0.0	0.0
MAX	1.1	3.7	8.4	7.6	11.4	3.5	2.6	1.5	0.4	0.3	0.6	0.8
MIN	-0.2	-1.5	-2.1	-4.2	-3.0	-6.4	-2.0	-0.3	-0.3	-1.1	-0.6	-0.4

Table A-1. Differences and Percent Differences between Future No Action and Intertie Alternative EC at Martinez (2030 LOD)

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action)
Collinsville

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	161.0	291.0	98.0	77.0	77.0	15.0	12.0	3.0	-44.0	-604.0	-57.0	227.0
1977	98.0	-598.0	-621.0	-171.0	-43.0	-23.0	-15.0	31.0	-5.0	-3.0	23.0	-45.0
1978	-15.0	289.0	381.0	18.0	1.0	1.0	1.0	7.0	7.0	-1.0	15.0	-43.0
1979	-52.0	27.0	80.0	96.0	7.0	-3.0	-12.0	-6.0	7.0	28.0	5.0	6.0
1980	4.0	23.0	91.0	2.0	0.0	0.0	0.0	0.0	-5.0	-7.0	3.0	-56.0
1981	-52.0	-13.0	-9.0	96.0	17.0	-13.0	-38.0	149.0	51.0	-24.0	-112.0	-152.0
1982	-118.0	61.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	-2.0	23.0
1983	12.0	1.0	0.0	-1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	2.0
1984	27.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	-6.0	-59.0
1985	45.0	26.0	39.0	52.0	13.0	67.0	47.0	-17.0	-40.0	-5.0	-38.0	-46.0
1986	-69.0	-30.0	167.0	107.0	1.0	0.0	0.0	0.0	4.0	30.0	17.0	9.0
1987	16.0	7.0	-268.0	862.0	295.0	20.0	-24.0	14.0	15.0	3.0	-32.0	-18.0
1988	1.0	18.0	151.0	64.0	1.0	-18.0	-4.0	0.0	-3.0	-29.0	-83.0	-125.0
1989	-63.0	-11.0	6.0	-24.0	-14.0	-8.0	-1.0	-1.0	-44.0	-50.0	8.0	15.0
1990	-7.0	62.0	-64.0	-377.0	-73.0	27.0	2.0	1.0	0.0	66.0	-27.0	-78.0
1991	-29.0	-753.0	-831.0	1679.0	280.0	-89.0	60.0	45.0	20.0	-12.0	203.0	421.0
AVG	-2.6	-37.4	-48.8	155.0	35.1	-1.4	1.8	14.1	-2.3	-37.9	-5.1	5.1
MAX	161.0	291.0	381.0	1679.0	295.0	67.0	60.0	149.0	51.0	66.0	203.0	421.0
MIN	-118.0	-753.0	-831.0	-377.0	-73.0	-89.0	-38.0	-17.0	-44.0	-604.0	-112.0	-152.0

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action)
Collinsville

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	5.0	6.7	1.8	1.6	2.2	0.7	0.4	0.1	-0.6	-7.9	-0.7	2.4
1977	0.9	-6.6	-6.9	-3.4	-1.3	-0.6	-0.4	0.5	-0.1	0.0	0.3	-0.5
1978	-0.2	3.3	7.5	5.2	0.5	0.5	0.5	2.6	1.0	-0.1	0.3	-0.7
1979	-0.6	0.3	1.1	3.4	2.3	-1.4	-2.4	-0.9	0.5	1.2	0.1	0.1
1980	0.0	0.3	3.6	0.9	0.0	0.0	0.0	0.0	-0.6	-0.4	0.1	-0.8
1981	-0.6	-0.2	-0.1	4.4	3.7	-4.9	-4.3	7.8	1.6	-0.6	-2.0	-2.0
1982	-1.3	4.9	0.0	0.0	0.0	0.5	0.6	0.0	0.0	0.0	0.0	1.3
1983	2.9	0.5	0.0	-0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.7
1984	3.5	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-0.2	-0.9
1985	0.6	2.2	6.1	2.1	0.5	3.9	2.2	-1.0	-1.5	-0.1	-0.8	-0.7
1986	-1.0	-0.4	3.4	6.1	0.5	0.0	0.0	0.0	0.3	1.5	0.4	0.1
1987	0.2	0.1	-3.2	23.3	22.7	4.0	-1.3	0.5	0.5	0.1	-0.5	-0.2
1988	0.0	0.2	2.9	6.6	0.1	-0.6	-0.1	0.0	-0.1	-0.5	-1.1	-1.3
1989	-0.6	-0.1	0.1	-0.8	-0.4	-1.6	-0.3	-0.1	-1.6	-1.4	0.1	0.2
1990	-0.1	0.7	-0.8	-14.3	-5.4	1.2	0.1	0.0	0.0	0.9	-0.3	-0.9
1991	-0.3	-8.0	-8.6	46.2	7.8	-9.9	5.3	1.1	0.3	-0.2	2.7	4.8
AVG	0.5	0.3	0.4	5.1	2.1	-0.5	0.0	0.7	0.0	-0.5	-0.1	0.1
MAX	5.0	6.7	7.5	46.2	22.7	4.0	5.3	7.8	1.6	1.5	2.7	4.8
MIN	-1.3	-8.0	-8.6	-14.3	-5.4	-9.9	-4.3	-1.0	-1.6	-7.9	-2.0	-2.0

Table A-2. Differences and Percent Differences between Future No Action and Intertie Alternative EC at Collinsville (2030 LOD)

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action) Emmaton												
WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	36.6	82.6	36.5	16.7	19.9	2.9	3.3	-0.5	-103.0	-360.0	69.7	152.2
1977	66.1	-405.1	-421.2	-37.0	8.9	-3.6	-3.6	65.8	4.3	6.1	16.6	-178.8
1978	-106.3	124.8	113.5	4.4	0.6	0.4	0.4	0.4	0.4	-0.2	10.8	-26.1
1979	-31.1	16.0	48.3	16.7	0.2	0.7	0.2	-0.6	1.2	5.7	-4.7	6.8
1980	6.6	7.8	17.9	0.3	0.2	0.0	0.0	0.0	-0.5	-1.8	1.8	-31.2
1981	-27.9	-4.8	-4.0	15.7	2.8	-0.3	-3.6	27.5	12.5	-5.0	-51.6	-79.3
1982	-75.7	11.8	0.2	0.0	-0.1	0.2	0.1	0.0	-0.1	-0.1	-1.5	3.0
1983	0.5	0.0	-0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
1984	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-3.7	-49.4
1985	34.7	7.1	3.3	10.8	3.2	11.2	8.0	-2.0	-9.2	-1.5	-13.9	-18.0
1986	-45.1	-12.1	45.7	23.1	0.1	0.1	0.0	0.0	0.6	6.1	0.7	5.3
1987	6.5	-1.4	-119.0	206.0	37.9	2.5	-5.4	4.9	3.3	0.2	-22.1	-16.2
1988	2.2	39.2	34.9	11.0	0.5	-3.6	-0.9	0.7	-7.0	-29.1	5.3	-58.7
1989	-36.8	-4.3	3.9	-4.4	-2.5	-0.2	-0.1	0.0	-11.1	-13.0	7.7	5.2
1990	-4.5	78.9	-66.2	-59.4	-8.2	4.8	0.6	0.3	-0.1	49.4	-6.0	-46.4
1991	-19.7	-192.9	-475.2	549.0	22.7	-16.5	7.1	12.6	8.2	-11.1	-23.4	333.8
AVG	-12.0	-15.8	-48.8	47.1	5.4	-0.1	0.4	6.8	-6.3	-22.1	-0.9	0.1
MAX	66.1	124.8	113.5	549.0	37.9	11.2	8.0	65.8	12.5	49.4	69.7	333.8
MIN	-106.3	-405.1	-475.2	-59.4	-8.2	-16.5	-5.4	-2.0	-103.0	-360.0	-51.6	-178.8

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action) Emmaton												
WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	6.2	9.8	3.0	1.7	3.0	0.8	0.5	0.0	-4.1	-15.7	2.6	4.2
1977	1.5	-14.8	-13.9	-3.4	1.3	-0.5	-0.4	3.3	0.2	0.3	0.6	-5.3
1978	-2.4	3.8	10.4	2.0	0.3	0.2	0.2	0.2	0.2	-0.1	1.0	-1.5
1979	-1.3	0.7	2.4	2.7	0.1	0.4	0.1	-0.3	0.4	1.3	-0.4	0.3
1980	0.2	0.4	3.2	0.2	0.1	0.0	0.0	0.0	-0.2	-0.4	0.2	-1.7
1981	-1.1	-0.2	-0.2	3.2	1.3	-0.2	-1.5	7.1	2.0	-0.6	-3.7	-3.2
1982	-2.5	3.5	0.1	0.0	-0.1	0.1	0.1	0.0	-0.1	0.0	-0.1	0.8
1983	0.3	0.0	-0.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
1984	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-2.4
1985	1.6	2.3	1.6	2.4	0.7	3.3	2.0	-0.6	-1.8	-0.2	-1.3	-1.1
1986	-2.1	-0.6	4.1	5.8	0.1	0.1	0.0	0.0	0.2	1.6	0.1	0.3
1987	0.3	-0.1	-4.8	25.8	13.5	1.2	-1.3	1.0	0.6	0.0	-1.1	-0.5
1988	0.1	1.4	3.2	3.7	0.2	-0.6	-0.1	0.1	-0.8	-1.8	0.2	-1.7
1989	-0.9	-0.2	0.2	-0.7	-0.3	-0.1	-0.1	0.0	-2.2	-1.9	0.5	0.3
1990	-0.2	3.0	-2.8	-10.7	-2.8	1.1	0.1	0.0	0.0	2.2	-0.2	-1.4
1991	-0.5	-6.1	-14.1	59.6	2.9	-6.1	2.5	1.2	0.3	-0.4	-0.9	10.6
AVG	0.0	0.2	-0.5	5.8	1.3	0.0	0.1	0.7	-0.3	-1.0	-0.2	-0.1
MAX	6.2	9.8	10.4	59.6	13.5	3.3	2.5	7.1	2.0	2.2	2.6	10.6
MIN	-2.5	-14.8	-14.1	-10.7	-2.8	-6.1	-1.5	-0.6	-4.1	-15.7	-3.7	-5.3

Table A-3. Differences and Percent Differences between Future No Action and Intertie Alternative EC at Emmaton (2030 LOD)

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action) Rio Vista												
WY	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
1976	2.8	8.0	5.8	1.1	1.9	0.3	0.3	-0.3	-42.6	-55.2	35.8	36.5
1977	17.0	-69.1	-90.2	-1.6	2.7	0.2	-0.2	27.1	4.5	3.0	4.9	-92.3
1978	-89.5	9.8	12.0	0.1	0.4	0.0	0.0	0.0	0.0	0.0	0.9	-4.1
1979	-4.7	2.6	8.3	0.7	-0.4	0.1	0.1	-0.1	0.1	0.4	-0.4	2.2
1980	1.5	0.9	1.3	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.2	-4.3
1981	-4.1	-0.3	-0.3	1.4	0.1	0.0	-0.1	1.2	1.5	0.6	-6.0	-11.6
1982	-13.9	0.6	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	0.2
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-8.2
1985	6.0	0.1	0.2	1.0	0.4	1.1	0.5	0.0	-0.6	-0.1	-1.4	-2.0
1986	-7.8	-1.1	5.2	1.7	0.1	0.0	0.0	0.0	0.0	0.4	0.1	1.4
1987	0.9	-0.6	-17.5	23.0	1.9	0.1	-0.1	0.4	0.2	0.2	-4.3	-4.9
1988	0.4	11.2	2.9	0.3	0.3	-0.1	-0.1	0.1	-1.2	-6.0	11.7	-6.2
1989	-8.2	-0.8	0.7	-0.6	-0.1	-0.1	0.0	0.0	-0.7	-1.2	1.2	0.5
1990	-0.7	18.7	-13.8	-5.9	-0.6	0.2	0.1	0.1	-0.1	9.4	0.8	-9.9
1991	-5.1	12.2	-104.1	80.3	0.0	-1.0	0.4	1.3	1.3	-3.1	-36.8	95.0
AVG	-6.6	-0.5	-11.8	6.3	0.4	0.1	0.1	1.9	-2.4	-3.2	0.4	-0.5
MAX	17.0	18.7	12.0	80.3	2.7	1.1	0.5	27.1	4.5	9.4	35.8	95.0
MIN	-89.5	-69.1	-104.1	-5.9	-0.6	-1.0	-0.2	-0.3	-42.6	-55.2	-36.8	-92.3

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action) Rio Vista												
WY	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
1976	1.4	3.7	2.1	0.4	0.9	0.2	0.1	-0.1	-8.2	-13.8	7.5	5.3
1977	2.0	-15.2	-16.4	-0.6	1.2	0.1	-0.1	6.7	1.1	0.7	0.9	-12.9
1978	-7.9	1.3	4.7	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.4	-1.3
1979	-1.2	0.6	2.2	0.3	-0.2	0.1	0.1	-0.1	0.1	0.2	-0.2	0.5
1980	0.3	0.2	0.6	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1	-1.3
1981	-1.0	-0.1	-0.1	0.7	0.1	0.0	-0.1	0.6	0.7	0.3	-2.1	-2.7
1982	-2.8	0.3	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-2.2
1985	1.6	0.1	0.1	0.5	0.2	0.6	0.3	0.0	-0.3	0.0	-0.5	-0.6
1986	-2.0	-0.3	1.9	0.8	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.4
1987	0.2	-0.1	-3.9	9.3	1.0	0.1	0.0	0.2	0.1	0.1	-1.1	-0.8
1988	0.1	2.3	1.2	0.2	0.1	0.0	0.0	0.0	-0.5	-1.8	2.4	-0.9
1989	-1.0	-0.2	0.2	-0.3	0.0	-0.1	0.0	0.0	-0.4	-0.5	0.4	0.1
1990	-0.2	4.1	-3.3	-2.7	-0.3	0.1	0.0	0.0	0.0	2.4	0.2	-1.5
1991	-0.7	2.1	-16.0	29.7	0.0	-0.5	0.2	0.5	0.3	-0.7	-7.3	16.4
AVG	-0.7	-0.1	-1.7	2.4	0.2	0.0	0.0	0.5	-0.4	-0.8	0.0	-0.1
MAX	2.0	4.1	4.7	29.7	1.2	0.6	0.3	6.7	1.1	2.4	7.5	16.4
MIN	-7.9	-15.2	-16.4	-2.7	-0.3	-0.5	-0.1	-0.1	-8.2	-13.8	-7.3	-12.9

Table A-4. Differences and Percent Differences between Future No Action and Intertie Alternative EC at Rio Vista (2030 LOD)

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action) Antioch												
WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	126.2	255.9	81.0	69.8	71.2	13.5	5.7	1.2	100.4	-188.7	-76.3	197.6
1977	93.8	-127.5	-114.9	-50.1	-74.2	-16.3	-6.1	-45.8	-9.4	-16.0	12.4	212.6
1978	109.0	267.9	375.2	70.4	1.1	3.7	3.0	2.0	0.6	-0.8	-13.5	-3.2
1979	19.5	41.8	15.1	87.3	13.7	2.1	0.7	-0.8	2.2	14.3	29.9	6.5
1980	-14.0	23.5	91.4	6.9	2.1	-0.6	-0.2	0.0	-0.7	0.8	0.2	-18.8
1981	-20.7	-4.3	-6.2	67.1	16.7	-4.1	-10.6	85.0	93.7	-3.7	-33.3	-90.2
1982	-62.6	26.7	3.6	-0.2	-0.8	1.8	1.4	0.0	0.0	0.0	2.0	13.8
1983	2.4	0.0	-0.9	-0.7	1.2	0.2	0.0	0.0	0.0	0.0	0.1	0.6
1984	10.3	1.0	0.5	-0.1	0.0	0.0	0.0	-0.1	0.0	0.4	9.6	37.4
1985	30.0	32.6	21.0	34.9	11.2	15.1	20.6	-8.6	-25.0	-0.4	-11.8	-30.5
1986	-19.3	-21.4	152.3	106.8	3.4	0.3	-0.1	0.0	0.9	8.1	27.3	11.9
1987	20.5	25.9	-297.4	253.4	207.7	18.1	-10.2	5.5	8.6	5.5	-9.0	5.8
1988	7.3	-57.3	132.6	57.2	2.9	-7.3	-2.3	0.1	15.4	25.8	-169.2	-143.9
1989	-54.9	-3.9	7.3	-8.7	-6.2	2.6	-0.5	0.0	-18.6	-26.2	0.3	13.1
1990	-4.6	-82.8	56.0	-146.4	-26.5	18.7	1.8	0.4	-0.4	12.7	-67.5	-73.0
1991	-21.7	-995.1	-713.7	453.1	-45.5	-154.1	15.4	19.5	12.1	-4.2	390.6	187.2
AVG	13.8	-38.6	-12.3	62.5	11.1	-6.6	1.2	3.7	11.2	-10.8	5.7	20.4
MAX	126.2	267.9	375.2	453.1	207.7	18.7	20.6	85.0	100.4	25.8	390.6	212.6
MIN	-62.6	-995.1	-713.7	-146.4	-74.2	-154.1	-10.6	-45.8	-25.0	-188.7	-169.2	-143.9

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action) Antioch												
WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	8.8	11.5	2.4	2.7	3.6	1.1	0.5	0.1	3.0	-4.4	-1.9	3.9
1977	1.6	-2.6	-2.3	-1.8	-5.9	-1.4	-0.4	-1.8	-0.3	-0.5	0.4	5.0
1978	2.2	6.5	11.5	10.3	0.5	1.6	1.3	0.9	0.2	-0.1	-0.6	-0.1
1979	0.4	0.8	0.3	4.4	4.0	0.9	0.3	-0.3	0.4	1.1	1.1	0.1
1980	-0.3	0.5	4.7	2.4	0.8	-0.3	-0.1	0.0	-0.2	0.1	0.0	-0.5
1981	-0.5	-0.1	-0.1	3.6	4.5	-1.8	-3.1	14.4	6.5	-0.2	-1.0	-1.9
1982	-1.1	1.6	1.6	-0.1	-0.4	0.8	0.7	0.0	0.0	0.0	0.1	1.6
1983	1.1	0.0	-0.4	-0.3	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.3
1984	3.4	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.9
1985	0.6	2.2	5.8	2.8	0.8	2.0	2.7	-1.5	-2.1	0.0	-0.4	-0.8
1986	-0.5	-0.5	4.7	9.1	1.2	0.1	0.0	0.0	0.3	1.0	1.2	0.3
1987	0.4	0.6	-5.7	12.2	27.9	5.2	-1.8	0.6	0.6	0.2	-0.2	0.1
1988	0.1	-1.1	4.0	6.6	0.6	-0.7	-0.1	0.0	1.0	1.0	-4.4	-2.9
1989	-0.9	-0.1	0.1	-0.5	-0.5	0.5	-0.2	0.0	-1.6	-1.2	0.0	0.3
1990	-0.1	-1.7	1.1	-8.7	-4.8	2.0	0.1	0.0	0.0	0.3	-1.7	-1.5
1991	-0.4	-20.2	-14.0	28.6	-3.1	-16.1	3.8	1.3	0.4	-0.1	11.8	4.0
AVG	0.9	-0.1	0.9	4.5	1.9	-0.4	0.2	0.9	0.5	-0.2	0.3	0.6
MAX	8.8	11.5	11.5	28.6	27.9	5.2	3.8	14.4	6.5	1.1	11.8	5.0
MIN	-1.1	-20.2	-14.0	-8.7	-5.9	-16.1	-3.1	-1.8	-2.1	-4.4	-4.4	-2.9

Table A-5. Differences and Percent Differences between Future No Action and Intertie Alternative EC at Antioch (2030 LOD)

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action)
Jersey Point

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	62.5	157.1	49.1	39.9	43.6	8.5	2.7	0.4	36.1	-56.4	-24.2	133.4
1977	65.3	-49.1	-4.0	-0.6	-25.6	-3.1	-1.5	-2.8	0.7	-5.8	7.8	85.1
1978	13.4	120.0	269.5	52.2	0.9	4.1	2.9	0.8	-0.2	-0.2	-15.5	-2.0
1979	15.5	34.6	-11.6	51.7	6.8	3.2	2.4	-0.2	0.7	5.2	26.4	8.9
1980	-13.3	18.8	71.3	4.8	2.1	-0.3	-0.1	0.0	0.1	0.3	-0.8	-2.4
1981	-6.8	-1.9	-3.3	55.2	14.4	-2.1	-2.4	26.7	53.1	17.2	-0.6	-41.5
1982	-32.9	51.7	3.3	-0.2	-0.9	2.0	1.1	0.0	0.0	-0.1	1.9	4.8
1983	0.2	-0.2	-0.9	-0.7	0.7	0.3	0.0	0.0	0.0	0.0	-0.1	0.1
1984	2.3	0.0	0.5	-0.1	0.0	0.0	0.0	0.0	0.1	0.1	11.6	48.8
1985	19.5	43.6	12.0	21.0	8.2	3.4	7.0	-2.6	-11.1	2.8	3.2	-14.1
1986	-2.9	-9.0	121.3	81.5	2.4	0.3	-0.1	0.0	0.0	1.2	19.5	10.7
1987	13.7	20.4	-223.2	48.0	100.8	12.2	-1.7	2.3	3.7	5.0	-3.2	3.8
1988	5.4	-40.7	101.7	59.4	4.9	-1.3	-0.9	0.1	5.8	16.7	-88.4	-86.0
1989	-36.4	-3.2	5.1	-3.5	-2.5	5.0	0.1	0.0	-6.5	-7.2	-0.5	8.2
1990	-2.3	-69.2	84.0	-44.3	-11.8	7.2	1.2	0.2	-0.2	1.9	-39.3	-45.7
1991	-13.6	-477.9	-460.3	161.1	-41.0	-51.7	4.0	7.3	6.4	-3.0	167.7	117.1
AVG	5.6	-12.8	0.9	32.8	6.4	-0.8	0.9	2.0	5.5	-1.4	4.1	14.3
MAX	65.3	157.1	269.5	161.1	100.8	12.2	7.0	26.7	53.1	17.2	167.7	133.4
MIN	-36.4	-477.9	-460.3	-44.3	-41.0	-51.7	-2.4	-2.8	-11.1	-56.4	-88.4	-86.0

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action)
Jersey Point

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	10.5	15.6	2.6	2.9	4.4	1.3	0.5	0.1	2.4	-2.7	-1.3	5.3
1977	2.2	-2.1	-0.2	0.0	-4.4	-0.6	-0.3	-0.3	0.1	-0.4	0.5	4.2
1978	0.5	5.6	14.5	10.3	0.4	1.7	1.2	0.4	-0.1	-0.1	-1.4	-0.1
1979	0.7	1.2	-0.4	4.5	2.2	1.4	1.1	-0.1	0.3	0.8	2.1	0.4
1980	-0.5	0.7	6.0	1.8	0.8	-0.1	0.0	0.0	0.0	0.1	-0.1	-0.1
1981	-0.3	-0.1	-0.1	4.4	4.5	-1.0	-1.1	8.7	8.6	1.3	0.0	-1.8
1982	-1.1	4.3	1.6	-0.1	-0.4	0.9	0.6	0.0	0.0	0.0	0.2	1.1
1983	0.1	-0.1	-0.4	-0.3	0.3	0.1	0.0	0.0	0.0	0.0	-0.1	0.1
1984	1.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	2.5
1985	0.8	4.3	4.4	3.1	1.0	0.9	1.9	-0.9	-2.1	0.2	0.2	-0.7
1986	-0.1	-0.4	6.3	10.8	0.9	0.1	0.0	0.0	0.0	0.3	1.9	0.5
1987	0.6	0.9	-7.9	4.1	21.4	4.6	-0.6	0.6	0.6	0.4	-0.2	0.2
1988	0.2	-1.7	5.3	8.1	1.6	-0.3	-0.1	0.0	1.0	1.5	-5.0	-3.5
1989	-1.2	-0.1	0.2	-0.3	-0.5	1.3	0.0	0.0	-1.3	-0.6	0.0	0.4
1990	-0.1	-2.9	2.9	-4.5	-3.6	1.7	0.2	0.0	0.0	0.1	-2.1	-2.0
1991	-0.5	-20.0	-18.1	17.9	-6.2	-8.9	1.6	1.1	0.4	-0.2	10.9	5.3
AVG	0.8	0.3	1.1	3.9	1.4	0.2	0.3	0.6	0.6	0.1	0.4	0.7
MAX	10.5	15.6	14.5	17.9	21.4	4.6	1.9	8.7	8.6	1.5	10.9	5.3
MIN	-1.2	-20.0	-18.1	-4.5	-6.2	-8.9	-1.1	-0.9	-2.1	-2.7	-5.0	-3.5

Table A-6. Differences and Percent Differences between Future No Action and Intertie Alternative EC at Jersey Point (2030 LOD)

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action) Rock Slough												
WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	11.9	32.7	39.7	-3.0	21.4	6.5	1.5	0.6	1.5	-23.7	-31.6	60.0
1977	35.1	-31.4	-49.9	5.7	5.2	7.0	2.0	3.4	6.2	0.3	0.9	13.4
1978	2.5	9.6	100.4	43.0	-4.1	11.3	4.8	-3.7	-0.4	0.1	-3.4	-16.8
1979	-15.6	-2.0	4.7	-0.6	1.5	9.3	3.7	0.0	0.0	0.8	5.7	7.5
1980	-1.2	2.8	22.6	4.1	-31.4	-15.8	-0.5	0.0	0.5	-0.5	-0.5	-0.4
1981	-4.5	-0.9	-1.7	17.2	12.0	2.9	0.9	-1.9	10.2	7.0	9.9	-16.7
1982	-14.7	20.5	3.2	-2.1	-5.2	14.2	4.4	0.0	-0.1	-0.1	0.2	0.6
1983	-0.2	-0.6	-13.9	5.0	-2.1	0.2	0.5	0.2	0.1	0.0	-0.3	-0.2
1984	-0.5	-2.9	-4.1	-2.2	0.0	0.1	0.0	0.0	0.0	0.0	2.8	11.6
1985	9.3	17.0	3.8	6.7	5.6	3.0	2.8	1.3	-1.6	0.8	3.9	-2.6
1986	-4.2	-4.0	34.5	44.3	1.4	-7.3	-1.2	-0.3	-0.2	0.3	3.5	5.9
1987	3.3	5.1	-53.7	-26.5	35.7	9.0	3.2	1.4	1.0	1.5	0.0	-2.8
1988	2.3	-3.8	26.8	47.9	9.4	2.4	0.0	0.1	-1.3	1.7	-11.5	-32.4
1989	-17.9	-6.1	1.9	-0.8	-1.0	-0.1	0.1	0.0	-0.9	-0.3	1.2	2.6
1990	-0.2	-8.1	14.6	20.1	-15.3	-2.1	0.5	0.1	0.0	1.9	-2.0	-17.1
1991	-9.0	-66.5	-188.7	-85.3	99.4	-21.5	0.9	1.1	2.9	-0.6	14.7	53.1
AVG	-0.2	-2.4	-3.7	4.6	8.3	1.2	1.5	0.1	1.1	-0.7	-0.4	4.1
MAX	35.1	32.7	100.4	47.9	99.4	14.2	4.8	3.4	10.2	7.0	14.7	60.0
MIN	-17.9	-66.5	-188.7	-85.3	-31.4	-21.5	-1.2	-3.7	-1.6	-23.7	-31.6	-32.4

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action) Rock Slough												
WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	4.4	10.4	6.3	-0.4	4.3	1.7	0.5	0.2	0.3	-3.2	-4.3	7.0
1977	3.0	-3.1	-5.5	0.7	1.2	1.7	0.5	0.7	1.0	0.1	0.1	1.8
1978	0.2	0.9	13.0	8.7	-1.5	3.5	1.4	-1.3	-0.2	0.0	-1.0	-2.6
1979	-2.0	-0.2	0.5	-0.1	0.4	3.4	1.4	0.0	0.0	0.3	1.4	1.0
1980	-0.1	0.3	3.3	1.2	-7.6	-4.4	-0.2	0.0	0.2	-0.2	-0.2	-0.1
1981	-0.6	-0.1	-0.2	2.2	3.9	1.3	0.4	-0.6	3.6	1.6	1.8	-2.2
1982	-1.5	3.0	1.4	-0.8	-1.8	4.8	2.1	0.0	0.0	0.0	0.1	0.2
1983	-0.1	-0.3	-4.5	1.2	-0.7	0.1	0.2	0.1	0.0	0.0	-0.1	-0.1
1984	-0.3	-1.4	-1.6	-0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.9	1.9
1985	1.3	3.0	1.6	2.4	1.3	0.9	1.0	0.4	-0.6	0.2	0.6	-0.4
1986	-0.6	-0.5	3.9	8.7	0.3	-2.3	-0.4	-0.1	-0.1	0.1	1.1	1.0
1987	0.5	0.7	-5.5	-3.4	9.9	3.4	1.2	0.4	0.4	0.4	0.0	-0.4
1988	0.2	-0.4	3.2	8.4	3.0	0.8	0.0	0.0	-0.4	0.5	-1.9	-3.7
1989	-1.6	-0.6	0.2	-0.1	-0.3	0.0	0.0	0.0	-0.4	-0.1	0.2	0.3
1990	0.0	-1.0	1.4	2.6	-4.8	-0.8	0.2	0.0	0.0	0.3	-0.3	-2.1
1991	-0.8	-6.5	-20.0	-9.6	25.7	-6.0	0.4	0.4	0.5	-0.1	2.2	7.1
AVG	0.1	0.3	-0.1	1.3	2.1	0.5	0.5	0.0	0.3	0.0	0.0	0.6
MAX	4.4	10.4	13.0	8.7	25.7	4.8	2.1	0.7	3.6	1.6	2.2	7.1
MIN	-2.0	-6.5	-20.0	-9.6	-7.6	-6.0	-0.4	-1.3	-0.6	-3.2	-4.3	-3.7

Table A-7. Differences and Percent Differences between Future No Action and Intertie Alternative EC at Old River near Rock Slough (2030 LOD)

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action) SJR Brandt Bridge												
WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	-0.5	0.0	0.0	0.0	0.0	0.0	0.2	-0.1	0.0	0.0
1978	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.1	0.1
1986	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	-0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.4	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.8	-0.5	0.0
1990	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.6	0.0
1991	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.0
AVG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
MAX	0.0	0.0	0.0	0.1	0.1	0.2	0.1	0.2	0.2	1.6	0.6	0.1
MIN	0.0	0.0	-0.5	0.0	-0.1	0.0	0.0	0.0	0.0	-3.8	-0.5	0.0

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action) SJR Brandt Bridge												
WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	-0.1	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AVG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MAX	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0
MIN	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	-0.1	0.0

Table A-8. Differences and Percent Differences between Future No Action and Intertie Alternative EC at Brandt Bridge, San Joaquin River (2030 LOD)

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action) Clifton Court												
WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	5.9	13.3	29.7	-4.8	11.2	6.3	1.3	0.7	7.1	-10.2	-27.0	23.7
1977	32.2	-8.6	-44.6	5.1	12.7	18.8	14.0	27.1	23.2	9.6	3.6	8.6
1978	39.9	47.1	51.8	40.5	-11.0	12.1	-0.8	-1.9	-0.7	0.1	-1.2	-8.5
1979	-7.1	-4.1	4.4	-6.4	-0.8	3.6	4.1	0.8	0.1	0.6	2.7	5.2
1980	0.2	0.3	11.0	5.3	-1.0	-0.2	-1.1	-0.2	0.3	-0.5	-0.5	-0.3
1981	-2.5	-0.6	-2.3	6.1	10.7	18.4	11.8	-3.6	-2.3	3.4	9.5	-8.3
1982	-7.8	8.8	1.6	-5.8	0.1	-5.9	-0.2	-0.2	0.0	-0.1	-0.1	0.3
1983	-0.3	0.2	2.0	0.4	2.8	0.3	0.0	0.0	0.0	0.0	-0.3	-0.3
1984	-0.7	1.7	0.4	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.6	6.8
1985	6.1	8.8	0.4	2.3	4.5	3.8	3.8	3.2	0.1	0.1	2.6	-0.9
1986	-2.7	-2.8	13.6	32.1	5.0	1.5	-0.3	-0.1	-0.1	1.1	1.5	3.5
1987	1.9	2.7	-20.3	-23.1	28.7	7.7	3.8	2.9	0.7	1.0	0.7	-1.2
1988	1.0	0.5	9.3	38.2	9.2	5.7	1.5	0.7	-0.6	-14.1	-2.2	-19.2
1989	-15.3	-6.8	0.3	0.0	-1.1	-3.8	-1.4	-0.4	-1.1	-0.4	1.0	1.5
1990	0.3	-2.1	1.4	35.3	-17.5	-12.1	-2.8	-0.9	-0.2	-2.6	1.7	-7.2
1991	-31.0	-18.6	-70.2	-124.4	63.5	1.8	-10.9	-3.6	-2.4	2.7	-9.3	14.3
AVG	1.2	2.5	-0.7	0.1	7.3	3.6	1.4	1.5	1.5	-0.6	-1.0	1.1
MAX	39.9	47.1	51.8	40.5	63.5	18.8	14.0	27.1	23.2	9.6	9.5	23.7
MIN	-31.0	-18.6	-70.2	-124.4	-17.5	-12.1	-10.9	-3.6	-2.4	-14.1	-27.0	-19.2

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action) Clifton Court												
WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	2.0	4.2	6.2	-0.7	2.1	1.4	0.3	0.1	1.4	-1.7	-4.5	3.8
1977	4.1	-1.0	-6.3	0.7	2.1	3.1	2.3	4.7	4.1	1.8	0.7	1.5
1978	6.1	6.1	8.1	6.7	-2.3	2.5	-0.2	-0.7	-0.2	0.0	-0.4	-1.8
1979	-1.2	-0.6	0.6	-0.9	-0.2	1.1	1.3	0.2	0.0	0.2	0.8	1.0
1980	0.0	0.0	1.8	1.4	-0.4	-0.1	-0.4	0.0	0.1	-0.2	-0.2	-0.1
1981	-0.4	-0.1	-0.3	0.8	2.7	5.6	3.5	-0.9	-0.7	0.9	2.1	-1.5
1982	-1.1	1.4	0.5	-1.5	0.0	-1.8	-0.1	-0.1	0.0	0.0	0.0	0.1
1983	-0.1	0.1	0.7	0.1	1.0	0.1	0.0	0.0	0.0	0.0	-0.1	-0.2
1984	-0.3	0.8	0.2	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.2	1.5
1985	1.1	1.7	0.1	0.7	1.0	0.8	0.9	0.7	0.0	0.0	0.5	-0.2
1986	-0.4	-0.5	1.9	6.1	1.1	0.6	-0.1	0.0	0.0	0.4	0.5	0.8
1987	0.3	0.5	-2.9	-3.1	6.0	1.8	0.9	0.7	0.2	0.3	0.2	-0.2
1988	0.1	0.1	1.4	6.7	1.8	1.0	0.3	0.1	-0.1	-3.5	-0.5	-3.3
1989	-2.0	-0.8	0.0	0.0	-0.2	-1.0	-0.5	-0.1	-0.3	-0.1	0.2	0.3
1990	0.0	-0.3	0.2	4.4	-3.6	-2.9	-0.7	-0.2	0.0	-0.5	0.3	-1.2
1991	-4.3	-2.3	-9.3	-15.4	10.1	0.4	-2.9	-0.9	-0.5	0.5	-1.6	2.5
AVG	0.2	0.6	0.2	0.4	1.3	0.8	0.3	0.2	0.2	-0.1	-0.1	0.2
MAX	6.1	6.1	8.1	6.7	10.1	5.6	3.5	4.7	4.1	1.8	2.1	3.8
MIN	-4.3	-2.3	-9.3	-15.4	-3.6	-2.9	-2.9	-0.9	-0.7	-3.5	-4.5	-3.3

Table A-9. Differences and Percent Differences between Future No Action and Intertie Alternative EC at Old River, State Highway 4 / Los Vaqueros Intake (2030 LOD)

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action) Los Vaqueros Intake												
WY	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
1976	8.5	21.8	34.7	-4.6	16.2	6.5	1.3	0.5	1.7	-15.6	-31.4	40.6
1977	29.5	-19.1	-37.6	4.8	22.3	16.0	5.8	9.6	5.6	1.5	0.5	19.4
1978	25.5	9.2	74.6	40.8	-6.7	12.4	-10.1	-10.6	-0.7	0.1	-2.0	-12.2
1979	-10.8	-3.2	4.6	-3.8	0.2	13.2	3.8	0.3	0.0	0.8	3.8	6.2
1980	-0.5	1.4	16.8	0.9	-25.4	-11.9	-1.4	-0.1	0.6	-0.6	-0.5	-0.4
1981	-3.4	-0.9	-1.5	11.5	11.0	9.0	5.4	-3.7	5.1	4.9	9.6	-12.4
1982	-11.1	14.6	2.7	-3.8	-8.1	34.8	2.2	-0.2	0.0	-0.1	0.2	0.3
1983	0.0	-0.7	-5.4	6.0	2.2	0.3	0.6	0.2	0.0	0.0	-0.6	-0.3
1984	-0.8	-4.7	-0.7	-1.5	-0.3	0.0	0.0	0.0	0.0	-0.3	1.6	8.7
1985	7.4	13.0	2.0	4.8	5.1	4.2	3.1	1.6	-0.6	0.6	3.2	-1.7
1986	-3.3	-3.3	23.6	38.0	-2.1	-2.1	-1.2	-0.5	-0.3	0.5	2.5	4.8
1987	2.7	3.7	-36.1	-25.7	31.8	9.0	4.3	1.8	0.8	1.2	0.6	-1.7
1988	1.6	-2.1	17.1	42.8	11.8	5.1	0.6	0.3	-3.0	-0.2	-10.8	-26.6
1989	-15.3	-6.0	1.1	-0.3	-0.7	-2.2	-0.5	-0.2	-0.9	-0.3	1.1	2.1
1990	0.0	-5.6	6.5	25.6	-18.8	-6.8	-0.4	-0.1	0.0	-0.1	-1.0	-12.0
1991	-8.2	-38.5	-126.6	-56.3	125.6	-10.6	-4.4	-0.3	1.9	0.1	12.4	28.7
AVG	1.4	-1.3	-1.5	4.9	10.3	4.8	0.6	-0.1	0.6	-0.5	-0.7	2.7
MAX	29.5	21.8	74.6	42.8	125.6	34.8	5.8	9.6	5.6	4.9	12.4	40.6
MIN	-15.3	-38.5	-126.6	-56.3	-25.4	-11.9	-10.1	-10.6	-3.0	-15.6	-31.4	-26.6

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action) Los Vaqueros Intake												
WY	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
1976	3.0	7.0	6.3	-0.7	3.1	1.5	0.3	0.1	0.3	-2.4	-4.9	5.6
1977	3.1	-2.1	-4.8	0.6	4.0	2.8	1.1	1.9	1.0	0.3	0.1	3.2
1978	3.2	1.0	10.6	7.2	-1.7	3.0	-2.8	-3.4	-0.2	0.0	-0.6	-2.2
1979	-1.6	-0.4	0.5	-0.5	0.0	4.3	1.2	0.1	0.0	0.3	1.0	1.0
1980	-0.1	0.2	2.6	0.2	-7.2	-3.2	-0.5	0.0	0.2	-0.2	-0.1	-0.1
1981	-0.5	-0.1	-0.2	1.5	3.0	3.2	1.7	-1.0	1.6	1.2	1.9	-1.9
1982	-1.3	2.2	1.0	-1.1	-2.3	9.3	1.2	-0.1	0.0	0.0	0.1	0.1
1983	0.0	-0.3	-1.5	1.7	0.7	0.1	0.3	0.1	0.0	0.0	-0.3	-0.1
1984	-0.3	-2.0	-0.3	-0.4	-0.1	0.0	0.0	0.0	0.0	-0.1	0.5	1.7
1985	1.2	2.4	0.7	1.6	1.1	1.0	0.8	0.4	-0.2	0.1	0.6	-0.3
1986	-0.5	-0.5	3.0	7.3	-0.4	-0.7	-0.4	-0.2	-0.1	0.2	0.8	0.9
1987	0.4	0.6	-4.4	-3.4	7.7	2.6	1.2	0.4	0.2	0.3	0.1	-0.3
1988	0.2	-0.3	2.3	7.4	2.8	1.1	0.1	0.1	-0.8	0.0	-2.1	-3.7
1989	-1.7	-0.7	0.1	0.0	-0.1	-0.7	-0.2	0.0	-0.3	-0.1	0.2	0.3
1990	0.0	-0.8	0.7	3.2	-4.5	-1.9	-0.1	0.0	0.0	0.0	-0.2	-1.8
1991	-0.9	-4.3	-15.5	-6.3	24.6	-2.6	-1.3	-0.1	0.4	0.0	2.1	4.5
AVG	0.3	0.1	0.1	1.1	1.9	1.2	0.2	-0.1	0.1	0.0	0.0	0.4
MAX	3.2	7.0	10.6	7.4	24.6	9.3	1.7	1.9	1.6	1.2	2.1	5.6
MIN	-1.7	-4.3	-15.5	-6.3	-7.2	-3.2	-2.8	-3.4	-0.8	-2.4	-4.9	-3.7

Table A-10. Differences and Percent Differences between Future No Action and Intertie Alternative EC at Clifton Court Forebay (2030 LOD)

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action)
Jones (DMC)

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	4.2	11.8	16.0	-4.5	7.0	10.3	1.0	0.4	-4.0	-11.9	-21.3	19.6
1977	9.5	-11.1	-22.8	2.0	49.6	10.5	6.9	8.5	5.3	2.2	0.4	0.5
1978	9.4	-2.6	37.5	18.4	-9.2	9.3	2.4	-0.2	-0.1	0.1	-1.3	-5.7
1979	-7.1	-1.8	4.2	-3.1	0.4	4.4	3.1	0.3	0.1	0.4	2.3	4.4
1980	0.4	1.2	4.1	-0.4	3.6	-0.1	-1.0	-0.1	0.1	-0.3	-0.6	-0.2
1981	-2.3	-0.5	2.2	4.9	-6.0	59.3	11.8	-1.9	0.7	3.0	7.4	-8.2
1982	-7.8	8.4	-11.5	-11.2	-1.4	7.8	0.2	-0.2	0.1	0.0	-0.1	0.2
1983	-0.2	-0.3	-0.3	-5.8	-0.5	0.5	2.7	0.2	0.3	0.2	-0.2	-0.3
1984	-1.1	-0.2	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	4.6
1985	5.9	7.6	-10.7	-9.0	3.1	4.1	3.4	1.7	1.8	-0.2	2.1	-1.0
1986	-2.8	-2.2	10.4	14.6	-1.7	1.2	1.3	0.0	-0.1	-0.3	0.2	2.7
1987	2.1	2.6	-15.9	-12.7	15.2	5.0	1.9	1.9	1.4	1.3	0.6	-1.4
1988	0.9	-0.5	6.3	22.5	8.1	2.8	0.9	0.3	-6.1	-0.9	2.9	-16.8
1989	-11.9	-5.0	0.4	0.0	-0.5	-14.8	-1.3	-0.2	-0.8	-1.1	0.7	1.3
1990	0.1	-2.2	1.2	21.6	-20.3	-7.9	-1.0	-0.2	0.0	-1.8	1.2	-6.8
1991	-5.4	-40.7	-66.1	-45.1	102.0	-54.0	-9.6	-1.4	-3.4	0.9	-12.6	15.0
AVG	-0.4	-2.2	-2.6	-0.5	9.3	2.4	1.4	0.6	-0.3	-0.5	-1.1	0.5
MAX	9.5	11.8	37.5	22.5	102.0	59.3	11.8	8.5	5.3	3.0	7.4	19.6
MIN	-11.9	-40.7	-66.1	-45.1	-20.3	-54.0	-9.6	-1.9	-6.1	-11.9	-21.3	-16.8

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action)
Jones (DMC)

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1976	1.4	3.5	2.9	-0.7	1.1	1.7	0.2	0.1	-0.7	-2.0	-3.6	3.2
1977	1.2	-1.4	-3.1	0.3	6.9	1.3	1.1	1.5	0.9	0.4	0.1	0.1
1978	1.4	-0.3	5.5	2.8	-1.6	1.7	0.8	-0.1	0.0	0.0	-0.4	-1.2
1979	-1.2	-0.3	0.6	-0.4	0.1	1.4	0.9	0.1	0.0	0.1	0.6	0.8
1980	0.1	0.2	0.6	-0.1	1.2	-0.1	-0.4	0.0	0.0	-0.1	-0.2	0.0
1981	-0.4	-0.1	0.3	0.7	-1.1	12.2	3.1	-0.5	0.2	0.8	1.6	-1.4
1982	-1.1	1.4	-2.6	-2.2	-0.5	2.5	0.1	-0.1	0.0	0.0	0.0	0.1
1983	-0.1	-0.2	-0.1	-1.6	-0.2	0.2	1.3	0.1	0.2	0.1	-0.1	-0.1
1984	-0.4	-0.1	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0
1985	1.1	1.5	-2.5	-2.0	0.5	0.7	0.8	0.4	0.5	0.0	0.4	-0.2
1986	-0.5	-0.4	1.5	2.4	-0.4	0.4	0.5	0.0	0.0	-0.1	0.0	0.6
1987	0.4	0.5	-2.3	-1.7	2.3	0.8	0.4	0.4	0.4	0.3	0.1	-0.2
1988	0.1	-0.1	0.9	3.5	1.1	0.4	0.2	0.1	-1.4	-0.2	0.6	-2.7
1989	-1.6	-0.6	0.0	0.0	-0.1	-2.9	-0.4	-0.1	-0.2	-0.3	0.1	0.2
1990	0.0	-0.3	0.1	2.7	-3.1	-1.4	-0.2	0.0	0.0	-0.3	0.2	-1.1
1991	-0.7	-5.1	-8.9	-5.2	14.5	-8.7	-2.4	-0.3	-0.7	0.1	-2.1	2.6
AVG	0.0	-0.1	-0.4	-0.1	1.3	0.6	0.4	0.1	-0.1	-0.1	-0.2	0.1
MAX	1.4	3.5	5.5	3.5	14.5	12.2	3.1	1.5	0.9	0.8	1.6	3.2
MIN	-1.6	-5.1	-8.9	-5.2	-3.1	-8.7	-2.4	-0.5	-1.4	-2.0	-3.6	-2.7

Table A-11. Differences and Percent Differences between Future No Action and Intertie Alternative EC at Jones Pumping Plant / Delta-Mendota Canal (2030 LOD)

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action) Old River at Tracy												
WY	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
1976	5.9	10.4	29.2	-3.5	9.0	6.5	1.1	0.4	-2.3	-10.1	-17.0	15.5
1977	6.7	-0.8	-33.2	1.4	72.6	17.1	5.8	5.2	4.3	1.4	0.3	-5.2
1978	5.1	-4.1	38.9	36.8	-0.2	0.3	0.1	0.0	0.0	0.0	-0.6	-6.6
1979	-6.3	-4.6	7.3	-3.5	-0.3	0.4	3.0	0.3	0.1	0.7	1.5	4.6
1980	1.0	-0.1	9.7	0.3	0.0	0.1	-0.5	-0.1	0.0	0.0	-0.1	0.3
1981	-2.3	-0.2	-1.3	6.5	8.8	41.3	13.6	0.7	-0.8	1.5	8.1	-7.6
1982	-8.0	9.3	1.5	-3.0	-0.1	0.4	0.0	0.0	0.0	0.0	0.0	0.0
1983	-0.1	0.0	0.0	-1.2	-0.7	0.5	3.6	0.3	0.4	0.5	-0.4	0.0
1984	-0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5
1985	6.3	9.4	-0.5	-0.4	4.3	6.3	3.5	1.1	0.4	-0.4	2.3	-0.7
1986	-3.0	-2.6	9.1	29.2	0.5	0.3	3.0	0.4	0.4	0.7	1.0	3.8
1987	2.3	3.3	-16.3	-24.4	22.2	5.0	-0.1	1.7	1.4	0.9	0.4	-1.4
1988	0.9	-1.0	4.4	36.9	7.3	2.1	0.9	0.3	-6.1	-1.4	13.7	-14.9
1989	-12.5	-5.4	0.1	0.3	-0.5	-4.3	-1.6	-0.2	-0.9	-0.7	0.9	1.4
1990	0.4	-3.0	-5.6	29.3	-35.2	-13.2	-1.1	-0.2	0.0	-3.3	1.6	-6.0
1991	-4.5	-67.9	-73.2	-26.8	142.6	5.5	-12.7	-1.6	-5.7	2.5	-11.8	11.8
AVG	-0.5	-3.6	-1.9	4.9	14.4	4.3	1.2	0.5	-0.5	-0.5	0.0	0.0
MAX	6.7	10.4	38.9	36.9	142.6	41.3	13.6	5.2	4.3	2.5	13.7	15.5
MIN	-12.5	-67.9	-73.2	-26.8	-35.2	-13.2	-12.7	-1.6	-6.1	-10.1	-17.0	-14.9

Difference in EC Predictions (2030 Intertie Alternative - 2030 Future No Action) Old River at Tracy												
WY	**OCT**	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**
1976	1.9	3.2	6.2	-0.5	1.5	1.0	0.2	0.1	-0.4	-1.6	-2.8	2.5
1977	0.9	-0.1	-4.6	0.2	9.8	1.9	0.8	0.9	0.7	0.2	0.1	-0.8
1978	0.7	-0.5	5.8	5.1	0.0	0.1	0.0	0.0	0.0	0.0	-0.1	-1.3
1979	-1.0	-0.7	1.0	-0.4	-0.1	0.1	0.8	0.1	0.0	0.2	0.4	0.8
1980	0.1	0.0	1.4	0.1	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.1
1981	-0.4	0.0	-0.2	0.8	1.9	10.6	3.1	0.1	-0.2	0.4	1.7	-1.3
1982	-1.1	1.4	0.4	-0.5	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	-0.4	-0.2	0.2	1.8	0.1	0.2	0.2	-0.2	0.0
1984	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1
1985	1.1	1.7	-0.1	-0.1	0.9	1.2	0.7	0.2	0.1	-0.1	0.4	-0.1
1986	-0.5	-0.4	1.3	5.0	0.1	0.1	1.2	0.2	0.1	0.2	0.3	0.8
1987	0.4	0.6	-2.4	-3.1	3.7	0.8	0.0	0.3	0.3	0.2	0.1	-0.2
1988	0.1	-0.1	0.6	5.8	1.0	0.2	0.1	0.0	-1.2	-0.3	2.6	-2.4
1989	-1.6	-0.7	0.0	0.0	-0.1	-1.0	-0.4	-0.1	-0.2	-0.2	0.2	0.2
1990	0.1	-0.5	-0.7	3.6	-6.0	-2.3	-0.2	0.0	0.0	-0.6	0.3	-1.0
1991	-0.6	-8.4	-9.9	-3.1	20.6	1.0	-2.7	-0.3	-1.0	0.4	-1.9	2.0
AVG	0.0	-0.3	-0.1	0.8	2.1	0.9	0.3	0.1	-0.1	-0.1	0.0	0.0
MAX	1.9	3.2	6.2	5.8	20.6	10.6	3.1	0.9	0.7	0.4	2.6	2.5
MIN	-1.6	-8.4	-9.9	-3.1	-6.0	-2.3	-2.7	-0.3	-1.2	-1.6	-2.8	-2.4

Table A-12 Differences and Percent Differences between Future No Action and Intertie Alternative EC at Jones Pumping Plant / Delta at Old River at Tracy Road Bridge (2030 Conditions).