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APPENDIX III. ASSUMPTIONS AND CRITERIA UTILIZED IN THE OPERATIONS, POWER, TEMPERATURE, AND WATER QUALITY MODELS

INTRODUCTION

This appendix summarizes the methodology, operational assumptions, and hydrologic and other data used in a series of computer model analyses conducted by Reclamation to estimate the CVP yield available for contracting. Further details are included in Technical Appendix B (bound separately). Resulting reservoir and river flow levels and temperatures, capacity and energy output, and Delta water quality are the basis for evaluating impacts of alternative actions relating to water contracting. Output from the computer models provides a means to quantify effects of each alternative on river flows, reservoir levels, power output, water temperatures, and water quality. Computer model output is included in Technical Appendix C (bound separately).

USE OF OPERATIONS, POWER, TEMPERATURE, AND WATER QUALITY MODELS

Reclamation's CVP Operations Planning Model is the basic tool used to estimate CVP water supply available for contracting and to identify how changing water demand patterns affect (1) surface water flow throughout the Central Valley, (2) Delta outflow, and (3) reservoir storage. Operations Planning Model output is supplied to a power operations model, which adjusts reservoir releases from CVP facilities to meet CVP power objectives while still meeting other project objectives. Average monthly reservoir inflows and releases from the power model are input to temperature and Delta water quality models. These models are used to identify the influence of project operations on reservoir and river water temperatures and Delta water quality.

MODELING ASSUMPTIONS

Each time the Reclamation models are run, a number of assumptions are made with respect to the hydrology, the capacity and array of water development facilities, operational criteria, instream flow requirements, water demands, and water supply deficiencies. Basic assumptions for the computer analyses and criteria specific to each of the alternatives are summarized below.

Period of Analyses

Monthly hydrologic data from October 1921 through September 1978 (water years 1922 through 1978) are used in the Operations Planning Model analyses. This 57-year period of record is used to simulate reservoir operations because it provides a reasonable range of hydrologic conditions that might be expected in the future. Due to requirements of a support contract between the United States and Pacific Gas and Electric Company, the power model operates on a calendar year basis. This results in a 56-year period of record (January 1922 through December 1977) being used for the power and temperature models.

Development Levels

Two levels of development are modeled for the water contracting EIS's. For convenience, a year (1985 or 2020) has been associated with each level of development although this is assumed merely to describe general conditions projected to occur at approximately the year indicated. The 1985 level of development simulates existing or current conditions; the 2020 level simulates future or ultimate conditions.

1985 (Existing)

Existing water deliveries are simulated to establish current conditions for reservoir levels and stream flows over a 57-year period of record. Only existing project facilities are assumed to be in operation, with Harvey O. Banks Delta pumping capacity limited to the current 6,300 cfs.

2020 (Future)

Impact analyses for the EIS alternatives use model results assuming full delivery of quantities under existing CVP water contracts and a capacity of 10,300 cfs at the Harvey O. Banks pumping plant (with pumping limited by Corps of Engineers criteria to 6,690 cfs plus one-third of San Joaquin River flow at Vernalis during the mid-December to mid-March period whenever those flows exceed 1,000 cfs). No additional demands or instream flow requirements are imposed.

Hydrology

Hydrologic data for the model analyses are based on Central Valley Basin depletion studies performed by DWR and Reclamation and described in the DWR memorandum report Input Data for the 1980 and 2000 Level Central Valley Depletion Studies dated August 22, 1977. The depletion study concept was derived out of necessity in the early 1960s as a means to establish a mutually acceptable hydrologic base by which the accomplishments of the CVP and the SWP could be measured. One

way to measure these accomplishments is to simulate an operation of the CVP and SWP facilities through a historical sequence of years but with the historical hydrology adjusted to reflect the future level of development to be studied. Simply stated, the depletion study concept entails converting historical water supplies to what the supplies would be under a projected level of development (e.g., 1980, 2000).

In the depletion analysis, the Central Valley of California was divided into 40 subareas including all the basins tributary to the Delta. Historical monthly data collected for each subarea included inflow and outflow, imports and exports, depletions by developed areas, and flow modifications due to regulatory facilities. The effects of the historic development were then undone; i.e., the inflows and outflows for each subarea were restored to a full natural state. Imports and exports to and from each subarea, flow modifications due to non-project facilities, and depletions were estimated for the projected level of development, and superimposed upon the full natural conditions. In other words, a hydrology at a projected level of development was developed without the CVP and SWP projects. Using the resultant projected inflows, accretions, and depletions, the operations model simulates the operations of the CVP and SWP.

The hydrology prepared for 1980 conditions was determined to be representative of existing development and was used in the 1985 analysis. The 2000 level depletion analysis, when coupled with ultimate level project demands, was judged to reasonably reflect the 2020 level of development.

FACILITIES

The scope of the model studies is limited to water supplies developed by CVP and SWP facilities that are now operational (except additional pumps at Banks, which are under construction). The facilities are listed in Table A.

DELIVERY DEFICIENCIES

The 1985 level operation studies simulate current operations as closely as possible. In the current level studies, full deliveries were made in all years except for critically dry years in which the CVP system storage fell below a certain level. No deficiencies were imposed on riparian demands at either the 1985 or the 2020 levels of development.

By the year 2020, all contracts for project water will have expired and new contracts will have been negotiated, either with the same users or with different users. It is expected that these new contracts will have deficiency criteria based on the Sacramento River Basin Index (see Technical Appendix B, Attachment 5) and will specify that deficiencies will be shared equally among agricultural and M&I users. Consequently, the 2020 level studies reflect this deficiency criteria. Full deliveries at the 2020 level were made in all years but critically dry

Table A. Existing Facilities

Central Valley Project	State Water Project
Reservoirs	
Shasta Lake	Lake Oroville
Keswick Reservoir	Thermalito Forebay
Clair Engle Lake	Thermalito Afterbay
Lewiston Lake	Thermalito Diversion Dam
Whiskeytown Lake	San Luis Reservoir (joint)
Folsom Lake	O'Neill Forebay (joint)
Lake Natoma	Lake Davis
San Luis Reservoir (joint)	Antelope Lake
O'Neill Forebay (joint)	Lake Del Valle
Millerton	Pyramid Lake
New Melones	Castaic Lake
	Silverwood Lake
	Lake Perris
Conveyance Facilities	
Corning Canal	Feather River Service Area Canals
Tehama Colusa Canal	California Aqueduct (joint)
Cow Creek Unit	South Bay Aqueduct
Clear Creek South Unit	North Bay Aqueduct
Folsom South Canal	
Delta Cross Channel	
Delta Mendota Canal	
San Felipe Division	
San Luis Unit	
Madera Canal	
Friant-Kern Canal	
Delta Export Facilities	
Contra Costa Pumping Plant No. 1	Harvey O. Banks Delta Pumping Plant, including Clifton Court Forebay (Pumping capacity assumed: 6,300 cfs in 1985; 10,300 cfs in 2020 with pumping rate limited to 6,690 cfs plus one-third of San Joaquin River flow at Vernalis during the mid-December to mid-March period whenever those flows exceed 1,000 cfs)

years as defined by the Sacramento River Basin Index. Deficiencies were taken equally on contract deliveries for agricultural uses and on M&I uses in all critical years. Generally, 25 percent deficiencies were taken, but in 1977, the deficiency was increased to 50 percent. Additional deficiencies were taken in the ARSA in 1977. No interim contracts were included at the 2020 level of development.

INSTREAM FLOW OBJECTIVES

Instream flow objectives are the same for the 1985 and 2020 analyses and are those now in effect under existing agreements and for existing facilities. These are summarized below.

Trinity River

The U.S. Fish and Wildlife Service initiated a 12-year study of salmon and steelhead production on the Trinity River in 1984. Guaranteed minimum flows from Lewiston Reservoir for the Trinity River during this study period were established on January 14, 1981, by the Secretary of the Interior. These flows are:

- o normal/wet year: increasing from 287,000 af/yr to 340,000 af/yr, as habitat and watershed restoration measures are implemented and evaluated;
- o dry year: 220,000 af/yr; and
- o critically dry year: 140,000 af/yr.

For the EIS studies, these interim Trinity River minimum flow standards are assumed. Should the standard eventually be decreased, additional water would become available for transfer to the Sacramento River basin. If the standard were to be increased, less water would be available and increased water supply shortages might be expected in drier years.

Sacramento River

Keswick releases meet the requirements of a memorandum of agreement dated April 5, 1960, between Reclamation and California Department of Fish and Game (DFG), and a January 1980 Memorandum of Understanding among Reclamation, DFG, and SWRCB. The 1980 memorandum calls for the following maximum concentration levels of total copper and zinc in the Sacramento River below Keswick Dam:

	Spring Creek Reservoir	
	Less than 5,000 af	More than 5,000 af
Copper	0.01 mg/l	0.015 mg/l
Zinc	0.072 mg/l	0.108 mg/l

Requirements of the 1960 memorandum are given below:

Period	Normal Year	Critical Dry Year
January 1 through February 28[a]	- 2,600 cfs	2,000 cfs
March 1 through August 31	- 2,300 cfs	2,300 cfs
September 1 through November 30[a]	- 3,900 cfs	3,900 cfs
December 1 through December 31[a]	- 2,600 cfs	2,000 cfs

[a]Letter dated October 8, 1981, (see Technical Appendix B, Attachment 6) changed normal year minimum releases to 3,250 cfs for the period October 1, 1981, through February 28, 1982. (The 3,250 cfs has continued in effect since that period and has been used for the Operations Planning Model runs.)

American River

The current minimum flow standard for the American River is described in SWRCB Decision 893 (D-893). Increased minimum flow requirements are described in SWRCB Decision 1400 (D-1400), and are to be implemented if Auburn Dam becomes operational. For all studies, flows defined in D-893 are the minimum requirement. In the 1985 level analysis and in several of the 2020 level alternatives, a modified D-893 flow objective was maintained.

Stanislaus River

An interim agreement was negotiated in June 1987 between Reclamation and DFG for a new schedule of minimum releases from New Melones Dam. A second interim agreement, "Agreement on Framework for Settling Litigation brought by the South Delta Water Agency against the United States and the California Department of Water Resources," is also in effect. The New Melones operation studies at the current level of development use the flow requirements set forth in these agreements. At the 2020 level, the interim agreements are no longer in effect and D-1422 requirements are met. New Melones operation studies produced revised Stanislaus River impaired inflows that were used in the Operations Planning Model.

Sacramento-San Joaquin Delta

Reclamation and DWR recently agreed to coordinate the operation of the federal and state water projects to meet Delta water quality standards described in D-1485, not including Suisun Marsh standards. The Operations Planning Model complies with criteria established by the COA. Hearings are in progress to revise Bay/Delta standards with final recommendations expected in several years. Reclamation will comply

with revised standards if meeting such standards is not inconsistent with Congressional directives. Because revision of the standards is in an early phase, current D-1485 standards govern the required Delta inflow in the Operations Planning Model.

OPERATIONS CRITERIA

The operating criteria used in these studies is intended to closely approximate current operating practices. The experiences gained from operating through the 1976-77 drought provided guidelines for critical years, and, in particular, a series of critical years. The operating criteria are similar to those employed in the COA studies, and are described below.

Both CVP and SWP reservoirs are operated to meet (1) mandatory requirements such as releases to maintain minimum fishery and navigation flows, downstream water rights, and local project demands; and (2) Delta requirements such as water quality, outflow, export demand, and consumptive use. In most normal and wet years, these minimum requirements are met without affecting project yield. However, during a critically dry period such as 1928 through 1934, water resources are limited and the water supply yield developed by the CVP and SWP in the Delta depends upon withdrawal from reservoir storage to satisfy downstream mandatory flow requirements.

In the 1985 analysis, Reclamation contractors use less water than their maximum contractual allocations. This remaining supply allows the CVP, even in dry and some critical years, to maintain flows in excess of minimum fishery, navigation and recreation requirements.

Required Delta Outflow

Minimum required Delta outflow necessary to satisfy the water quality objectives set forth in D-1485 were calculated using methods described in a February 1981 report, Delta Water Use and Outflow Estimate. These requirements are satisfied from uncontrolled flows or storage releases, if necessary.

Outflow requirements vary depending upon the month and hydrologic year type. Furthermore, if there has been a surplus Delta outflow in the preceding month, an adjustment can be made to reduce the current month's requirement. This adjustment is referred to as a "ramping savings." In critical years, the water quality objectives are reduced and an appropriate adjustment is made in the outflow requirement.

Carriage Water

When export rates from the southern Delta are increased beyond a certain point relative to inflow from the southern Delta, more water is drawn from the western Delta. To maintain suitable water quality at the export pumps, the saline water being drawn in from the Bay must be repelled by increasing Delta outflow. The additional releases are called "carriage water" and are calculated as an additional adjustment to required Delta outflow.

The method for calculating carriage water is contained in SWRCB Order WR81-15 (also known as SWRCB Permit Term 91), dated November 19, 1981.

OPERATIONS RESULTS

Bases for utilization of the model results in the water contracting impact analyses are described below.

Yield Estimates

Results of firm water yield estimates of the northern CVP under demands utilized for each of the alternatives are given in Table B. The demand values used in each of the Operations Planning Model runs are also given in that table.

Adjustments for Analyses

As shown in Table B, yield estimates for each of the alternatives include an incremental element. This is potentially available firm yield water that was not allocated to meet demands under the model run for that alternative. Since an objective of water contracting is to allocate all remaining yield of the CVP, water allocations for the EIS analyses have been adjusted to use this incremental water. The amount of incremental water given in Table B is based on water remaining in the reservoirs above required minimums at the end of the 1928-1934 critical period from the Operations Planning Model output. Much of this water is actually released to the river systems by the power operations model in meeting CVP power objectives so allocating this incremental water does not significantly change flows or reservoir levels that are used in the impacts analyses. There would be some change in the monthly release pattern; however, an analysis of those months affected indicate the impact on river flows, temperatures, and water quality is not significant. Intermittent water (available in normal and above normal water years) is also allocated under a number of the alternatives. As with the incremental yield water, much of this water is actually released to the river systems by power operations and its allocation does not significantly change flows or reservoir levels.

Table B. Operations Planning Model Demand Inputs and Yield Estimates
(In Thousand Acre-Feet Annually)

Area	No-Action (2020 Base)	Alt. 1B	Alt. 2	Alt. 3	Alt. 4A	Alt. 4D	Alt. 5	Alt. 6	Alt. 7
DEMAND SUBTOTALS									
SACRAMENTO RIVER	3,140	3,610[a]	3,300	3,600	3,140	3,140	3,240	3,420	3,140
FEATHER RIVER (THROUGH EXCHANGE W/DWR)	0	70[a]	0	0	0	0	70	50	0
AMERICAN RIVER	940	1,233.4[b]	1,230	1,280	940	940	940	1,110	940
DELTA EXPORTS	3,270	3,890[a]	3,520	3,270	3,960	4,800	3,490	3,700	3,270
INCREMENTAL	810	[c]	390	400	400	190	220	160	740
TOTAL NORTHERN CVP FIRM WATER YIELD	8,200	[c]	8,400	8,600	8,400	9,100	8,000	8,400	8,100
DEMANDS FOR FIRM SUPPLY EXCEPT AS NOTED									
SACRAMENTO RIVER									
Clear Creek South	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1	16.1
Spring Creek Conduit	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Cow Creek South	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
City of Redding	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Toyon Pipeline & Shasta Area	6.4	9.4	9.4	9.4	6.4	6.4	6.4	9.4	6.4
Sacramento River Diverters:									
Project Water	385.0	385.0	385.0	385.0	385.0	385.0	385.0	385.0	385.0
Base Supply	1,833.2	1,833.2	1,833.2	1,833.2	1,833.2	1,833.2	1,833.2	1,833.2	1,833.2
Bypasses and Riparian	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0	500.0
Wildlife Refuges	.0	105.0[a]	.0	.0	.0	.0	105.0	92.0	.0
Feather R. Water District	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Sacramento Canals:									
Corning Canal	43.8	51.6	51.6	51.6	43.8	43.8	43.8	51.6	43.8
Tehama-Colusa Canal	286.2	616.5[a]	406.6	574.6	286.2	286.2	286.2	344.2	286.2
GCID Canal	.0	23.8[a]	23.8	23.8	.0	.0	.0	.0	.0
Stony Creek Diverters	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Losses	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Shifted Am R dmd--FSC to Freeport	.0	.0	.0	140.0	.0	.0	.0	121.0	.0
SUBTOTAL	3,137.5	3,607.4[a]	3,292.5	3,600.5	3,137.5	3,137.5	3,242.5	3,419.3	3,137.5
FEATHER RIVER									
Refuges (through exchange with DWR)	.0	66.0[a]	.0	.0	.0	.0	66.0	51.0	.0

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Table B
(Continued)

Area	No-Action (2020 Base)	Alt. 1B	Alt. 2	Alt. 3	Alt. 4A	Alt. 4D	Alt. 5	Alt. 6	Alt. 7
AMERICAN RIVER									
Placer County CVP water	117.0	5.0	117.0	117.0	117.0	117.0	117.0	117.0	117.0
Placer Co Wt Rts	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0
El Dorado County	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
El Dorado County Water Rights	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0
San Juan Suburban	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2
City of Roseville	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0
Add'l Folsom Lake demand	.0	91.1[b]	87.0	87.0	.0	.0	.0	87.0	.0
North Area Water Rights:									
Natomas	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0	32.0
No Fork Ditch (SnJn)	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0
Folsom Prison	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
City of Sacramento	230.0	156.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0
Carmichael ID & Riparian	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0	56.0
Add'l H Street demand	.0	77.7[b]	60.0	39.0	.0	.0	.0	60.0	.0
Folsom South Canal:									
SMUD	75.0	30.0[d]	75.0	75.0	75.0	75.0	75.0	75.0	75.0
EBMUD	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0	150.0
Losses	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Add'l Folsom South Canal (Ag)	.0	292.9[b]	121.0	170.0	.0	.0	.0	.0	.0
Add'l Folsom South Canal (M&I)	.0	76.5[b]	23.0	47.0	.0	.0	.0	23.0	.0
SUBTOTAL	935.2	1,242.4[b]	1,226.2	1,278.2	935.2	935.2	935.2	1,105.2	935.2
DELTA EXPORTS									
Delta Mendota Canal:									
DMC--Mendota Pool	537.1	537.1	537.1	537.1	537.1	537.1	537.1	537.1	537.1
Exchange Contracts	840.0	840.0	840.0	840.0	840.0	840.0	840.0	840.0	840.0
Schedule II	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3	37.3
Grasslands	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
State of CA	19.0	19.0	19.0	19.0	19.0	379.2	19.0	19.0	19.0
Patterson	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Losses	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0
Contra Costa Canal	195.0	195.0	195.0	195.0	195.0	195.0	195.0	195.0	195.0
San Felipe Unit	216.0	216.0	216.0	216.0	216.0	216.0	216.0	216.0	216.0

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Table B
(Continued)

Area	No-Action (2020 Base)	Alt. 1B	Alt. 2	Alt. 3	Alt. 4A	Alt. 4D	Alt. 5	Alt. 6	Alt. 7
DESA--Irrigation:									
Westlands	900.0	1,150.0	1,150.0	900.0	1,397.3	1,294.8	900.0	1,150.0	900.0
San Luis WD	79.5	114.5	79.5	79.5	114.5	114.5	79.5	110.5	79.5
Panoche	44.0	67.0	44.0	44.0	67.0	67.0	44.0	64.4	44.0
Pacheco	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Misc	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Losses	59.0	59.0	59.0	59.0	59.0	59.0	59.0	59.0	59.0
Pleasant Valley WD	.0	16.8	.0	.0	40.0	40.0	.0	.0	.0
Tracy Golf & CC	.0	.7	.0	.0	.7	.7	.0	.7	.0
Buena Vista WSD	.0	1.5[a]	.0	.0	.0	.0	.0	.0	.0
Mid-Valley WD	.0	4.3[a]	.0	.0	.0	28.6	.0	.0	.0
Kerchoff WD	.0	.9[a]	.0	.0	.0	.0	.0	.0	.0
Mid-Valley	.0	38.6[a]	.0	.0	54.2	612.9	.0	.0	.0
South San Joaquin MUD	.0	.0	.0	.0	13.1	.0	.0	.0	.0
Delta Refuges	.0	220.7[a]	.0	.0	.0	.0	220.4	110.0	.0
DESA--Municipal & Industrial:									
Avenal	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Coalinga	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Huron	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Westlands	11.0	11.0	11.0	11.0	13.7	13.7	11.0	11.0	11.0
Veteran's Admin.	.0	.9	.0	.0	.9	.9	.0	.9	.0
City of Dos Palos	.0	1.3	.0	.0	1.3	1.3	.0	1.3	.0
Santa Nella CWD	.0	10.7	.0	.0	10.7	10.7	.0	10.7	.0
Kern Co WA	.0	.0	.0	.0	.0	.0	.0	.0	.0
Kaweah Delta WCD	.0	.0	.0	.0	.0	.0	.0	.0	.0
City of Tracy	.0	4.1	.0	.0	4.1	4.1	.0	4.1	.0
Musco Olive	.0	.6	.0	.0	.6	.6	.0	.6	.0
City of Mendota	.0	5.0	.0	.0	5.0	5.0	.0	.0	.0
Fresno County	.0	.0	.0	.0	1.4	1.4	.0	.0	.0
Cross Valley Canal	128.0	128.0	128.0	128.0	128.0	128.0	128.0	128.0	128.0
SUBTOTAL	3,273.1	3,887.2[a]	3,523.1	3,273.1	3,963.1	4,795.1	3,493.5	3,702.8	3,273.1
TOTAL	7,345.8	8,803.0[a,b]	8,041.8	8,151.8	8,035.8	8,867.8	7,737.2	8,278.3	7,345.8

[a]Demand met with dependable supply or combination of firm and dependable supply.

[b]Met by conjuntive use.

[c]Yield for Alternative 1B is not comparable to other alternatives. Demands are met by combination of firm surface supplies, dependable supplies, and groundwater supplies.

[d]Demands met by coordinating operation of Folsom and conjunctive use with groundwater.

A comparison of demands used for the model runs with those being used for the water contracting analyses is given in Table C. Differences and impacts on applicability of the model runs are described below.

- o No-Action - Differences in the Delta Export model run and EIS analysis numbers are caused by the following incorrect numbers being used for 2020 contract deliveries:

  - Westlands Water District total contract amount is 900,000 af/yr, but the operations model used 900,000 for agricultural and 11,000 for M&I.

  - A total of 216,000 af/yr has been committed to the San Felipe Unit and was used in the model but only 197,000 are currently under contract.

- o Alternative 1B - There are only very small differences between the model run and EIS allocations, and the run output is considered applicable for the impact analysis. No model run was made for Alternative 1A because impacts of that allocation will be similar to the Alternative 3 impacts.

- o Alternative 2 - The incremental yield and intermittent water available are reserved to meet future needs under this alternative. Increases shown on Table C for the Sacramento River reflect refinement in the needs analysis. The less than 1 percent increase in Sacramento River totals has an insignificant impact on reservoir levels and river flows. In the ARSA, the division between agricultural and M&I water is slightly different for the model run. This results in the run output showing a slight shift of releases from winter to summer months. However, the quantity is small and impacts on river flows are insignificant. The Delta Export EIS values show a shift of water reserved for the San Felipe Unit to the ag column and the double counted Westlands M&I water plus delivery of M&I water to the Veterans Administration. It results in a slightly smaller total allocation for the EIS analysis.

  Total allocations under the model run and EIS analyses for Alternative 2 are 0.2 percent and do not affect applicability of the run output.

- o Alternative 3 - The incremental yield available under Alternative 3 was allocated to increases resulting from refinements of the needs estimates for the SRSA and ARSA and to DESA deliveries. Available intermittent water is allocated to refuges (Level 2) and water banking in the DESA. The SRSA and ARSA increases are minor and will not significantly change river flows. However, DESA deliveries increase by about 9 percent and evaluation of impacts will require use of output from one of the other runs to reflect impacts on the Delta.

Table C. Comparison of Allocations for Model Runs and EIS Analyses
(In Thousand Acre-Feet Annually)

Alternative		Sacramento River					American River				Delta Export					Incre-	Totals	
		Ag	M&I	Refug.	Firm	Interm.	Ag	M&I	Firm	Interm.	Ag	M&I	Refug.	Firm	Interm.	mental	Firm	Interm.
No-Action	Model Run	3,071	67	--	3,138	--	--	935	935	--	2,875	398	--	3,273	--	810	8,156	--
	Analysis	3,071	67	--	3,138	--	--	935	935	--	2,864	379	--	3,243	--	810	8,126	--
Alt. 1B	Model Run	3,143	70	--	3,213	460 (avg)	--	856	856	386 (avg)	3,200	421	--	3,621	266 (avg)	129	7,819	1,112
	Analysis	3,146	72	--	3,218	458	--	1,087	1,087	386	3,208	402	--	3,610	266 (avg)	129	8,044	1,110
Alt. 2	Model Run	3,223	70	--	3,293	--	121	1,105	1,226	--	3,125	398	--	3,523	--	390	8,432	--
	Analysis	3,246	72	--	3,318	--	109	1,113	1,229	--	3,133	380	--	3,513	--	390	8,450	--
Alt. 3	Model Run	3,291	170	--	3,461	--	264	1,154	1,418	--	2,875	398	--	3,273	--	400	8,552	--
	Analysis	3,333	172	--	3,505	143	293	1,180	1,473	--	3,192	390	--	3,582	257	--	8,560	400
Alt. 4	Model Run	3,071	67	--	3,138	--	--	--	935	--	3,538	425	--	3,963	--	400	8,436	--
	Analysis	3,246	72	--	3,318	171	109	1,113	1,222	--	3,546	406	--	3,952	221	--	8,492	392
Alt. 4D	Model Run	3,071	67	--	3,138	--	--	935	935	--	4,370	425	--	4,795	--	190	9,058	--
	Analysis	3,071	67	--	3,138	143	--	935	935	--	4,571	406	--	4,977	257	--	9,050	400
Alt. 5	Model Run	3,071	67	171	3,309	--	--	935	935	--	2,875	398	221	3,494	--	220	7,958	--
	Analysis	3,071	67	171	3,309	--	--	935	935	--	2,864	379	221	3,464	--	220	7,928	--
Alt. 6	Model Run	3,137	70	143	3,350	--	121	1,105	1,226	--	3,177	416	110	3,703	--	160	8,439	--
	Analysis	3,246	72	143	3,461	--	121	1,131	1,252	--	3,185	397	110	3,692	400	--	8,405	400
Alt. 7	Model Run	3,071	67	--	3,138	--	--	935	935	--	2,875	398	--	3,273	--	740	8,086	--
	Analysis	3,071	67	--	3,138	171	--	935	935	--	2,864	379	--	3,243	221	740	8,056	392

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The Alternative 3 run output is considered applicable for reservoir levels and river flows in the SRSA and ARSA, but output from the Alternative 1B run should be used for analysis of impacts on the Delta.

- Alternative 4A/B - Available incremental yield was allocated to the SRSA and ARSA in accordance with Alternative 2 needs. Intermittent water was allocated to refuges (Level 4). The run output is considered applicable for analysis of impacts under this alternative except that total Delta inflow and outflow will be less than the run output shows. A Fischer model run was made with flows adjusted to reflect this adjustment to provide better data for analysis of impacts in the Delta.

- Alternative 4C/D - The available incremental yield was allocated to DESA agriculture, and intermittent water was allocated to refuges (Level 2) and water banking in the DESA. The differences in model run and analysis values are minor, and the run output is considered applicable for the impact analysis.

- Alternative 5 - There are only very minor differences between the model run and the analysis for this alternative.

- Alternative 6 - Available incremental yield was allocated to increase SRSA agriculture deliveries up to the Alternative 2 level, and intermittent water was allocated to water banking in the DESA. The model run output is considered applicable for the impact analysis of Alternative 6.

- Alternative 7 - Intermittent water was allocated to refuges (Level 4). The model run output is considered applicable for the impact analysis of Alternative 7.