Attachment B

ADDENDUM USERS' GUIDE AND DOCUMENTATION

METHODOLOGY

The procedure used to produce DAYFLOW output for water year 83-84 involved:

1. Acquiring input data
2. Creating the DAYFLOW program input data deck
3. Executing the DAYFLOW program (after needed refinements).

Input Data Acquisition

Table 1 is a summary of each input parameter needed to run the DAYFLOW program, the DAYFLOW parameter name(s) associated with each input parameter, the data source, and the file name used to computerize the data, along with pertinent comments.

Input data were acquired from three sources: DWR Central District, DWR Division of Operations and Maintenance, and U. S. Geological Survey Sacramento office. The data were received on data forms, computer printouts, or computer tapes. After being keyed in or transmitted via modem, they were organized and placed in individual computer files using an IBM-XT microcomputer. Specific changes and assumptions are summarized in Table 1 and described later in this attachment (see Notes).

All major inputs were acquired for October 1983 through August 1984; data were unavailable for Mokelumne River for September 1984, no data were available for Dry Creek, and Marsh Creek was not monitored during water year 83-84. However, because of the relatively small flows of these streams compared to total inflow, the DAYFLOW output are still thought to be meaningful, particularly estimates of Delta outflow. In addition, since the monitoring site for the Sacramento River has been moved from Sacramento to Freeport, Morrison Creek is no longer included in the calculation for miscellaneous stream inflow (QMISC).

Input Data Deck Creation

Use of the DAYFLOW program in its present form requires that various input data, as acquired, be manipulated and combined before executing the program. A brief description of DAYFLOW input and output parameters, pre-execution calculations, and program calculations is presented in Table 2. The column numbers in the table refer to the sample DAYFLOW summary output listing for October 1982 shown in Figure 1. (The revised column headings should be noted.) Comments in Table 2 include information pertinent to the water year 83-84 update.

The process of creating the DAYFLOW input data deck consisted of several steps. Once the input data were acquired, precipitation and Delta Cross Channel gate operation codes were hand-calculated or determined, and unit conversions were made (acre-feet to cubic feet per second) using spreadsheet software. Individual computerized data files were then made for the input data (see Table 1). Finally, a FORTRAN program (DFDAT84; see Attachment C) was executed on an IBM-XT to: (1) read the individual input data files; (2) perform the pre-execution calculations for QMISC and QYOLO (QDPP was determined using spreadsheet software); and (3) write the DAYFLOW input data deck in the format required.

DAYFLOW Program Execution

The DAYFLOW program (FORTRAN) residing on the DWR CYBER 720 was down-loaded to an IBM-XT and successfully executed using the input data deck for water year 82-83 after minor adjustments (see DAYFLO2; Attachment D). In this process, an error was discovered in the read format statement for the Delta Cross Channel gate operation codes. This affected the values reported in the June 1984 DAYFLOW Summary for the Cross Channel and Georgiana Slough (QXGEO), as well as the estimate of San Joaquin River flow from the western Delta (QWEST). Specifically, values are incorrect for day 12 and day 23 of each month when both gates were closed. In addition, values reported are incorrect for days from the twelfth to the end of the month when gate settings were changed. This format error was corrected before final execution. (See the next section for details on water year 82-83 revisions.) DAYFLO2 was executed using water year 83-84 input data deck (through August 1984); the output is reported in Attachment A. The revised output for water year 82-83 is also reported in Attachment A.

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NOTES

In using the data reported in Attachment A, certain information is essential for proper interpretation:

1. All of the input data acquired for water year 83-84 is preliminary and is subject to revision following final screening by the respective sources (see Table 1).

2. The DAYFLOW program was run for water year 83-84 only through August 1984, because data for Mokelumne River were not available at time of execution. Also, the program was run without data for Marsh Creek (not monitored) and Dry Creek (not available).

3. Certain input parameter records were missing data for various days. The specific parameters, the dates for which data are missing, and the estimated or assumed values substituted are presented in Table 3. (These are the parameters with file names ending with an "E" in Table 1.) The DAYFLOW program was executed for water year 83-84 with the substituted values reported in Table 3.

4. The read format statement error (mentioned in the previous section) was corrected, and the DAYFLOW program was run using the input data deck for water year 82-83. The specific dates during water year 82-83 for which values of the Delta Cross Channel and Georgiana flow and the estimate of San Joaquin River flow from the western Delta were affected are:

11/16/82	1/12/83	3/23/83	6/12/83
11/17/82	1/23/83	4/12/83	6/23/83
11/23/82	2/12/83	4/23/83	7/12/83
12/12/82	2/23/83	5/12/83	7/22/83
12/23/82	3/12/83	5/23/83	

The revised 82-83 output is presented in Attachment A, which updates the June 1984 DAYFLOW Summary. Because the input data decks for water years prior to 82-83 are not available, revisions were not made in this addendum, but will be made during January 1985.

5. Outdated headings used in the DAYFLOW output listing were revised, as shown in Figure 1.

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TABLE 1. INPUT DATA ACQUISITION SUMMARY - 8384 WATER YEAR

Input Data	DAYFLOW Parameters	Source 1/	Computer File Name 2/	Comments
Bear Creek - Lodi	QMISC	CD	BRCR84E	Missing data interpolated; assumed 5 cfs flow with irrigation dam (4/14 - 9/30/84).
Calaveras River - Stockton	QMISC	CD	CALR84	
French Camp Slough - French Camp	QMISC	CD	FSCL84	
Gross Channel Depletion	QDEPL	CD	DFGCDLY	Leap year data deck.
Precipitation - Stockton Fire Stn #4	QPREC	CD	PREC84	Oct. 1-4 includes 2006 cfs from Sept. 1983.
Sacramento Weir Spill	QYOLO	CD	SWS84	
South Fork Putah Creek	QYOLO	CD	SPCR84E	Missing data interpolated.
Stockton Diverting Canal	QMISC	CD	SDC84E	Missing data interpolated.
Byron-Bethany Pumping	QDPP	O & M	BBD84	Converted from acre-feet to cfs.
Clifton Court Forebay Inflow	QDPP	O & M	CLIN84	
Contra Costa Canal Pumping	QCCC	O & M	CCC84	Converted from acre-feet to cfs.
Cross Channel Gates Open	OPENF, OPENP QXGEO	O & M	GATE84	Converted to gate operation code used in DAYFLOW program; hand calculated.
Cross Channel Gate Change Time	OPENF, OPENP QXGEO	O & M	GATE84	Used to determine partial gate settings in a day; hand calculated.
Tracy Pumping Plant	QTPP	O & M	TPP84	Converted from acre-feet to cfs.
Cosumnes River - Michigan Bar	QCRM	USGS	CSMR84	
Dry Creek - Galt	QMISC	USGS	DRCR84E	Not available; assumed to be insignificant; set to zero.
Marsh Creek - Byron	QMISC	USGS	---	No longer monitored; contact Mel Weston, Contra Costa County (415) 372-4470.
Mokelumne River - Woodbridge	QMOKE	USGS	MOKE84	Data for Sept. 1984 unavailable, DAYFLOW program ran through Aug. 1984.
Morrison Creek - Sacramento	QMISC	USGS	---	Not included since Sacramento River flow measurement moved to Freeport.
Sacramento River - Freeport	QSAC	USGS	SAC84	
San Joaquin River - Vernalis	QSJR	USGS	SJR84	
Yolo Bypass - Woodland	QYOLO	USGS	YOLW84E	Acquired data through 5/2/84; remaining flow through 9/30/84 assumed zero.

1/ CD - Central District, DWR; computer printout or data forms.
O & M - DWR Operations and Maintenance; computer printout.
USGS - U. S. Geological Survey, Sacramento; computer tape.

2/ IBM - XT microcomputer; suffix E implies estimated or assumed values included.

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TABLE 2. SUMMARY DAYFLOW PROGRAM DOCUMENTATION

Column No. 1/	DAYFLOW Parameter 2/	Description	Pre - Execution Calculation	DAYFLOW Program Calculation	Comments
(1)	QSJR (I)	San Joaquin R. at Vernalis	none	none	Gage data.
(2)	QCRM (I)	Cosumnes R. at Michigan Bar	none	none	Gage data.
(3)	QMOKE (I)	Mokelumne R. at Woodbridge	none	none	Gage data.
(4)	QMISC (I)	Miscellaneous stream flow	Sum of Calavaras R., Bear Cr., Marsh Cr., Dry Cr., Stockton Div. Canal and French Camp Sl.	none	Gage data; Marsh and Dry Cr. not included in 8384 run; intermediate program used (DFDAT84).
(5)	QEAST (O)	East Delta Inflow	none	Sum of flows (1) through (4).	
(6)	QSAC (I)	Sacramento R. at Freeport	none	none	Gage data.
(7)	QYOLO (I)	Yolo Bypass flow	Sum of Yolo Bypass nr. Woodland, Sac. Weir Spill and South Fork Putan Creek.		Gage data; intermediate program used (DFDAT84).
(8)	QTOT (O)	Total inflow	none	Sum of flows (5) and (6).	
(9)	QXGED (O)	Delta Cross Channel and Georgiana Slough	Gate operation code and partial settings (OPENF and OPENO).	Calculated by empirical formula based on gate settings and Sac. R. flow.	Times determined and operations coded by hand.
(10)	QMID (I)	Miscellaneous diversions	none	none	Not included; set zero.
(11)	QCCC (I)	Contra Costa Canal pumping	none	none	Operations records.
(12)	QTRP (I)	Tracy pumping plant	none	none	Operations records.
(13)	QDSP (I)	Clifton Court Forebay inflow	Byron - Bethany pumping subtracted.	none	Operations records; comp. spreadsheet software.

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TABLE 2. CONTINUED

Column No. 1/	DAYFLOW Parameter 2/	Description	Pre - Execution Calculation	DAYFLOW Program Calculation	Comments
(14)	QEXP (O)	Total exports	none	Sum of exports (10) through (13).	
(15)	QDEPL (I)	Gross channel depletion	none	none	Repeating annual cycle: DWR 1965 estimates.
(16)	QPREC (I)	Delta precipitation	Depth converted to volume; evenly distributed over 5 days from event.	none	Hand calculated; Delta area = 682,230 acres.
(17)	QCD (O)	Net channel depletion	none	Depl(15) - flow(16).	
(18)	QEFFECT (O)	Effective inflow	none	A. If (exp(14) + 42% of depl(17)))= flow(1), then flow(18) = flow(8) - flow(1). B. If (exp(14) + 42% of depl(17)) (flow(1), then flow(18) = Lower(flow(8)-(65%flow(1)+15%depl(17)) OR exp(14) + 42%depl(17)).	
(19)	QDIVER (O)	Percent diverted	none	(Exp(14) + depl(17)) / flow(8).	
(20)	QWEST (O)	San Joac. R. flow from W. Delta	none	Flow(5)+flow(9)-exp(14)-65%depl(17).	
(21)	QOUT (O)	Delta outflow at Chipps Is.	none	Flow(8) - depl(17) - exp(14).	
(22)	QEFFDIV (O)	Effective % diverted	none	(Flow(18) - flow(21)) / flow(18).	

1/ Column numbers refer to Figure 1.
2/ I for input; O for output.

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Figure 1. SAMPLE DAYFLOW PRINTOUT

HISTORIC VALUES IN CUBIC FEET PER SECOND (CFS)

CALENDAR YEAR 1984

FLOWS FOR THE MONTH OF AUG

DATE	SAN JOAQUIN RIV VERNALIS	COSUMNES RIVER AT MICH. BAR	MOKELUMNE RIVER AT WODBRIDGE	MISC. STREAM FLOWS	SUBTOTAL SJR+COS+MOKE+MISC	SACRAMENTO RIVER FREEPORT	YOLO BYPASS FLOW	TOTAL INFLOW (CFS)	DEL-X-CH GEORGIANA FLOW	MISC. DIVERSION (CFS)	CONTRA COSTA PUMPING
1	1950.	48.	303.	80.	2381.	22000.	16.	24397.	8536.	0.	238.
2	1930.	46.	309.	66.	2351.	21300.	16.	23667.	8331.	0.	247.
3	1910.	46.	342.	86.	2384.	21000.	15.	23399.	8243.	0.	250.
4	1910.	45.	380.	84.	2419.	20700.	15.	23134.	8155.	0.	257.
5	1930.	45.	367.	111.	2453.	20300.	15.	22768.	8038.	0.	257.
6	2030.	44.	389.	124.	2587.	20400.	14.	23001.	8067.	0.	257.
7	1950.	43.	377.	88.	2458.	20500.	14.	22972.	8097.	0.	247.
8	1830.	42.	348.	78.	2298.	20100.	14.	22412.	7979.	0.	254.
9	1830.	40.	331.	71.	2272.	19800.	14.	22086.	7891.	0.	249.
10	1850.	40.	345.	74.	2309.	19300.	11.	21620.	7745.	0.	243.
11	1880.	38.	370.	88.	2376.	18900.	13.	21289.	7628.	0.	240.
12	1970.	37.	387.	101.	2495.	18100.	12.	20607.	7393.	0.	216.
13	2110.	37.	413.	104.	2664.	17200.	15.	19879.	7130.	0.	257.
14	2100.	37.	404.	96.	2637.	16700.	16.	19353.	6983.	0.	279.
15	2010.	36.	460.	124.	2630.	16500.	18.	19148.	6925.	0.	288.
16	2010.	36.	466.	162.	2674.	16700.	17.	19391.	6983.	0.	283.
17	2090.	36.	451.	148.	2725.	16700.	18.	19443.	6983.	0.	269.
18	2210.	36.	463.	170.	2879.	16800.	16.	19695.	7012.	0.	270.
19	2230.	36.	471.	146.	2883.	17100.	13.	19996.	7100.	0.	279.
20	2300.	34.	444.	147.	2925.	17600.	13.	20538.	7247.	0.	257.
21	2240.	34.	458.	132.	2864.	17800.	15.	20679.	7305.	0.	246.
22	2360.	33.	440.	155.	2988.	18200.	15.	21203.	7423.	0.	243.
23	2440.	32.	442.	147.	3061.	18400.	17.	21478.	7481.	0.	248.
24	2490.	32.	448.	178.	3148.	18400.	17.	21565.	7481.	0.	236.
25	2470.	32.	490.	138.	3130.	18700.	17.	21847.	7569.	0.	239.
26	2490.	31.	485.	192.	3198.	18800.	20.	22018.	7598.	0.	224.
27	2750.	32.	497.	212.	3491.	19400.	20.	22911.	7774.	0.	238.
28	2630.	33.	489.	174.	3326.	19500.	21.	22847.	7804.	0.	241.
29	2520.	32.	451.	157.	3160.	19000.	19.	22179.	7657.	0.	244.
30	2570.	32.	491.	183.	3276.	18300.	20.	21596.	7452.	0.	231.
31	2570.	31.	524.	168.	3293.	18100.	18.	21411.	7393.	0.	220.
SUMMATION	67560.	1156.	13035.	3984.	85735.	582300.	494.	668529.	235404.	0.	7747.
AVERAGE	2179.	37.	420.	129.	2766.	18784.	16.	21565.	7594.	0.	250.

DATE	TRACY PUMPING PLANT	CLIFTON COURT INFLOW	TOTAL EXPORTS (CFS)	GROSS CHN DEPLETION (CFS)	PRECIPITATION (CFS)	NET CHN. DEPLETION (CFS)	EFFECTIVE INFLOW (CFS)	PERCENT DIVERTED	SJR FLOW FR. WESTERN DELT	OUTFLOW CHIPPS ISLAND	EFFECTIVE PERCENT DIVERTED
1	4647.	5196.	10081.	4200.	0.	4200.	22447.	59.	-1894.	10116.	55.
2	4675.	4873.	9795.	4200.	0.	4200.	21737.	59.	-1843.	9672.	56.
3	4643.	4874.	9767.	4150.	0.	4150.	21489.	59.	-1838.	9482.	56.
4	4650.	5198.	10105.	4150.	0.	4150.	21224.	62.	-2228.	8879.	58.
5	4632.	5321.	10210.	4100.	0.	4100.	20838.	63.	-2384.	8458.	59.
6	4648.	5478.	10383.	4100.	0.	4100.	20971.	63.	-2394.	8518.	59.
7	4656.	5408.	10311.	4050.	0.	4050.	21022.	63.	-2389.	8611.	59.
8	4650.	5410.	10314.	4050.	0.	4050.	20582.	64.	-2669.	8048.	61.
9	4451.	5818.	10518.	4000.	0.	4000.	20256.	66.	-2955.	7568.	63.
10	4678.	4996.	9917.	4000.	0.	4000.	19770.	64.	-2463.	7703.	61.
11	4682.	5381.	10303.	3950.	0.	3950.	19409.	67.	-2867.	7036.	64.
12	4656.	5378.	10250.	3950.	0.	3950.	18637.	69.	-2929.	6407.	66.
13	4642.	5416.	10315.	3900.	0.	3900.	17769.	72.	-3056.	5664.	68.
14	4647.	5401.	10327.	3850.	0.	3850.	17253.	73.	-3209.	5176.	70.
15	4636.	5407.	10331.	3850.	0.	3850.	17138.	74.	-3279.	4967.	71.
16	4625.	5167.	10075.	3800.	0.	3800.	17381.	72.	-2888.	5516.	68.
17	4569.	4633.	9471.	3800.	0.	3800.	17353.	68.	-2233.	6172.	64.
18	4612.	4916.	9798.	3750.	0.	3750.	17485.	69.	-2344.	6147.	65.
19	3971.	5384.	9634.	3700.	0.	3700.	17766.	67.	-2056.	6662.	63.
20	4239.	5302.	9798.	3700.	0.	3700.	18238.	66.	-2031.	7040.	61.
21	4513.	4955.	9714.	3650.	0.	3650.	18439.	65.	-1917.	7315.	60.
22	4458.	4401.	9102.	3600.	0.	3600.	18843.	60.	-1031.	8501.	55.
23	4449.	4529.	9226.	3600.	0.	3600.	19038.	60.	-1024.	8652.	55.
24	4439.	4643.	9318.	3550.	0.	3550.	19075.	60.	-996.	8697.	54.
25	4425.	4898.	9562.	3500.	0.	3500.	19377.	60.	-1138.	8785.	55.
26	4390.	4216.	8830.	3450.	0.	3450.	19528.	56.	-276.	9738.	50.
27	4121.	5086.	9445.	3450.	0.	3450.	20161.	56.	-422.	10013.	50.
28	3378.	4958.	8577.	3400.	0.	3400.	20217.	52.	343.	10870.	46.
29	3027.	3732.	7003.	3350.	0.	3350.	19659.	47.	1637.	11826.	40.
30	3222.	2926.	6379.	3300.	0.	3300.	19026.	45.	2204.	11917.	37.
31	3690.	2198.	6108.	3250.	229.	3021.	18841.	43.	2615.	12282.	35.
SUMMATION	135721.	151499.	294967.	117350.	229.	117121.	600969.		-49957.	256441.	
AVERAGE	4378.	4887.	9515.	3785.	7.	3778.	19386.	62.	-1612.	8272.	57.

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TABLE 3. MISSING DATA SUBSTITUTIONS

Input Data	Date(s)	Entry 1/	Substituted Entry 2/
Bear Creek - Lodi	2/15/84	NR	98
South Fork Putah Creek	7/16 - 8/8/84	NR	Flow = - 0.33(Time) + 21
Stockton Diverting Canal	1/18 - 2/2/84	NR	Flow = - 2(Time) + 35
	7/6 - 7/12/84	NR	2
	8/17 - 8/21/84	NR	5
	8/22 - 8/26/84	NR	4
	8/27 - 8/31/84	NR	3
	9/1 - 9/5/84	NR	2
	10/1 - 10/3/84	NR	3
Yolo Bypass - Woodland	5/3 - 9/30/84	Missing	Zero

1/ NR - no record.
2/ Rounded to nearest 1 cfs; time in days from first missing record.

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