

SUMMARY DOCUMENTATION OF
SEVERAL DATA BASES
OF HISTORICAL DELTA HYDROLOGY

Some Historical Delta Hydrology Data Bases

In addition to DAYFLOW data for historical Delta inflow and net Delta outflow, other data bases have been developed and are being used by Federal and State agencies. The computational schemes used to generate several of these data bases are documented herein to enable DAYFLOW data users to make proper comparisons.

The Interagency Data Management Technical Committee is conducting a more thorough comparison to document differences between the various data bases of net Delta outflow. This will allow better qualification of analyses made using net Delta outflow estimates from a particular data base.

Federal and State agencies will soon be analyzing Delta hydrologic data in preparation for the 1986 Decision 1485 hearings. In prior hearings, the use of different data bases made it difficult or impossible to compare and contrast exhibits submitted by the various agencies. With prior coordination among these agencies, this problem can be averted.

Informal and formal communications with the U. S. Bureau of Reclamation (Sheryl Baughman), Department of Fish and Game (Dan Odenweller), State Water Resources Control Board (Jim Sutton), and the Interagency Data Management Technical Committee indicate that agreement upon a common data base of historical Delta hydrology is urgently needed for interagency activities.

DAYFLOW Program Documentation for Calculating Historical Net Delta Outflow and Total Delta Inflow

Total Delta Inflow =

- Sacramento River flow at Freeport (at I Street Bridge, Sacramento through September 1979)
- + San Joaquin River flow at Vernalis
- + Consumnes River flow at Michigan Bar (previously at McConnell)
- + Mokelumne River flow at Woodbridge
- + Calaveras River flow at Stockton
- + Bear Creek flow at Lodi
- + Stockton Diverting Canal flow
- + French Camp Slough flow at French Camp
- + Marsh Creek flow at Byron (discontinued October 1983)
- + Yolo Bypass flow near Woodland

- + Sacramento Weir Spill
- + South Fork Putah Creek flow

Net Delta Outflow =

- Total Delta Inflow (see above)
- Delta Gross Channel Depletions (estimated values including Byron-Bethany Irrigation District diversion; Table 4)
- + Delta precipitation runoff estimate using Stockton Fire Station #4 data
- + Byron-Bethany Irrigation District diversion
- CVP Tracy pumping
- Contra Costa Canal pumping
- Clifton Court Inflow (from May 1971; SWP pumping plant from October 1967 through April 1971)
- Miscellaneous diversions/transfers (e.g., island flooding or pumpage)

It should be noted that precipitation runoff is subtracted from gross channel depletion giving an estimate of net channel depletions (actual water removed to meet consumptive needs) rather than being included in total Delta inflow.

Documentation of Historical
Net Delta Outflow as Calculated by
DWR Operation and Maintenance

O&M calculates daily mean net Delta outflow as follows:

Net Delta Outflow =

- Sacramento River flow at Freeport (0600 reading at I Street Bridge, Sacramento through September 1979)
- + San Joaquin River flow near Vernalis (0600 reading)
- + Sacramento Treatment Plant discharge (since January 1, 1983)
- CVP Tracy pumping
- Contra Costa Canal pumping
- Clifton Court Forebay inflow (SWP pumping plant diversion from October 1967 through April 1971)
- Net consumptive use estimate (see Table 7)
- + Byron-Bethany Irrigation District diversion (since April 1, 1980)

TABLE 7
NET DELTA WATER REQUIREMENTS (CONSUMPTIVE USE)
FEDERAL-STATE MEMORANDUM OF AGREEMENT DATED APRIL 9, 1969
(TABLE COMPUTED BY USBR-WPCD OCTOBER 1969)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	600	900	400	400	1,500	2,500	4,000	4,600	3,500	2,400	1,400	500
2	700	800	400	500	1,500	2,600	4,000	4,600	3,400	2,400	1,300	400
3	800	800	400	600	1,500	2,600	4,000	4,600	3,400	2,400	1,300	400
4	800	800	400	700	1,600	2,700	4,100	4,500	3,300	2,300	1,300	400
5	900	800	400	800	1,600	2,700	4,100	4,500	3,200	2,300	1,300	300
6	900	800	300	800	1,600	2,800	4,100	4,500	3,200	2,300	1,200	300
7	900	800	300	900	1,700	2,800	4,100	4,400	3,200	2,200	1,200	300
8	900	800	300	900	1,700	2,800	4,200	4,400	3,200	2,200	1,200	200
9	900	800	300	900	1,700	2,900	4,200	4,400	3,100	2,200	1,100	200
10	900	700	300	1,000	1,800	2,900	4,200	4,300	3,100	2,100	1,100	200
11	1,000	700	300	1,000	1,800	3,000	4,300	4,300	3,100	2,100	1,100	100
12	1,000	700	300	1,000	1,800	3,000	4,300	4,300	3,000	2,000	1,000	100
13	1,000	700	200	1,000	1,900	3,100	4,300	4,200	3,000	2,000	1,000	100
14	1,000	700	200	1,000	1,900	3,100	4,300	4,200	3,000	2,000	1,000	0
15	1,000	700	200	1,100	1,900	3,200	4,400	4,100	2,900	1,900	900	0
16	1,000	600	200	1,100	2,000	3,200	4,400	4,100	2,900	1,900	900	0
17	1,000	600	200	1,100	2,000	3,300	4,400	4,100	2,900	1,900	900	0
18	1,000	600	200	1,100	2,000	3,300	4,400	4,000	2,800	1,800	800	0
19	1,000	600	100	1,200	2,100	3,400	4,500	4,000	2,800	1,800	800	100
20	1,000	600	100	1,200	2,100	3,500	4,500	4,000	2,800	1,800	800	100
21	900	600	100	1,200	2,100	3,500	4,500	3,900	2,700	1,800	700	100
22	900	600	100	1,200	2,200	3,500	4,500	3,900	2,700	1,700	700	100
23	900	500	100	1,300	2,200	3,600	4,500	3,800	2,700	1,700	700	100
24	900	500	100	1,300	2,200	3,600	4,600	3,800	2,600	1,600	700	200
25	900	500	0	1,300	2,300	3,700	4,600	3,800	2,600	1,600	600	200
26	900	500	0	1,300	2,300	3,700	4,600	3,700	2,600	1,600	600	200
27	900	500	0	1,400	2,300	3,800	4,600	3,700	2,500	1,500	500	200
28	900	500	100	1,400	2,400	3,800	4,600	3,600	2,500	1,500	500	200
29	900	500	100	1,400	2,400	3,800	4,600	3,600	2,500	1,500	500	300
30	900	500	200	1,500	2,500	3,900	4,600	3,600	2,400	1,500	500	300
31	900	500	300	1,500	2,500	3,900	4,600	3,500	2,400	1,400	500	400
Mean	-28,200	-18,700	-5,200	34,600	61,100	96,300	135,100	127,000	87,700	59,500	27,700	1,000
Acres-												
Feet	-56,000	-37,000	-10,000	63,000	121,000	191,000	268,000	252,000	174,000	118,000	55,000	2,000

- Sacramento River flow at Freeport for a particular day is taken as the previous mean daily flow as measured by the USGS acoustic velocity meter (AVM) at Freeport (an averaging technique is used if the AVM was out of service, see the Operations Control Branch Standing Operating Order Number PC700.23, July 1, 1982 for details).
- The estimates obtained using the equation presented above are published in the following reports:
 - Dispatcher's Daily Report (6 a.m.) - daily
 - Summary of Daily Operational Report - monthly
 - Delta Outflow Index - monthly table
 - State Water Project Operations Data - monthly report
 - State Water Project Annual Report of Operations
 - DWR Bulletin 132, Appendix E, "Management of California State Water Project, Water Operation in the Sacramento-San Joaquin Delta"
- DWR, O&M calculate two other estimates of net Delta outflow:
 1. The value presented above plus Sacramento Weir and Freemont Weir (inclusion of Yolo Bypass flow addition). These estimates of net Delta outflow are reported in a monthly table titled Delta Outflow Index With Bypass.
 2. The value presented in the above plus Sacramento Weir, Freemont Weir and Cache Creek flow at Rumsey (refinement of Yolo Bypass flow estimate). These estimates of net Delta outflow are published by the O&M Water Quality Section in the following reports:
 - Daily Delta Water Quality Conditions
 - Water Quality at Selected Delta Stations (formerly "Delta Water Quality Compliance Report")
- Values for Sacramento Weir, Freemont Weir and Cache Creek at Rumsey are obtained from DWR Flood Management.
- For details contact DWR, O&M Project Records and Reports at (916) 324-9687 and O&M Water Quality at (916) 324-0072.

Documentation of Historical
Net Delta Outflow as Calculated by
USBR Central Valley Operation

CVOP calculates daily mean net Delta outflow as follows:

Net Delta Outflow =

Sacramento River flow at Freeport (0600 reading at I Street Bridge, Sacramento through September 1979)

+ San Joaquin River flow near Vernalis (0600 reading)

+ Sacramento Treatment Plant discharge (since January 1, 1983)

- CVP Tracy pumping
- Contra Costa Canal pumping
- Clifton Court Forebay inflow (SWP pumping plant diversion from October 1967 through April 1971)
- Net consumptive use estimate (see Table 8)
- + Byron-Bethany Irrigation District diversion (since April 1980)
- Sacramento River flow at Freeport (see above, NOTES on O&M's NET DELTA OUTFLOW ESTIMATES).
- The estimates obtained using the equation presented in the above are published in a monthly report entitled "State Federal Sacramento-San Joaquin Delta Daily Operations".
- The values for net Delta outflow currently reported in EPA's data base STORET are determined using Sacramento River flow at Sacramento I Street Bridge (6 a.m. instantaneous flow). NDO estimates determined using Sacramento River flow at Freeport as reported by CVOP will be entered into STORET in the future. For details, contact CVOP in Sacramento, CA at (916) 978-5221.

Documentation of Historical Flow to Delta
Available for Consumptive Use and Salinity Control as
Reported by the USBR (Water Years 1923-24 through 1957-58)

Flow to the Delta available for consumptive use and salinity control for water years 1923-24 to 1957-58 is shown in Table 9. As footnoted on the table, the monthly mean values were calculated as follows:

Total Delta Inflow =

- Sacramento River flow at Sacramento
- + Yolo Bypass flow near Woodland
- + Putah Creek flow near Davis
- + Cosumnes River flow at McConnell
- + Dry Creek flow near Galt
- + Mokelumne River flow at Woodbridge
- + Stockton Diverting Canal flow at Stockton
- + San Joaquin River flow near Vernalis
- Contra Costa Canal pumping

TABLE 8
NET DELTA WATER REQUIREMENTS (CONSUMPTIVE USE)
FEDERAL-STATE MEMORANDUM OF AGREEMENT DATED APRIL 9, 1969
(TABLE COMPUTED BY USBR-WPCD OCTOBER 1969)

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	600	900	400	400	1,500	2,500	4,000	4,600	3,500	2,400	1,400	500
2	700	800	400	500	1,500	2,600	4,000	4,600	3,400	2,400	1,300	400
3	800	800	400	600	1,500	2,600	4,000	4,600	3,400	2,400	1,300	400
4	800	800	400	700	1,600	2,700	4,100	4,500	3,300	2,300	1,300	400
5	900	800	400	800	1,600	2,700	4,100	4,500	3,300	2,300	1,300	300
6	900	800	300	800	1,600	2,800	4,100	4,500	3,200	2,300	1,200	300
7	900	800	300	900	1,700	2,800	4,100	4,400	3,200	2,200	1,200	300
8	900	800	300	900	1,700	2,800	4,200	4,400	3,200	2,200	1,200	200
9	900	800	300	900	1,700	2,900	4,200	4,400	3,100	2,200	1,100	200
10	900	700	300	1,000	1,800	2,900	4,200	4,300	3,100	2,100	1,100	200
11	1,000	700	300	1,000	1,800	3,000	4,300	4,300	3,100	2,100	1,100	100
12	1,000	700	300	1,000	1,800	3,000	4,300	4,300	3,000	2,000	1,000	100
13	1,000	700	200	1,000	1,900	3,100	4,300	4,200	3,000	2,000	1,000	100
14	1,000	700	200	1,000	1,900	3,100	4,300	4,200	3,000	2,000	1,000	0
15	1,000	700	200	1,100	1,900	3,200	4,400	4,100	2,900	1,900	900	0
16	1,000	600	200	1,100	2,000	3,200	4,400	4,100	2,900	1,900	900	0
17	1,000	600	200	1,100	2,000	3,300	4,400	4,100	2,800	1,800	800	0
18	1,000	600	200	1,100	2,000	3,300	4,400	4,000	2,800	1,800	800	0
19	1,000	600	100	1,200	2,100	3,400	4,500	4,000	2,800	1,800	800	100
20	1,000	600	100	1,200	2,100	3,500	4,500	4,000	2,800	1,800	800	100
21	900	600	100	1,200	2,100	3,500	4,500	3,900	2,700	1,800	700	100
22	900	600	100	1,200	2,200	3,500	4,500	3,900	2,700	1,700	700	100
23	900	500	100	1,300	2,200	3,600	4,500	3,800	2,700	1,700	700	100
24	900	500	100	1,300	2,200	3,600	4,600	3,800	2,600	1,600	600	200
25	900	500	0	1,300	2,300	3,700	4,600	3,700	2,600	1,600	600	200
26	900	500	0	1,300	2,300	3,700	4,600	3,700	2,500	1,600	600	200
27	900	500	0	1,400	2,300	3,800	4,600	3,700	2,500	1,600	600	200
28	900	500	100	1,400	2,400	3,800	4,600	3,600	2,500	1,500	500	200
29	900	500	100	1,400	2,400	3,800	4,600	3,600	2,500	1,500	500	300
30	900	500	200	1,500	2,500	3,900	4,600	3,600	2,400	1,500	500	300
31	900	500	300	1,500	2,500	3,900	4,600	3,500	2,400	1,400	500	400
Mean	-28,200	-18,700	-5,200	31,600	61,100	96,300	135,100	127,000	87,700	59,500	27,700	1,000
Acres- feet	-56,000	-37,000	-10,000	63,000	121,000	191,000	268,000	252,000	174,000	118,000	55,000	2,000

TABLE 9
FLOW TO DELTA (TAF)*
1923 - 1924 to 1957 - 1958
AVAILABLE FOR CONSUMPTIVE USE AND SALINITY CONTROL

WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1923-24	624	499	551	617	1254	579	622	350	113	77	105	183	5574
1924-25	375	790	1083	1088	5632	2587	3995	3475	1422	441	227	334	21449
1925-26	522	597	824	738	4598	1796	4052	1385	367	144	141	309	15473
1926-27	462	1253	2834	2502	7180	4822	4951	3392	2219	591	299	388	30893
1927-28	564	1397	1306	1543	2605	5394	5165	2040	605	293	218	360	21490
1928-29	488	659	765	802	1384	1147	1048	1254	677	200	187	316	8927
1929-30	418	428	2422	2009	1857	3521	2127	1478	736	240	207	398	15841
1930-31	534	596	618	963	888	1058	493	291	133	0	38	188	5800
1931-32	293	418	1564	2157	2330	2222	2043	2981	2153	627	202	256	17246
1932-33	353	402	589	882	934	1612	1463	1334	1278	235	130	259	9471
1933-34	386	516	1030	2071	1625	1728	1063	483	240	86	92	214	9534
1934-35	325	842	796	2677	1675	2888	6960	4179	2264	459	243	345	23653
1935-36	548	568	722	3926	7362	4059	3698	2962	1869	478	243	366	26801
1936-37	461	487	628	807	3304	4835	4236	3811	1968	445	182	315	21479
1937-38	578	2461	6010	2462	10398	11602	7306	7341	4963	1589	534	515	55759
1938-39	719	888	1129	1052	1098	1636	1221	619	221	99	110	314	9106
1939-40	432	428	726	4016	5772	8658	7371	2945	1410	333	234	432	32757
1940-41	524	767	3672	7193	7616	7781	6709	5083	2927	1115	407	415	44209
1941-42	586	747	3758	5524	8662	3026	5117	4447	3490	1068	348	466	37239
1942-43	656	986	1928	5471	4422	6948	4413	2925	1727	433	265	387	30561
1943-44	617	675	782	947	1776	2214	1233	1702	761	246	229	381	11563
1944-45	428	1022	1439	1292	4405	2454	2267	2628	1639	634	494	588	19290
1945-46	759	1235	4539	4946	1771	2040	2408	2572	1086	484	464	582	22886
1946-47	653	939	1326	938	1555	2125	1576	778	546	318	355	474	11483
1947-48	661	820	1684	1586	827	1295	3577	3779	2719	676	545	678	18847
1948-49	744	806	998	899	941	3667	2132	1832	758	441	475	552	14245
1949-50	529	629	610	1807	2974	2145	2682	2316	1480	529	460	582	16743
1950-51	707	4162	7973	4749	5086	3294	1894	2270	886	556	588	642	32807
1951-52	720	986	2866	6498	5978	5304	6275	6650	4085	1318	645	728	42053
1952-53	690	768	2518	7076	2165	1637	1781	2321	2071	568	380	759	22734
1953-54	759	936	1038	1987	3843	3497	3389	1876	509	282	393	563	19072
1954-55	643	939	1686	1729	1018	858	731	1218	604	323	334	491	10574
1955-56	442	649	7362	11498	5696	3950	2272	3720	2243	743	599	855	40029
1956-57	897	1014	933	891	1268	3824	1151	2054	1112	339	408	638	14529
1957-58	1206	1249	1619	2571	9806	6590	8822	4922	3185	965	760	980	42675

*From Table 31 of USBR Report, Region 2, Division of Irrigation and Power Report of Operations, December 1960.

- CVP Tracy pumping
- 0.89 (diversions from Old River
 - + diversions from Tom Paine Slough
 - + diversions from the San Joaquin River from Stockton to Vernalis)

Values reported in Table 9 were calculated as described below:

- Water years 1923-24 through 1928-29 from State Division of Water Resources Bulletin 27, page 428.
- Water years 1929-30 through 1957-58 see above equation.