CVP/SWP Flood Control Reoperations

April 1997

CALFED BAY-DELTA PROGRAM

D-005995

D-005995

FC_OP2.XLS Speadsheet

Flood Control Transfer

CVP/SWP Spreadsheet Models

Background

The extreme floods of December 1996 prompted CALFED to investigate alternative means of providing additional flood control protection for Central Valley areas with a link to water development. The possibility of transferring flood control space from Shasta and Oroville to new offstream storage has been preliminarily investigated. The following is a proposed addition to the CALFED spreadsheet models to investigate such an alternative.

Model

Excel was used to develop the logic in a module called FC_OPS2.XLS. The THRDELT7.XLS module was used as a starting point, with the new logic being incorporated into it. This allows the user to investigate the expected side benefits of transferring CVP/SWP water into new offstream storage. Water transferred to offstream storage is monitored in FC_OPS2.XLS as one would keep an account ledger. When the CVP/SWP balance (owed) has been zeroed out, any remaining transferred, or banked storage, is develop as a new supply to supplement the new water developed from recovered spills and surpluses in CALFED alternatives.

Criteria

The following criteria has been used to evaluate the proposed alternative:

Shasta and Oroville will be allowed to transfer storage in the summer and fall months when lake levels are more than high enough to provide adequate temperature control in the Sacramento and Feather Rivers. Minimum target lake levels can be set in Criteria!$C67:D71. These minimum levels are coded to act as flood control limits, and, as such, will force water out of the respective Lake whether or not there is a place to "park" them.

The new "spill" will be transferred to offstream storage to the extent possible; limited by available storage space and by the conveyance limits set in Cells C62 and C62 for Shasta and Oroville respectively. The conveyance capacity for Shasta is the same facility used to pick up excess Sacramento River water in the previous versions of the spreadsheet models Criteria!$C21. Water transferred from Shasta is not subjected to the same pulse flow test as the new pumping. It is assumed that the Oroville facility is a new conveyance directly from Oroville to the offstream reservoir. Any water in excess of these transfer limits will remain in the river and flow into the Delta, where, if conditions permit, will be picked up at the south Delta CVP and SWP pumps.

Withdrawals from offstream storage to meet existing CVP and SWP needs are made in accordance with the targets set in Criteria!$C74:D80. Withdrawals are made to meet baseline CVP/SWP pumping. Such releases are not counted as new Delta

D-005997

inflow but only to replace the inflow that would have been ordinarily been released from Shasta and Oroville.

Withdrawal targets alone are not enough to protect against the occurrence of CVP/SWP shortages if the "summer" flood control levels are set too low at Shasta and Oroville. The ability to preserve the base CVP/SWP water supplies depends on the size of the offstream storage. Too little new offstream storage will result in spills that cannot be reregulated. Some of the spill is picked up in the Delta, but, some is not resulting in a baseline CVP/SWP shortage.

Analyses were done with three ranges of "summer" flood control targets, or, transfer targets referred to as 1) high, 2) medium, and, 3) low. The targets for Shasta and Oroville are shown in Table 1.

Table 1

Transfer Storage Targets for Shasta and Oroville (1000 AF)

Month	Shasta			Oroville		
	High	Medium	Low	High	Medium	Low
July	3950	3850	3750	3100	3000	2900
August	3300	3200	3100	2800	2700	2600
September	2800	2700	2600	2600	2500	2400
October	2500	2400	2300	2200	2100	2000
November	2400	2300	2200	2000	1900	1800

Results

Studies were run for each of the above targets with varying sizes of north of Delta offstream storage. Output from DWRSIM 472 B was used as input. The transfer targets were tested and provide a balancing of the "new" spills, distributing them fairly evenly over the summer and fall months to allow a steady benefit to the rivers and the Delta while reaching the Delta at times when most of the new inflow could be picked up at the Delta pumps, thus supplementing the development of new water in CALFED proposed alternatives.

As you would expect, the alternatives can be many. Eight runs were made with FC_OPS2.XLS. All eight included north of Delta offstream storage (NDSS), in-Delta surface storage (IDSS), and, south of Delta offstream storage (SDSS) Many others could be run quickly and efficiently.

D-005998

The eight studies analyzed for comparative purposes were:

Facilities including **NDSS = 3.0 MAF**, IDSS = 0.4 MAF, SDSS = 1.5 MAF

1. **Base run**. No reoperation of Shasta and Oroville.
2. Reoperation of Shasta and Oroville at **high** summer/fall flood control targets.
3. Reoperation of Shasta and Oroville at **medium** summer/fall flood control targets.
4. Reoperation of Shasta and Oroville at **low** summer/fall flood control targets.

Facilities including **NDSS = 2.0 MAF**, IDSS = 0.4 MAF, SDSS = 1.5 MAF

5. **Base run**. No reoperation of Shasta and Oroville.
6. Reoperation of Shasta and Oroville at **high** summer/fall flood control targets.
7. Reoperation of Shasta and Oroville at **medium** summer/fall flood control targets.
8. Reoperation of Shasta and Oroville at **low** summer/fall flood control targets.

All studies were done with the criteria set as follows:

1. Conveyance for Sacramento River operations set at 5000 CFS, a single conveyance facility shared between Shasta storage transfers and the pumping of spills and surpluses. Shasta transfers were not subjected to the Sacramento river pulse flow requirement. Normal spill and surplus water picked up for storage in offstream facility were subjected to the following test. Flow in the preceding month at Butte City must equal or exceed 1.0 MAF; total of flow in the preceding two months must equal or exceed 1.5 MAF.

2. Conveyance for Oroville transfers was set at 5000 CFS.

3. The storing and allocation of new water in the NDSS was shared 50:50 between water supply and environmental supply. Water supply targets were unmet CVP/SWP demands, as before. The environmental targets were set at minimum Delta outflows of 12,000 CFS, January through June.

4. The storage and allocation of new water in the IDSS was shared between environmental and water supply purposes. Added Delta outflow was given first priority with allocation to water supply when storages on the first of each month were at or above June 1st (360 TAF), July 1st (320 TAF), August 1st (280 TAF), September 1st (240 TAF), and October 1st (200 TAF). Only the amount above these targets was available for water supply. This insures carryover for Delta outflow the following year if a dry year occurs.

5. The storage and allocation of new water in the SDSS was shared 50:50 between water supply and environmental. Environmental targets were added Delta outflow as both NDSS and IDSS with the added outflow made available through base south Delta pumping replaced by withdrawals from SDSS to meet base CVP/SWP demands.

Results are summarized in Table 2. The table presents the new water development for water supply and environmental purposes, for the eight alternatives. Also shown are the impacts to CVP/SWP base water supply for the three ranges of summer/fall flood control transfers for each of the scenarios as well as the minimum size of NDSS required to avoid any loss to CVP/SWP yield.

Following Table 2 are a series of graphs for each scenario that depict:

1. Monthly storages for Shasta, before and after reoperation for the period 1963 through 1992 (3 graphs) along with the before and after spills. (Other periods could be demonstrated. These were shown to present examples of output.)

2. The 71 year (1922 - 1992) average shift in spills for Shasta.

3. Monthly storages for Oroville, before and after reoperation for the period 1963 through 1992 (3 graphs) along with the before and after spills.

4. The 71 year (1922 - 1992) average shift in spills for Oroville.

5. A time series (1922 - 1992) plot of storage in NDSS.

6. A time series (1922 - 1992) plot of storage in IDSS.

7. A time series (1922 - 1992) plot of storage in SDSS.

8. A bar chart depicting the annual delivery of new water supply matched against the target demand. (Summary data displayed.)

9. A bar chart depicting the annual delivery of supplemental Delta outflow matched against the target demand. (Summary data displayed.)

In summary, there does appear to be potential for reoperations of Shasta and Oroville to both reduce flooding in some months of some years, while contributing to the development of new supplies. This would, however, require the construction of a new regulatory facility in the Sacramento Valley of from 2 to 2.5 MAF according to the findings of this study.

Table 2
Results

Facility	Water Supply				Environmental			
	Base	Reoperate High	Reoperate Medium	Reoperate Low	Base	Reoperate High	Reoperate Medium	Reoperate Low
	(Average TAF/Yr 1922-1992)				(Average TAF/Yr 1922-1992)			
North of Delta Surface Storage (3.0 MAF)	239	258	254	245	196	193	187	181
In-Delta Surface Storage (0.4 MAF)	87	91	93	96	79	79	81	84
South of Delta Surface Storage (1.5 MAF)	101	103	105	106	47	47	49	50
Interruptable	146	186	193	198				
CVP/SWP Shortage	N/A	0	0	0				
Net Supply	573	638	645	645	322	319	317	315
Net Supply(w/o Interrupt)	427	452	452	447				
North of Delta Surface Storage (2.0 MAF)	214	209	192	171	171	157	149	139
In-Delta Surface Storage (0.4 MAF)	88	103	116	128	80	81	85	88
South of Delta Surface Storage (1.5 MAF)	101	107	108	111	47	50	51	55
Interruptable	147	194	200	205				
CVP/SWP Shortage	N/A	-8	-82	-247				
Net Supply (Total)	550	605	534	368	298	288	285	282
Net Supply(w/o Interrupt)	403	411	334	163				

	Reoperate High	Reoperate Medium	Reoperate Low
Offstream Storage need for zero CVP/SWP Shortage (1,000 AF)	2,063	2,263	2,463

Graphs -- Base Case

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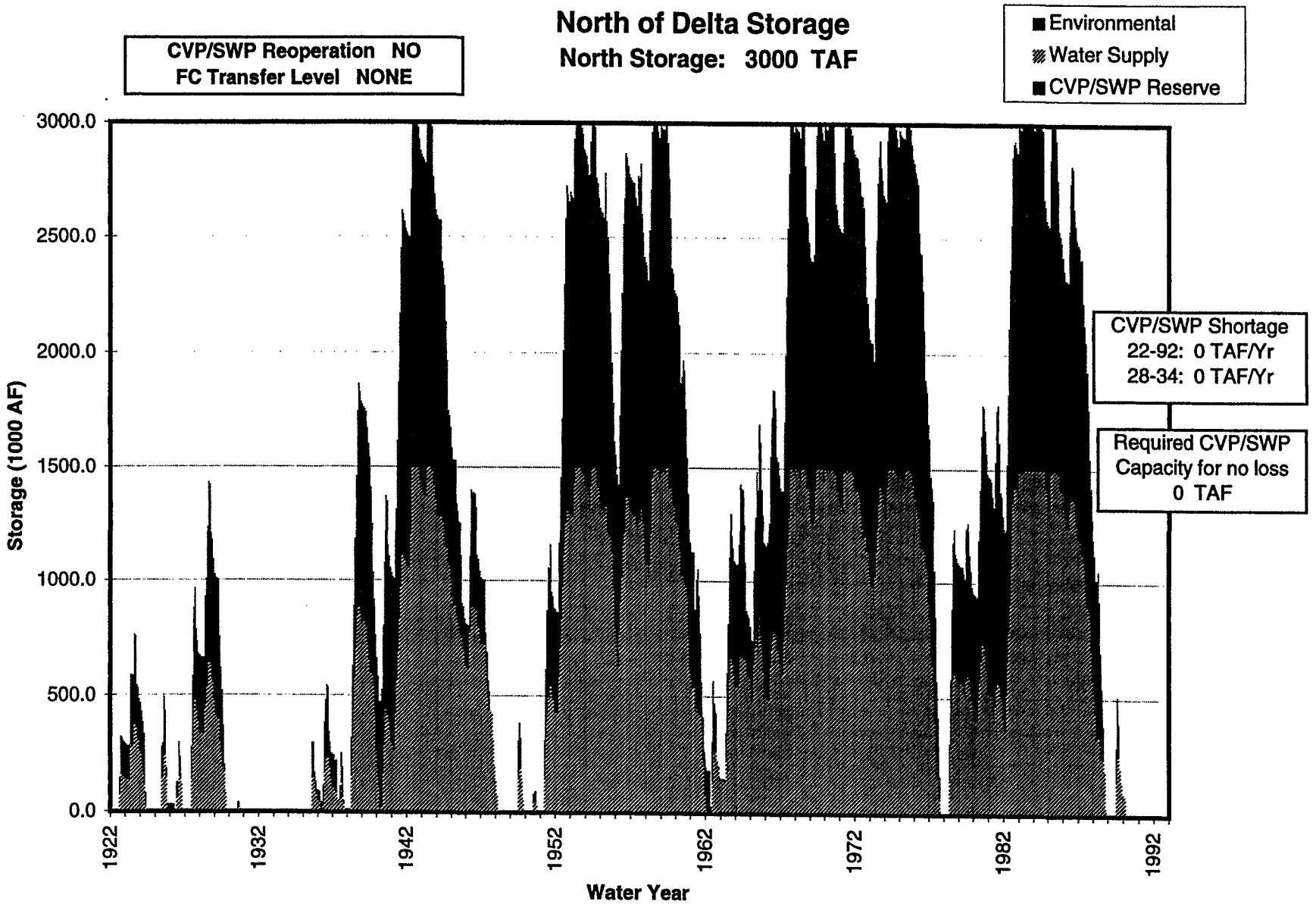

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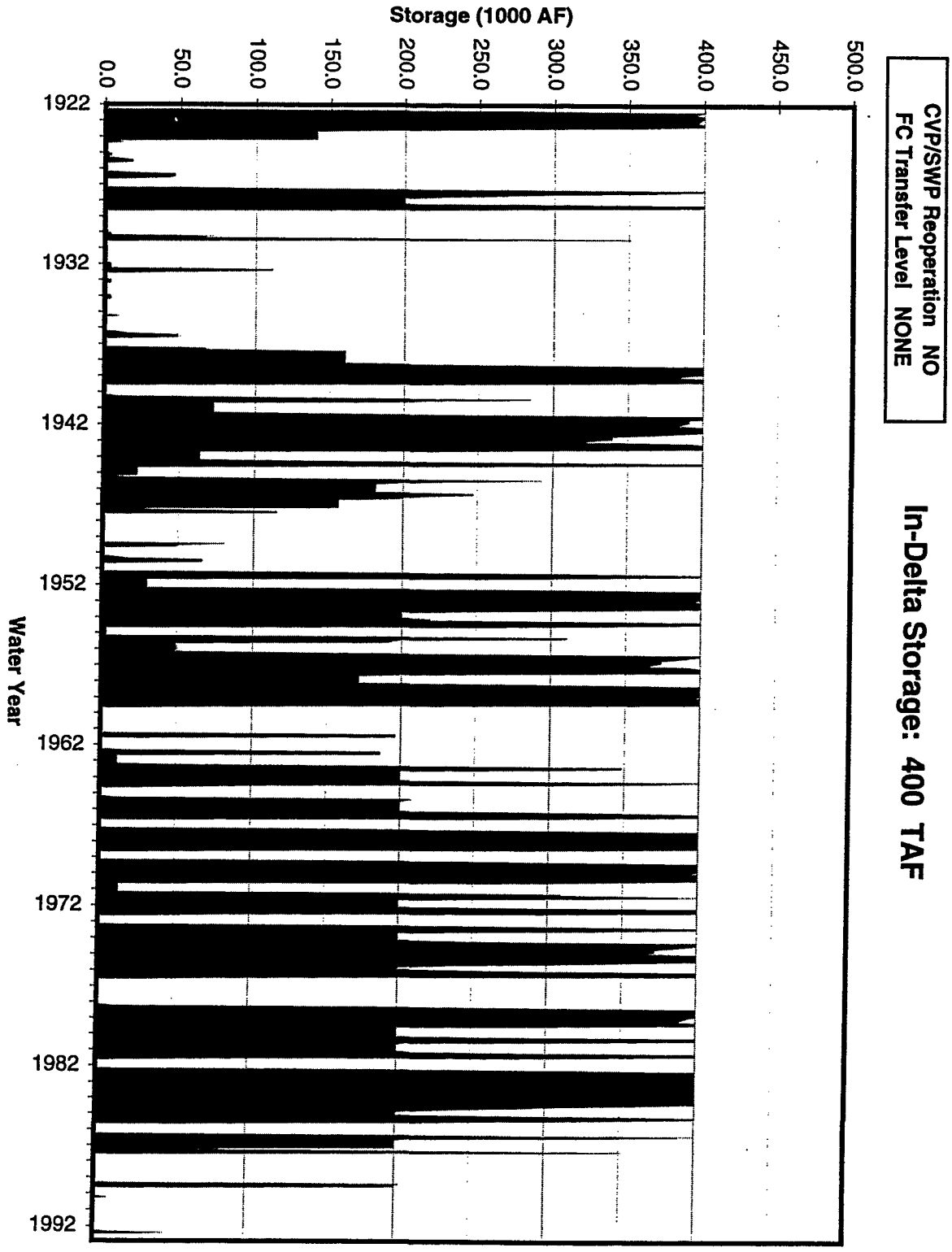

In-Delta Storage: 400 TAF

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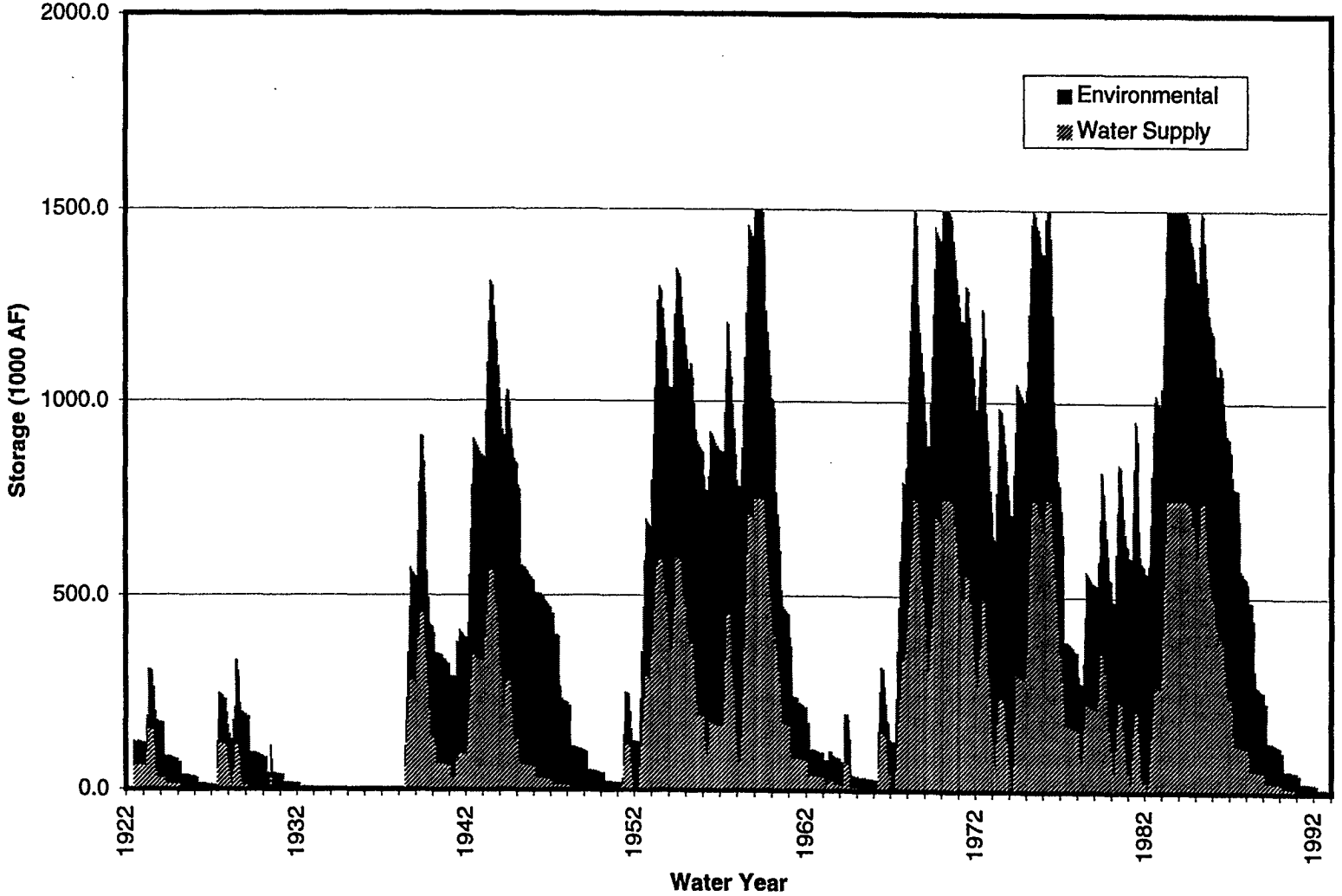
CVP/SWP Reoperation NO
FC Transfer Level NONE

South Offstream Storage

South Storage: 1500 TAF



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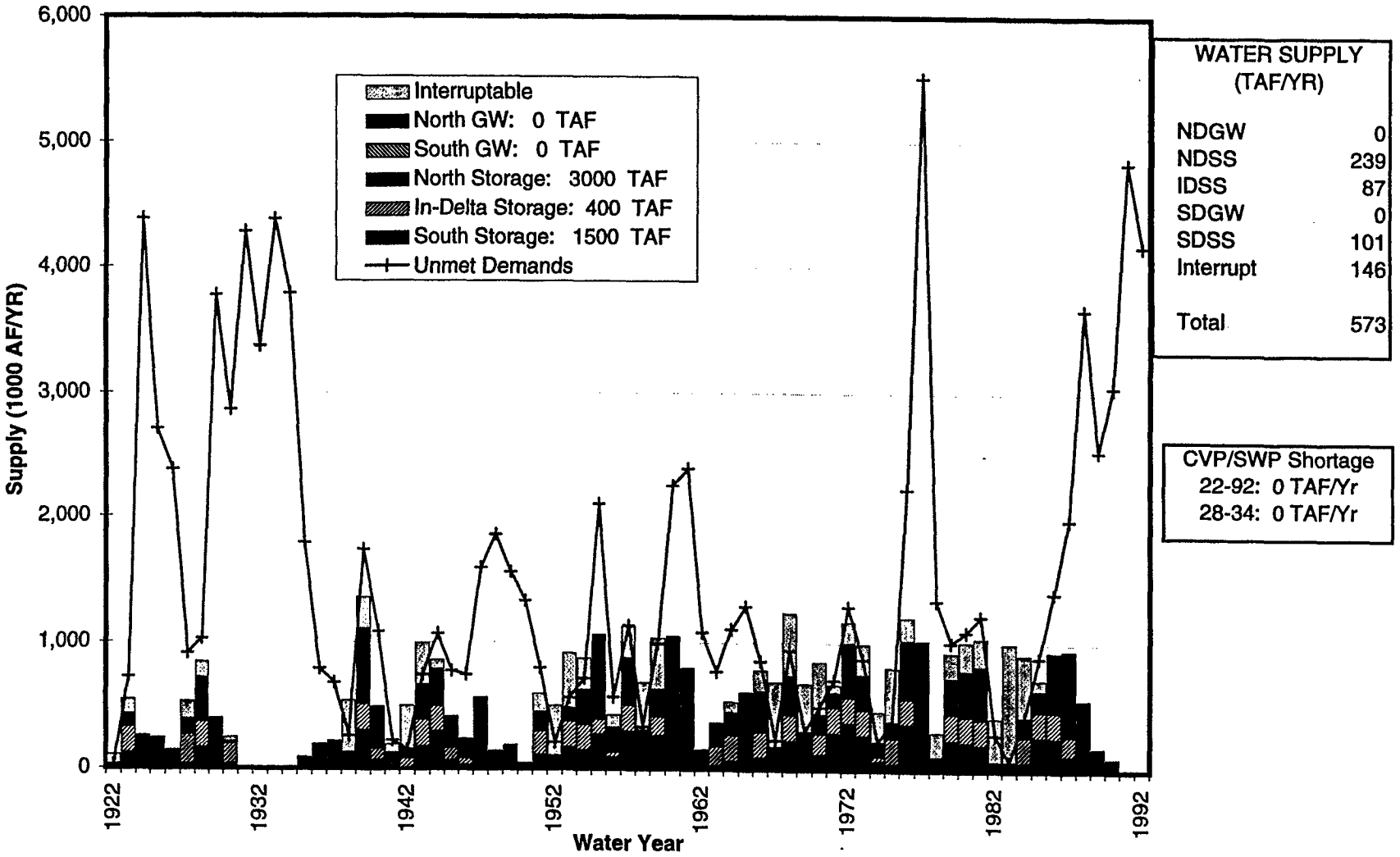
Water Supply Opportunities

CVP/SWP Reoperation NO
FC Transfer Level NONE

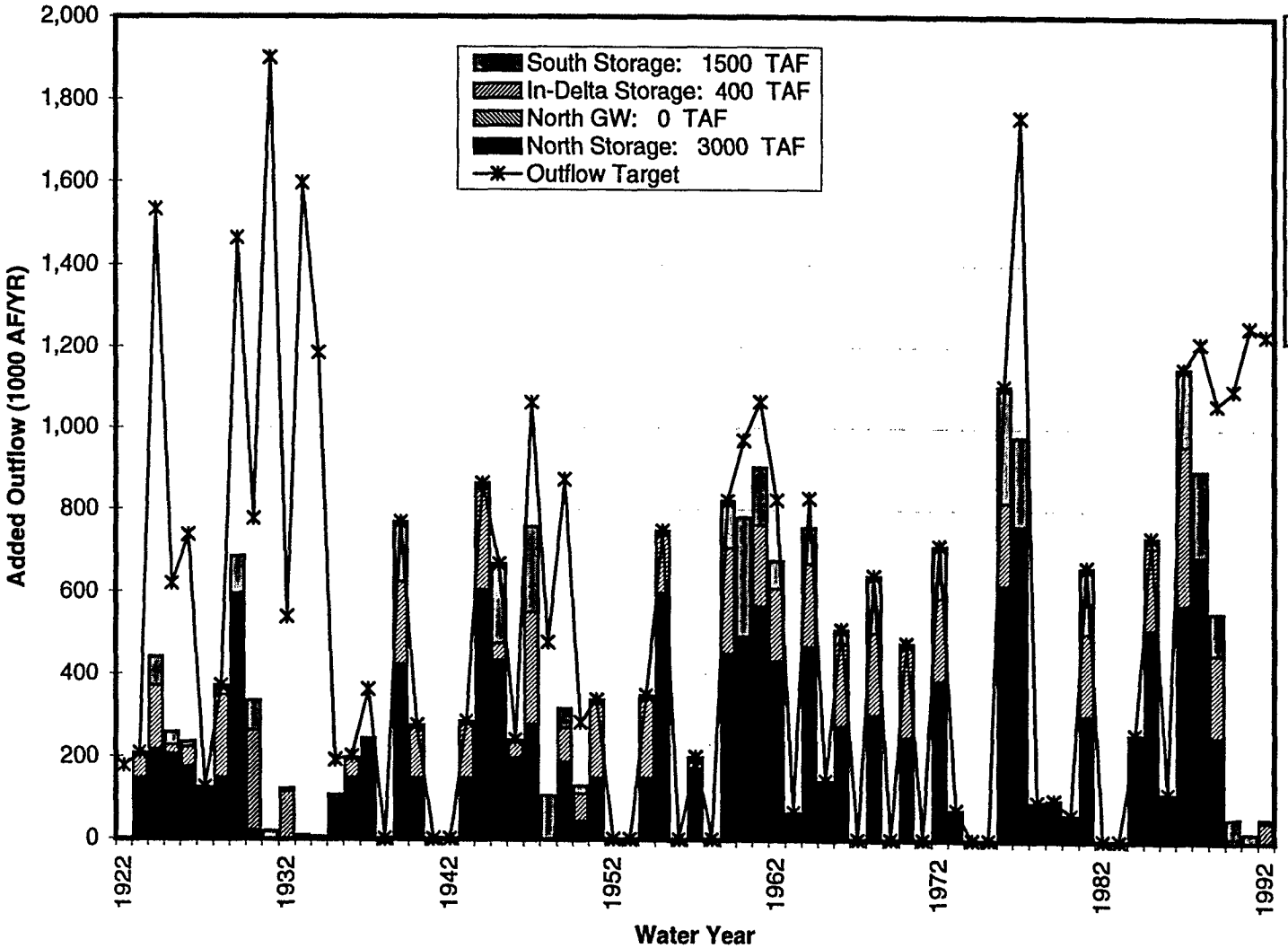


WATER SUPPLY (TAF/YR)	
NDGW	0
NDSS	239
IDSS	87
SDGW	0
SDSS	101
Interrupt	146
Total	573

CVP/SWP Shortage
22-92: 0 TAF/Yr
28-34: 0 TAF/Yr

CVP/SWP Reoperation NO
FC Transfer Level NONE

Supplemental Delta Outflow



ADDED OUTFLOW (TAF/YR)	
NDGW	0
NDSS	196
IDSS	79
SDSS	47
Total	321

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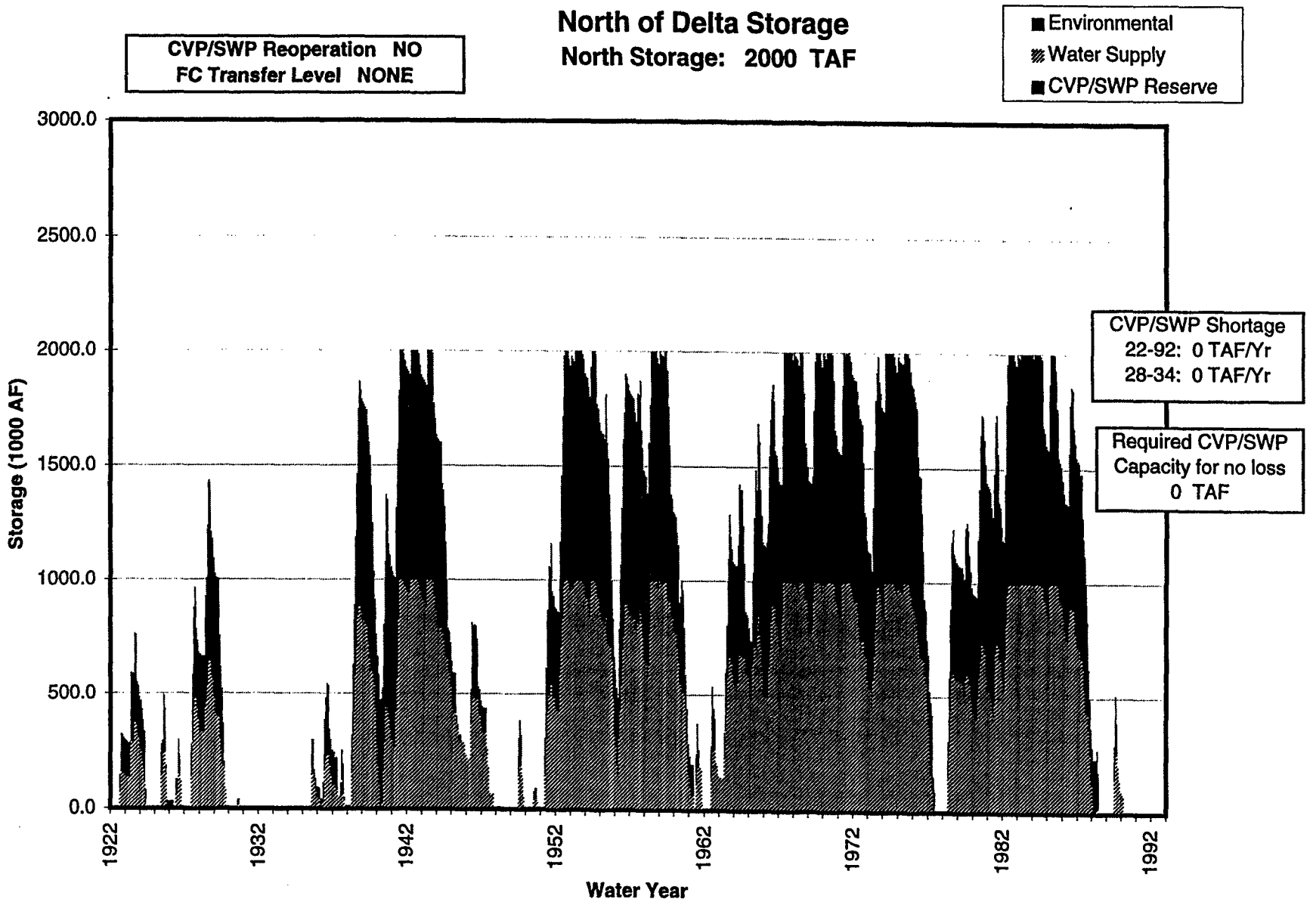

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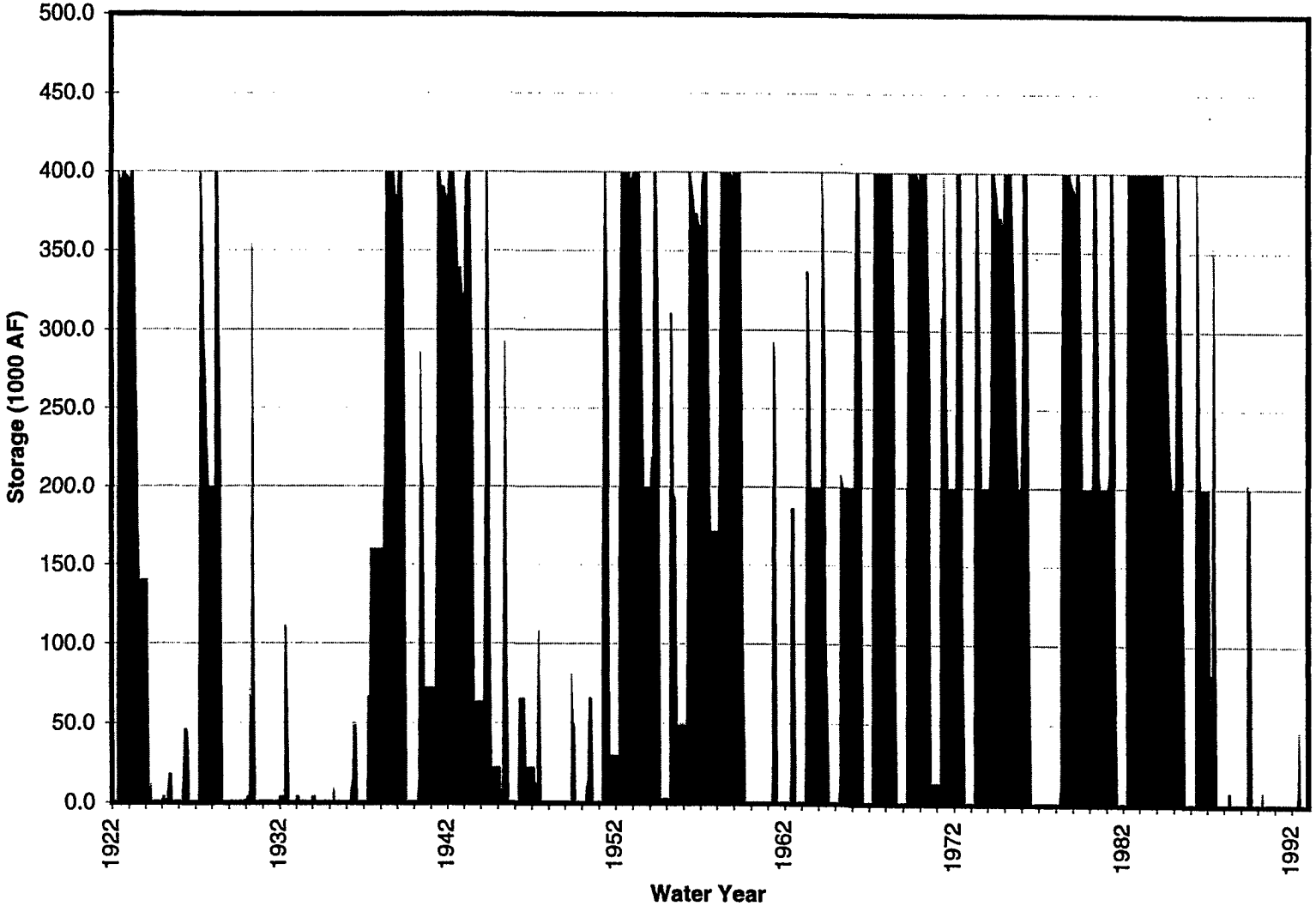
CVP/SWP Reoperation NO
FC Transfer Level NONE

In-Delta Storage: 400 TAF



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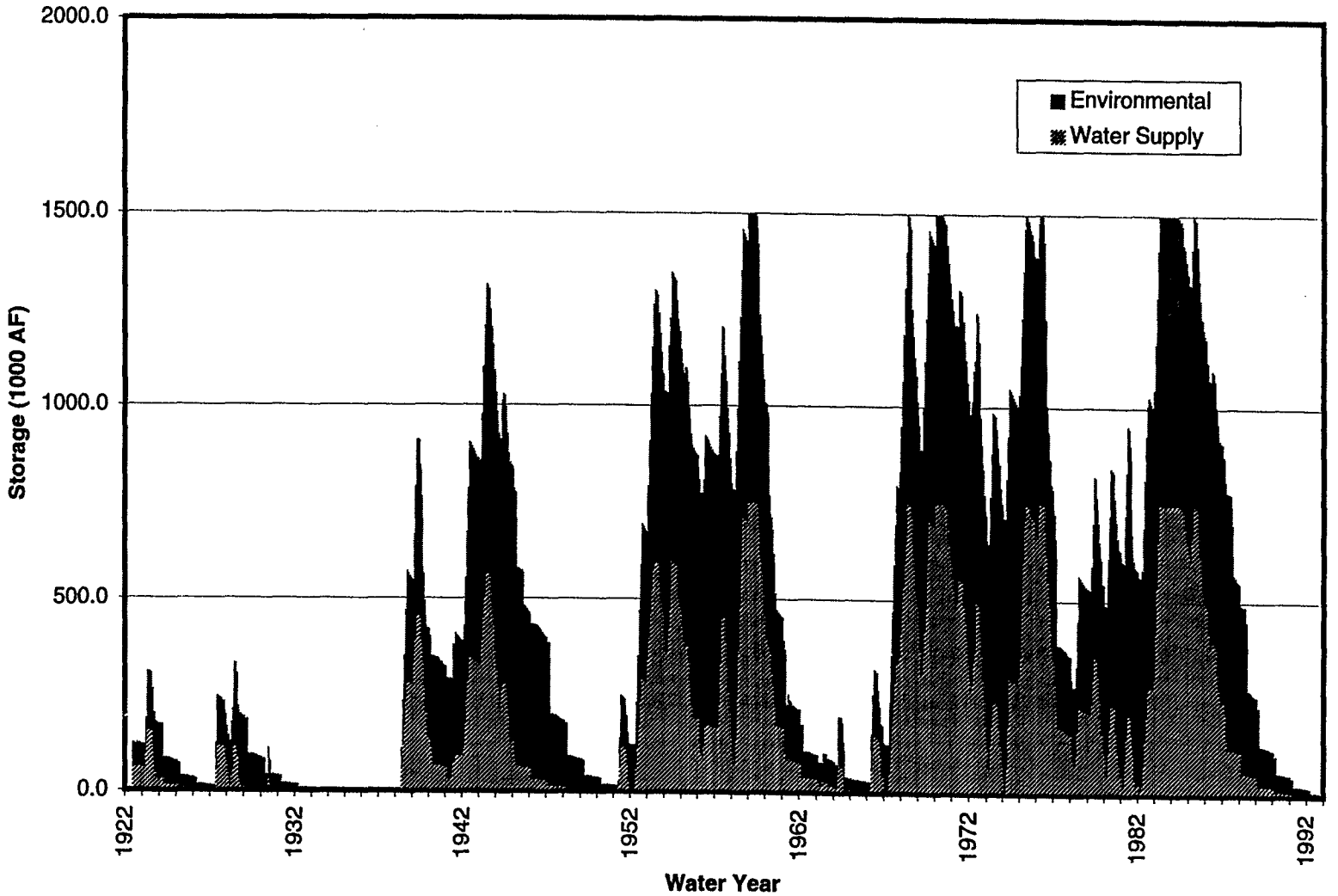
D-006009

CVP/SWP Reoperation NO
FC Transfer Level NONE

South Offstream Storage

South Storage: 1500 TAF



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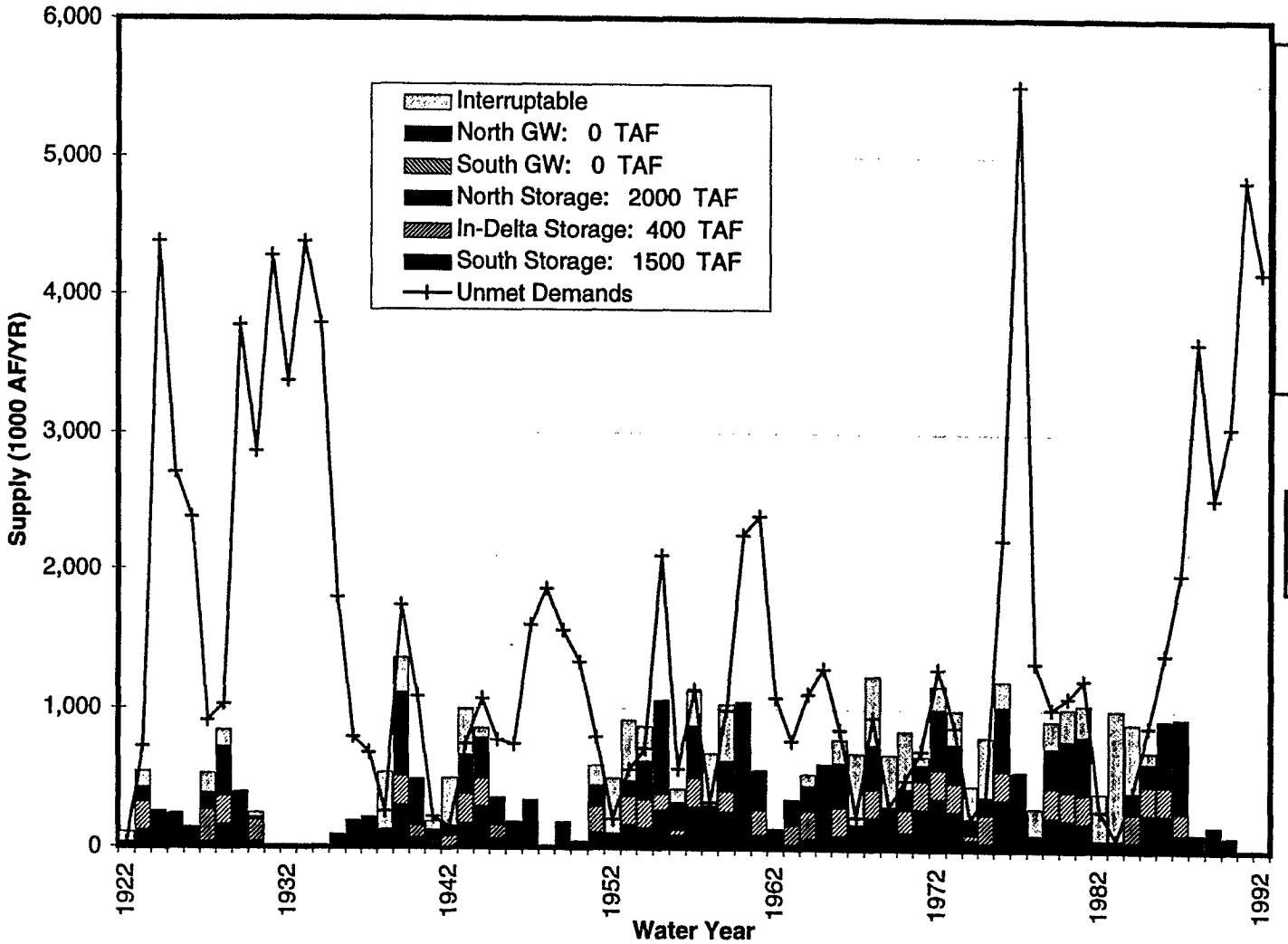
Water Supply Opportunities

CVP/SWP Reoperation NO
FC Transfer Level NONE



WATER SUPPLY (TAF/YR)	
NDGW	0
NDSS	214
IDSS	88
SDGW	0
SDSS	101
Interrupt	147
Total	550

CVP/SWP Shortage
22-92: 0 TAF/Yr
28-34: 0 TAF/Yr

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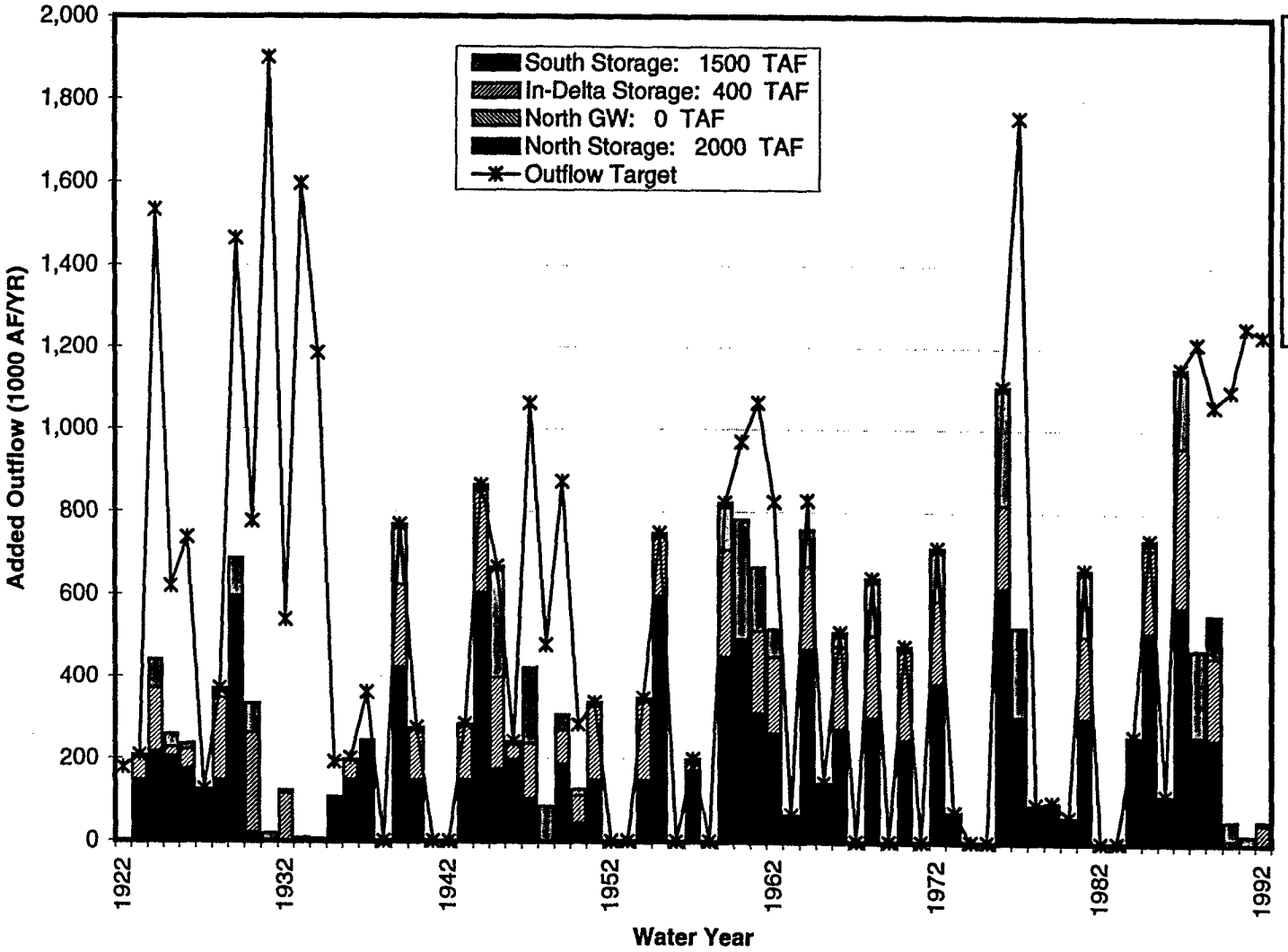
CVP/SWP Reoperation NO
FC Transfer Level NONE

Supplemental Delta Outflow



ADDED OUTFLOW (TAF/YR)	
NDGW	0
NDSS	171
IDSS	80
SDSS	47
Total	298

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Graphs -- Reoperation

NDSS 3.0 MAF

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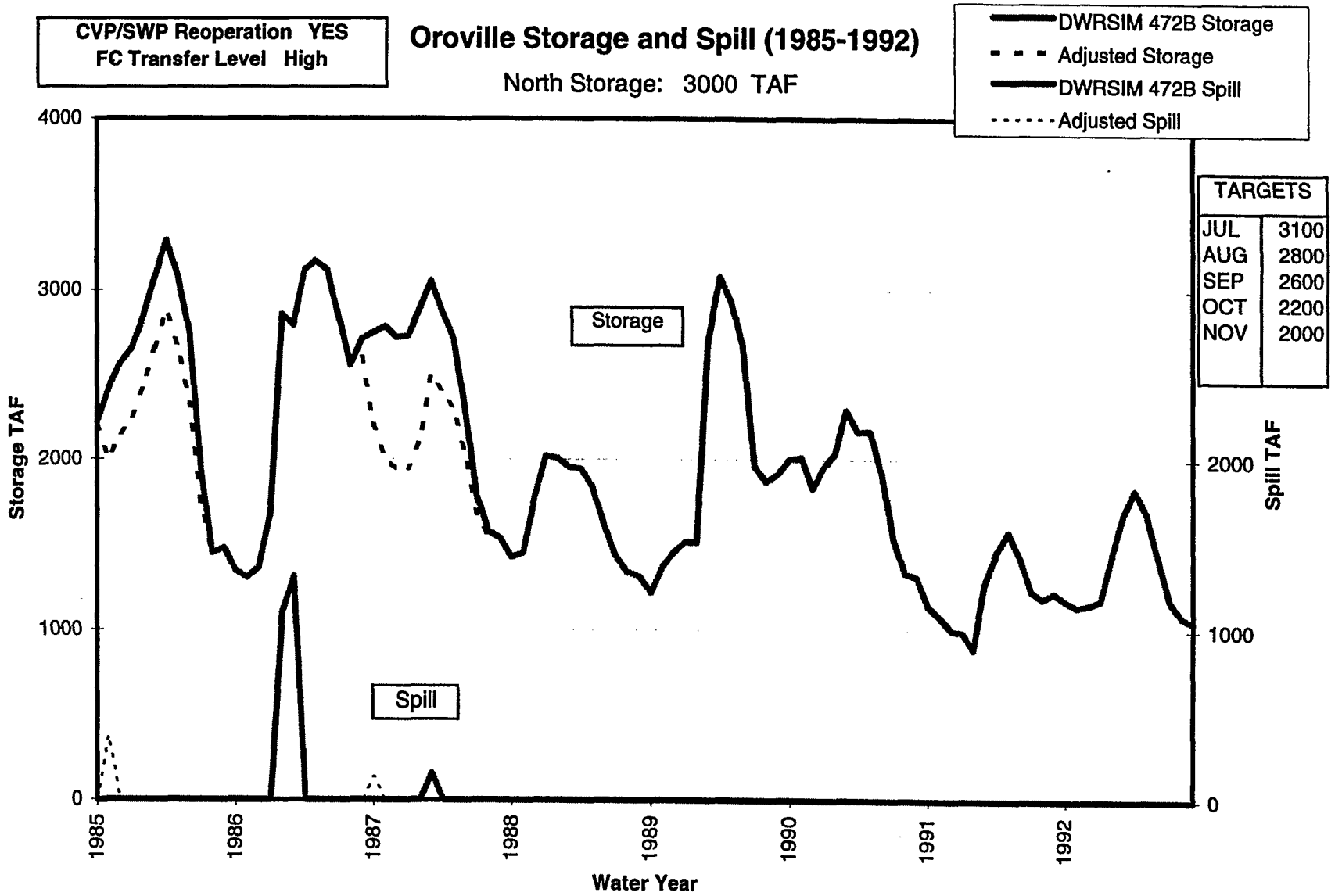
CVP/SWP Reoperation YES
FC Transfer Level High

Oroville Storage and Spill (1985-1992)

North Storage: 3000 TAF



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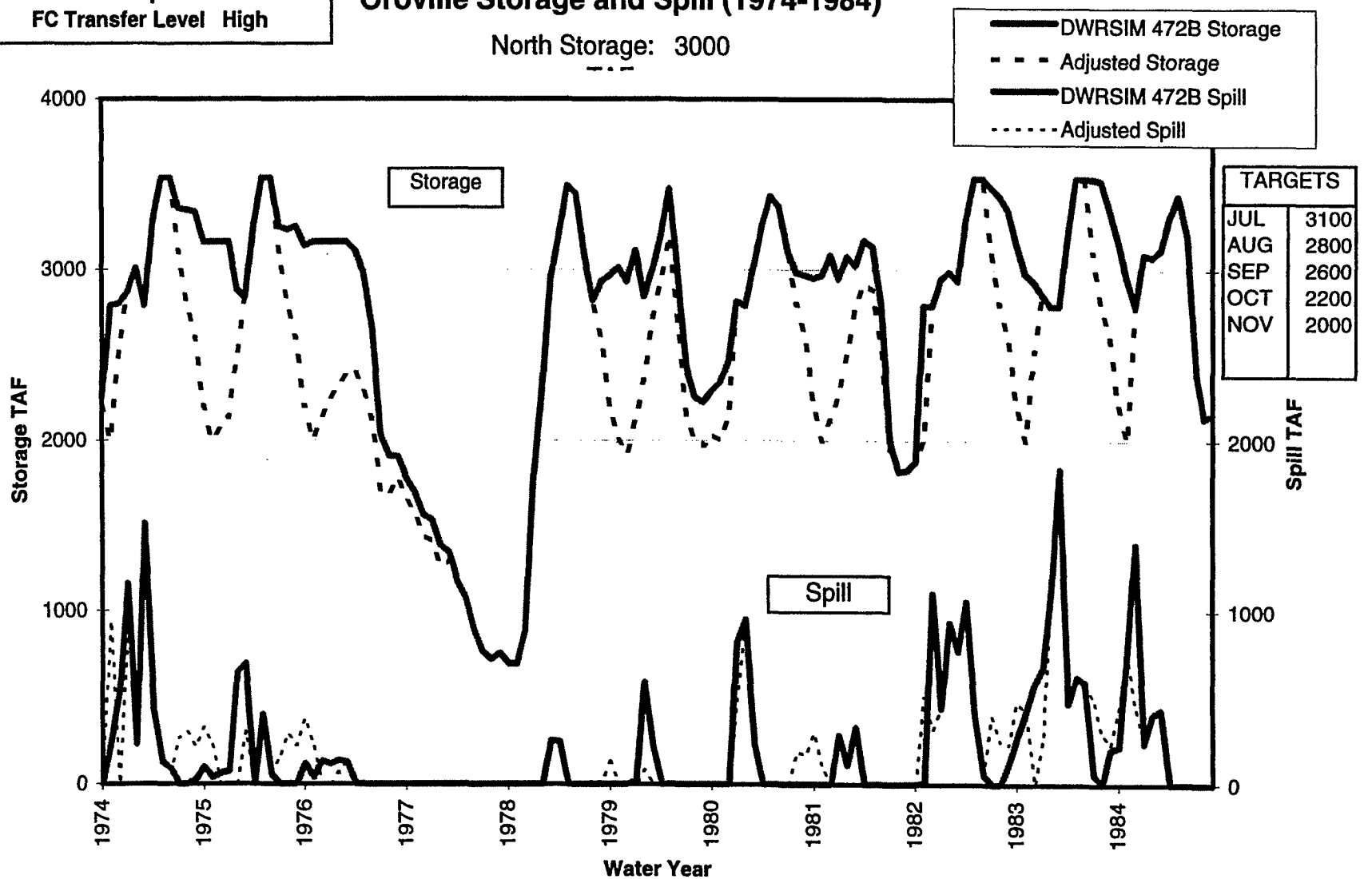
CVP/SWP Reoperation YES
FC Transfer Level High

Oroville Storage and Spill (1974-1984)

North Storage: 3000



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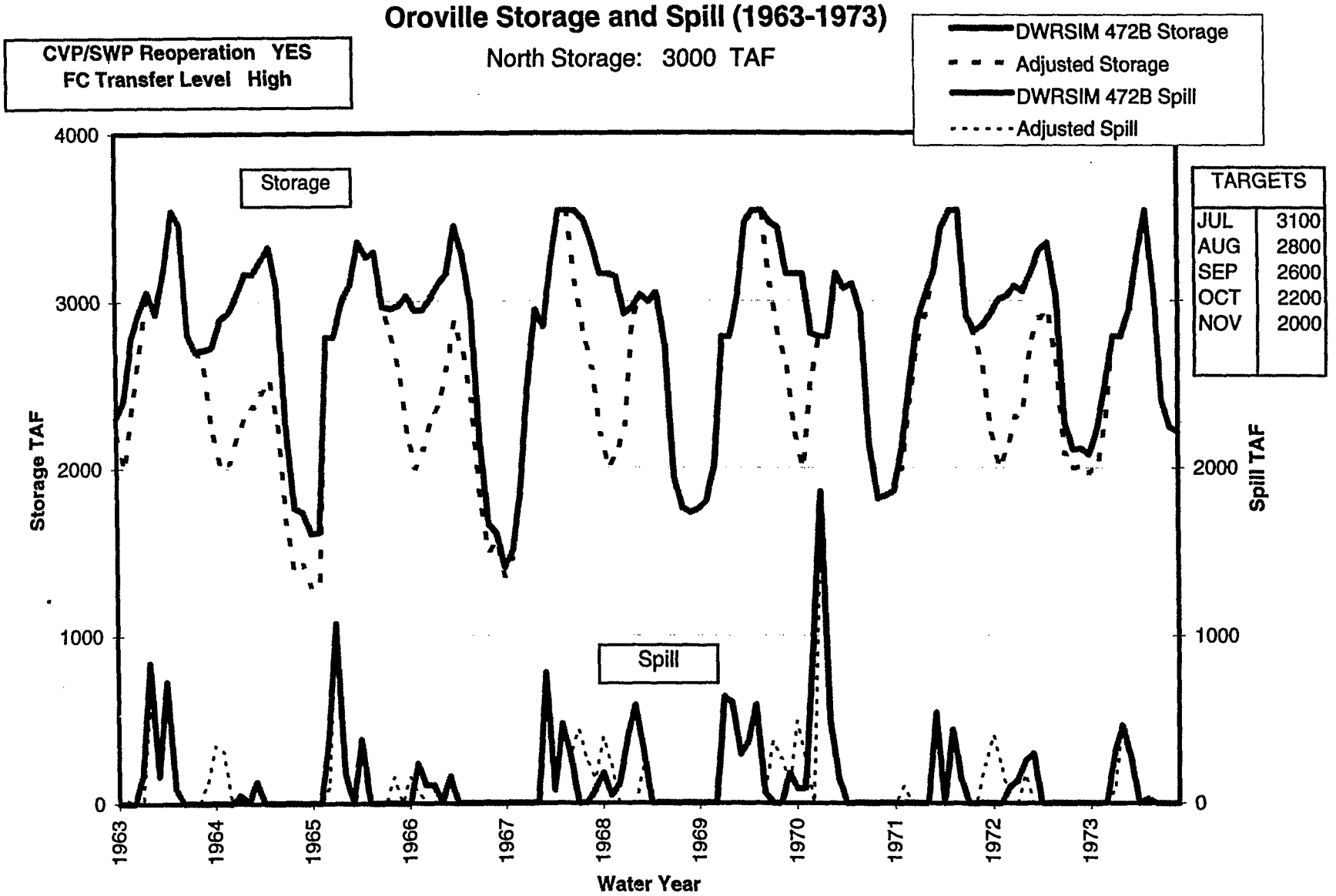

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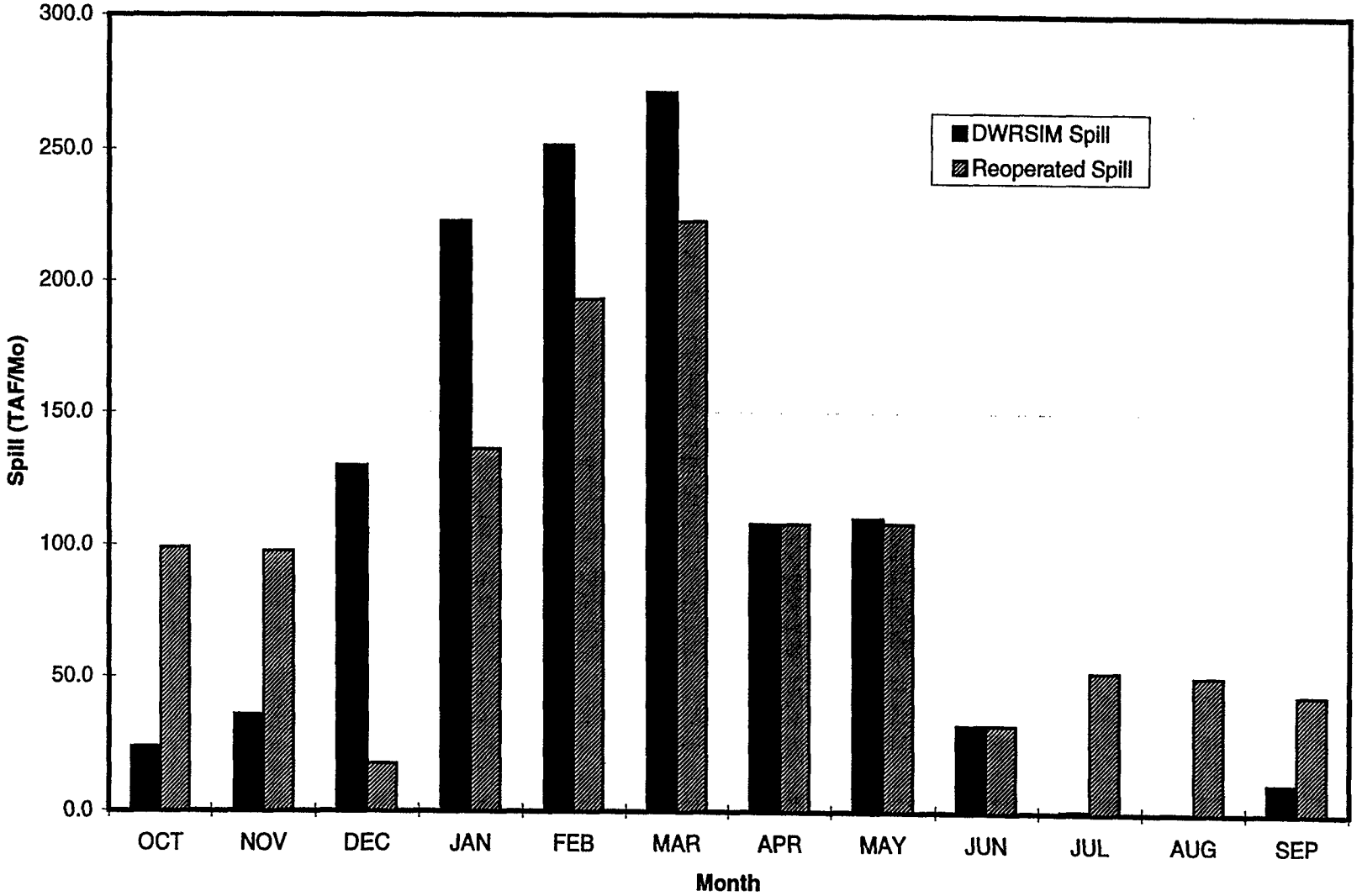
CVP/SWP Reoperation YES
FC Transfer Level High

Oroville Spills -- Average for 1922-1992



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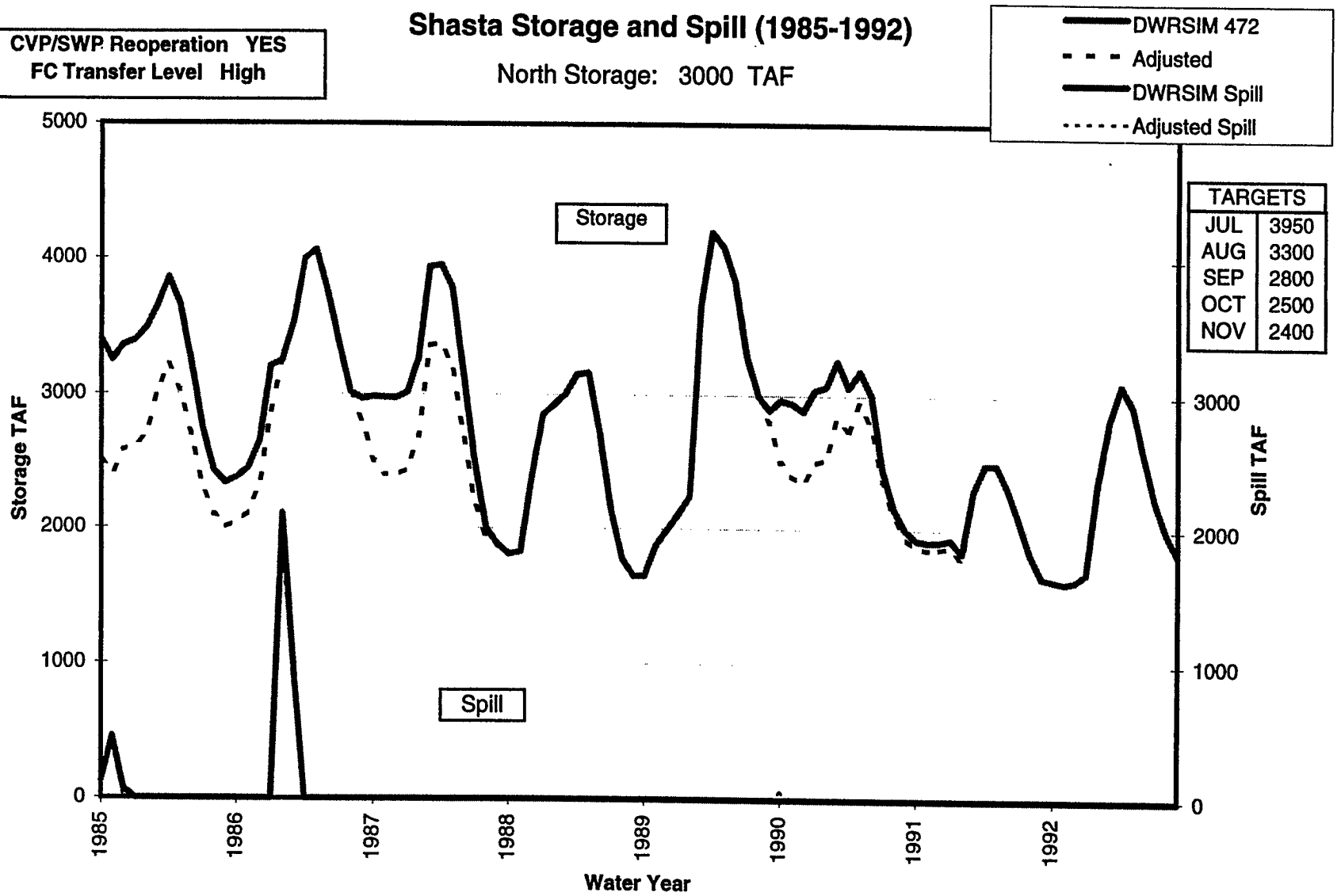
CVP/SWP Reoperation YES
FC Transfer Level High

Shasta Storage and Spill (1985-1992)

North Storage: 3000 TAF



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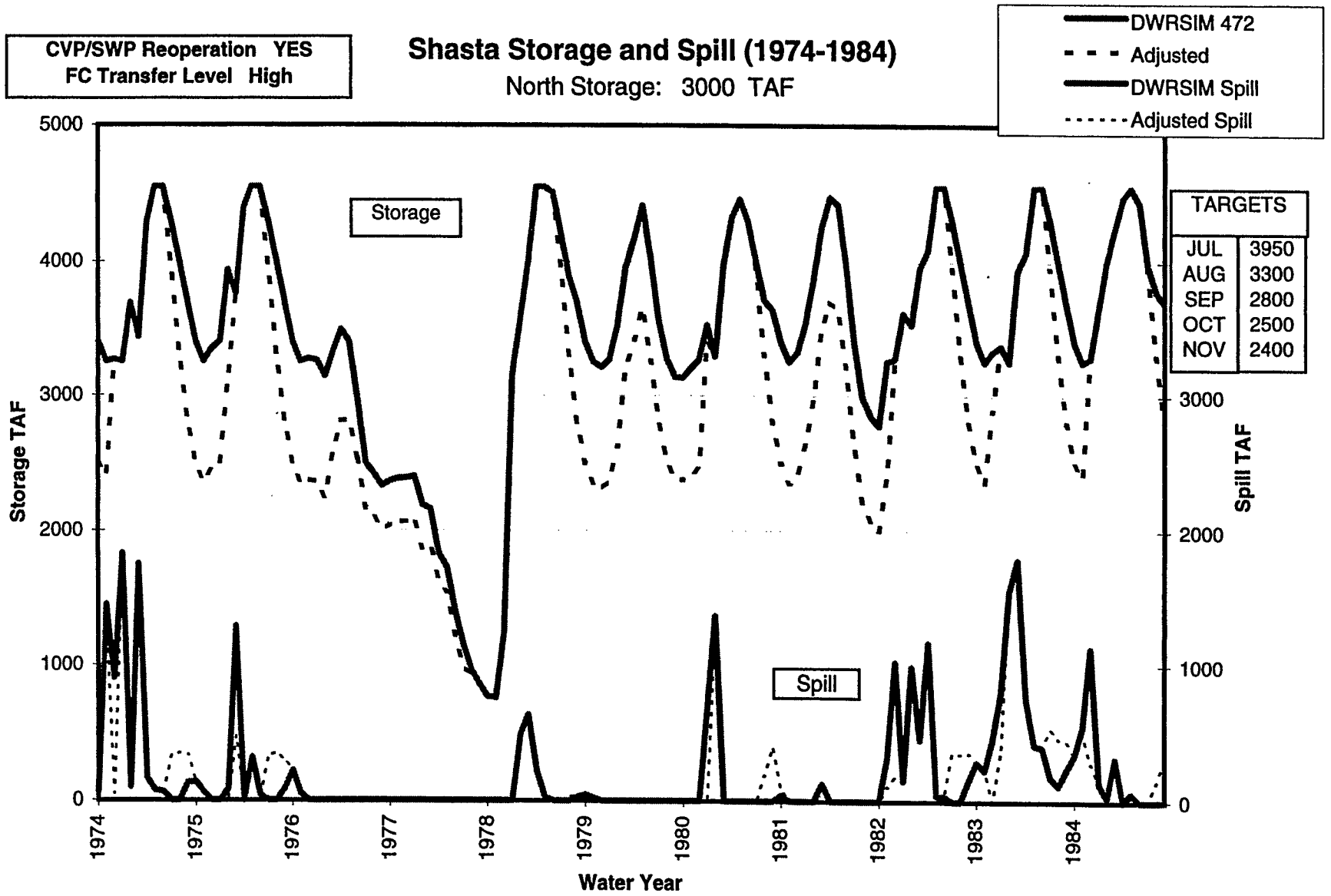
CVP/SWP Reoperation YES
FC Transfer Level High

Shasta Storage and Spill (1974-1984)

North Storage: 3000 TAF



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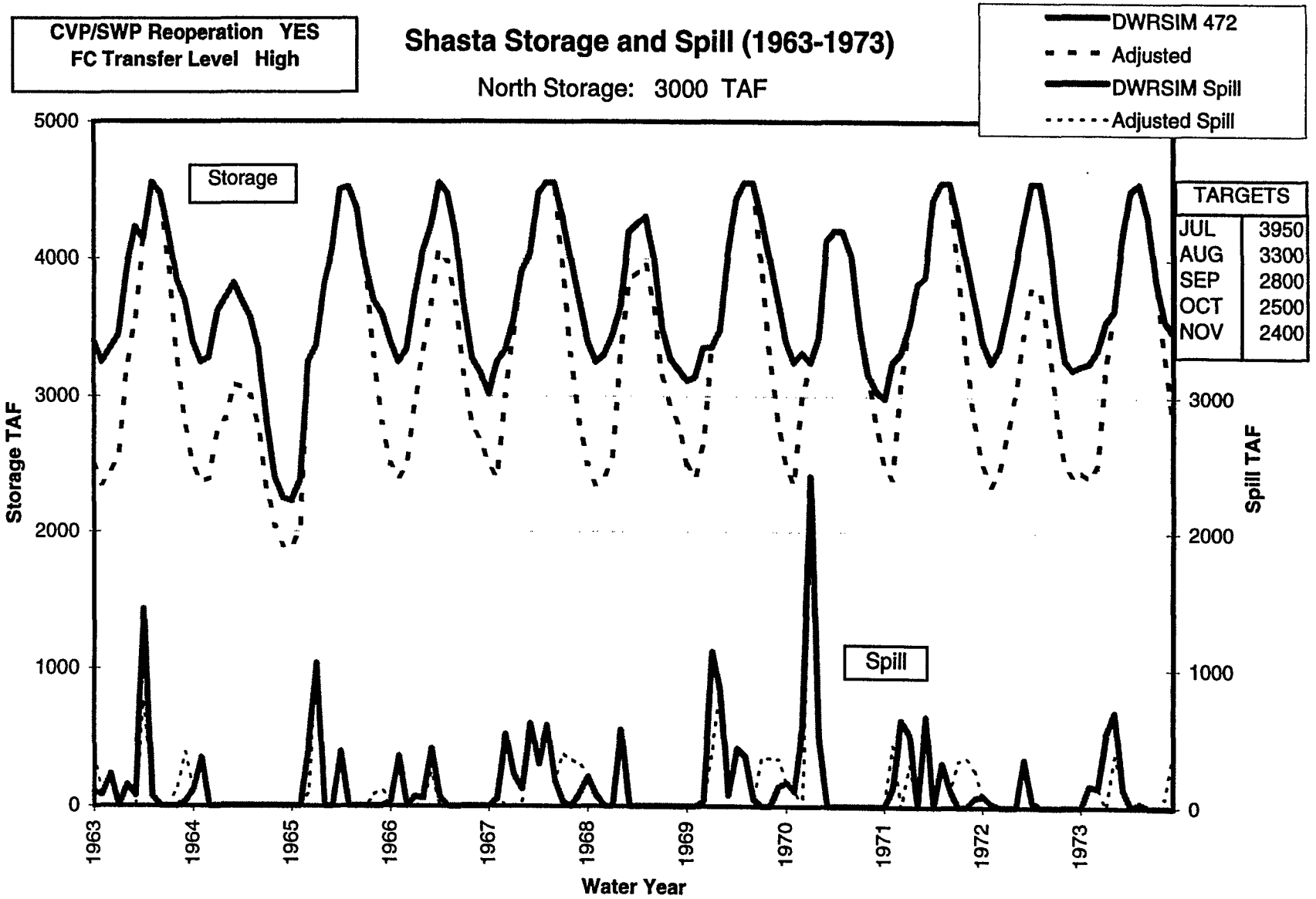

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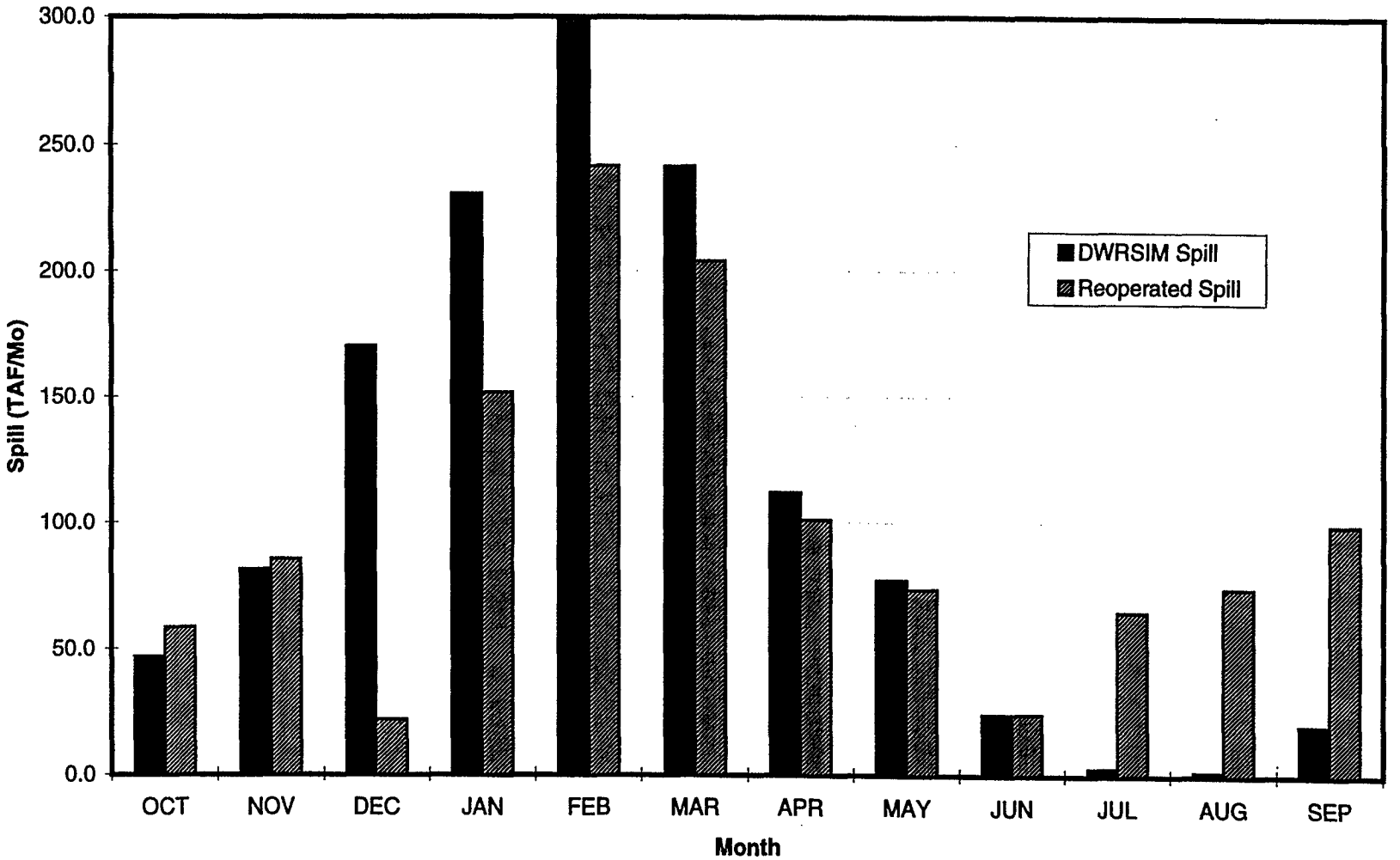
CVP/SWP Reoperation YES
FC Transfer Level High

Shasta Spill -- Average of 1922-1992



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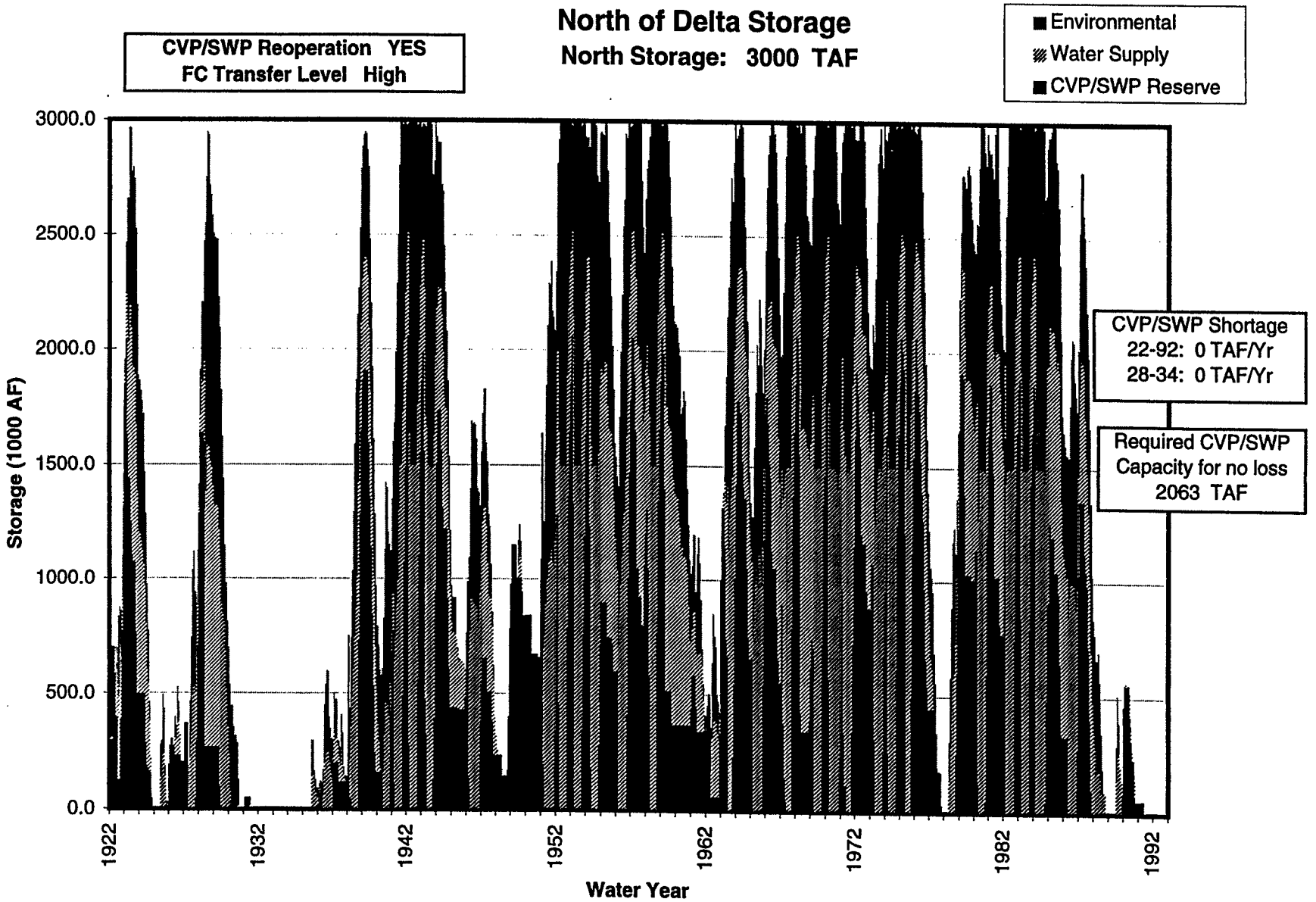

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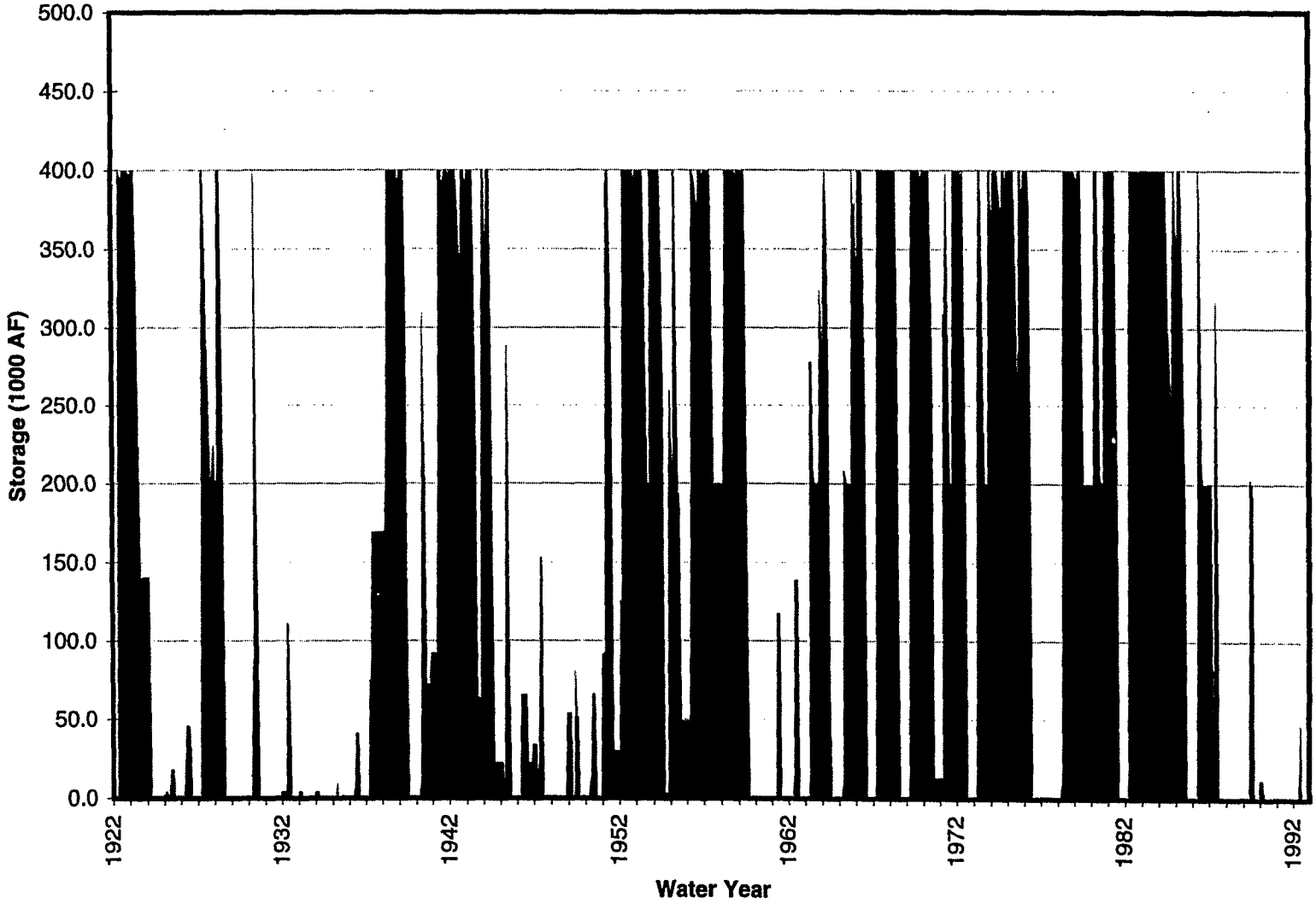
D-006022

CVP/SWP Reoperation YES
FC Transfer Level High

In-Delta Storage: 400 TAF



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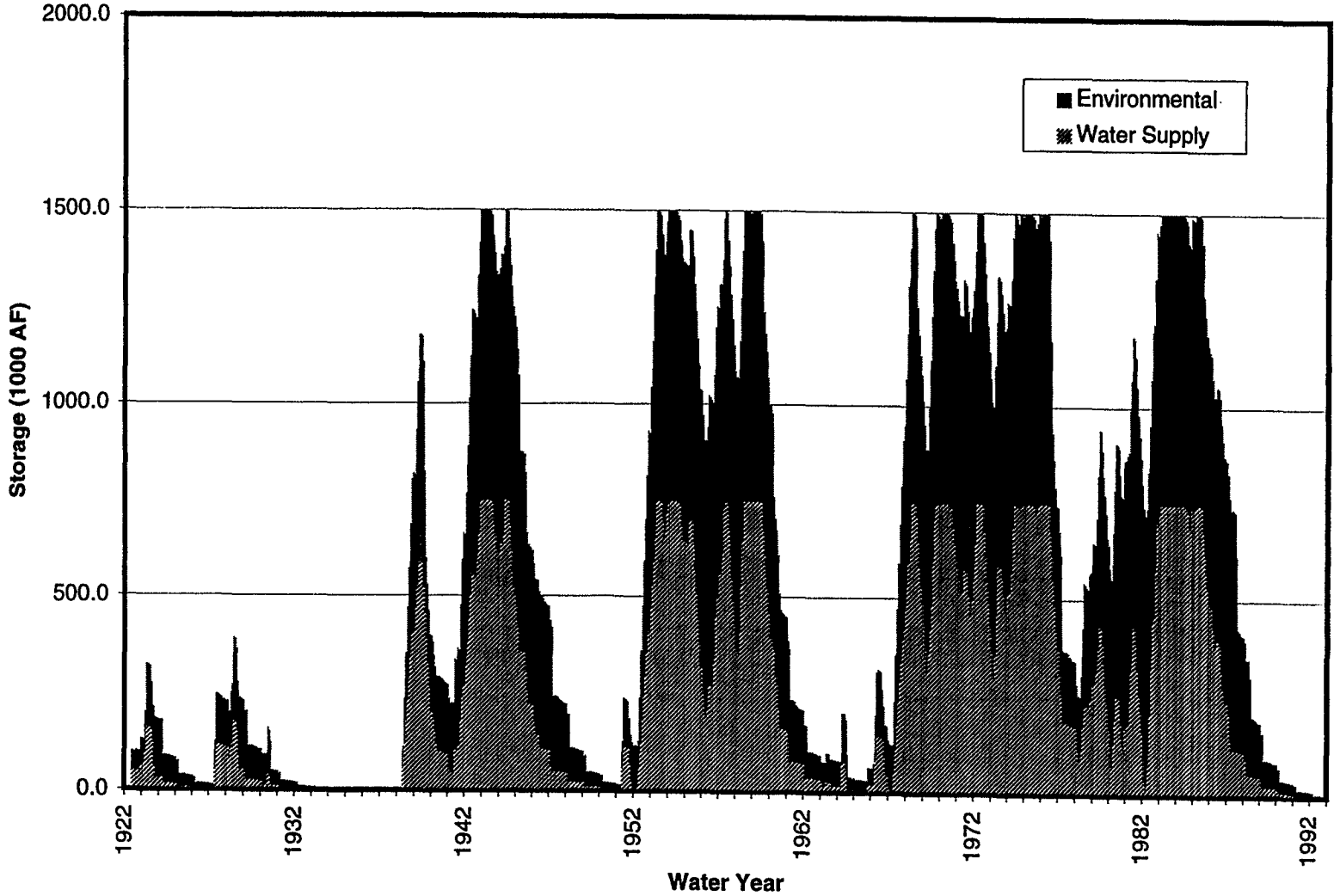
D-006023

CVP/SWP Reoperation YES
FC Transfer Level High

South Offstream Storage

South Storage: 1500 TAF



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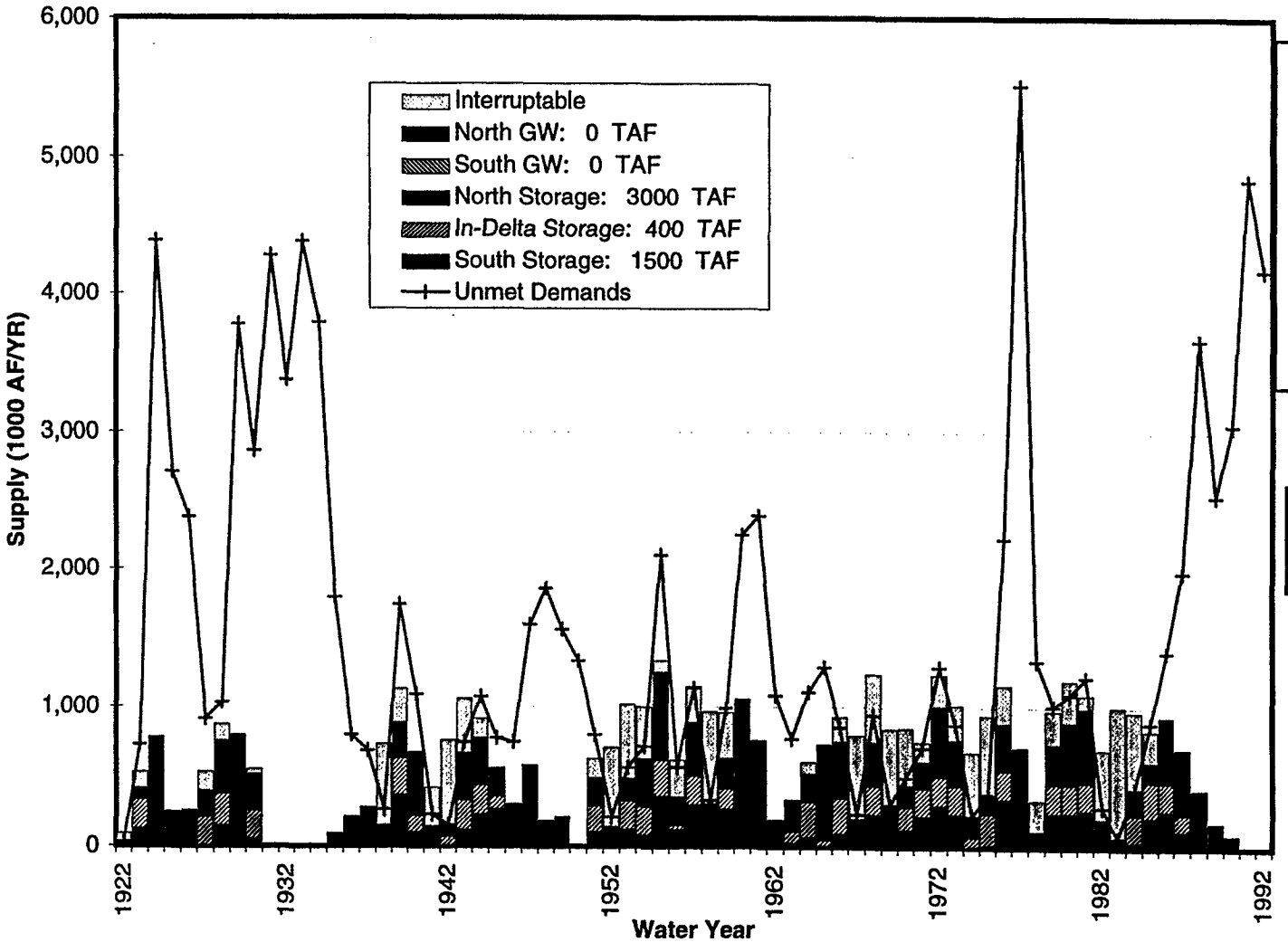
Water Supply Opportunities

CVP/SWP Reoperation YES
FC Transfer Level High

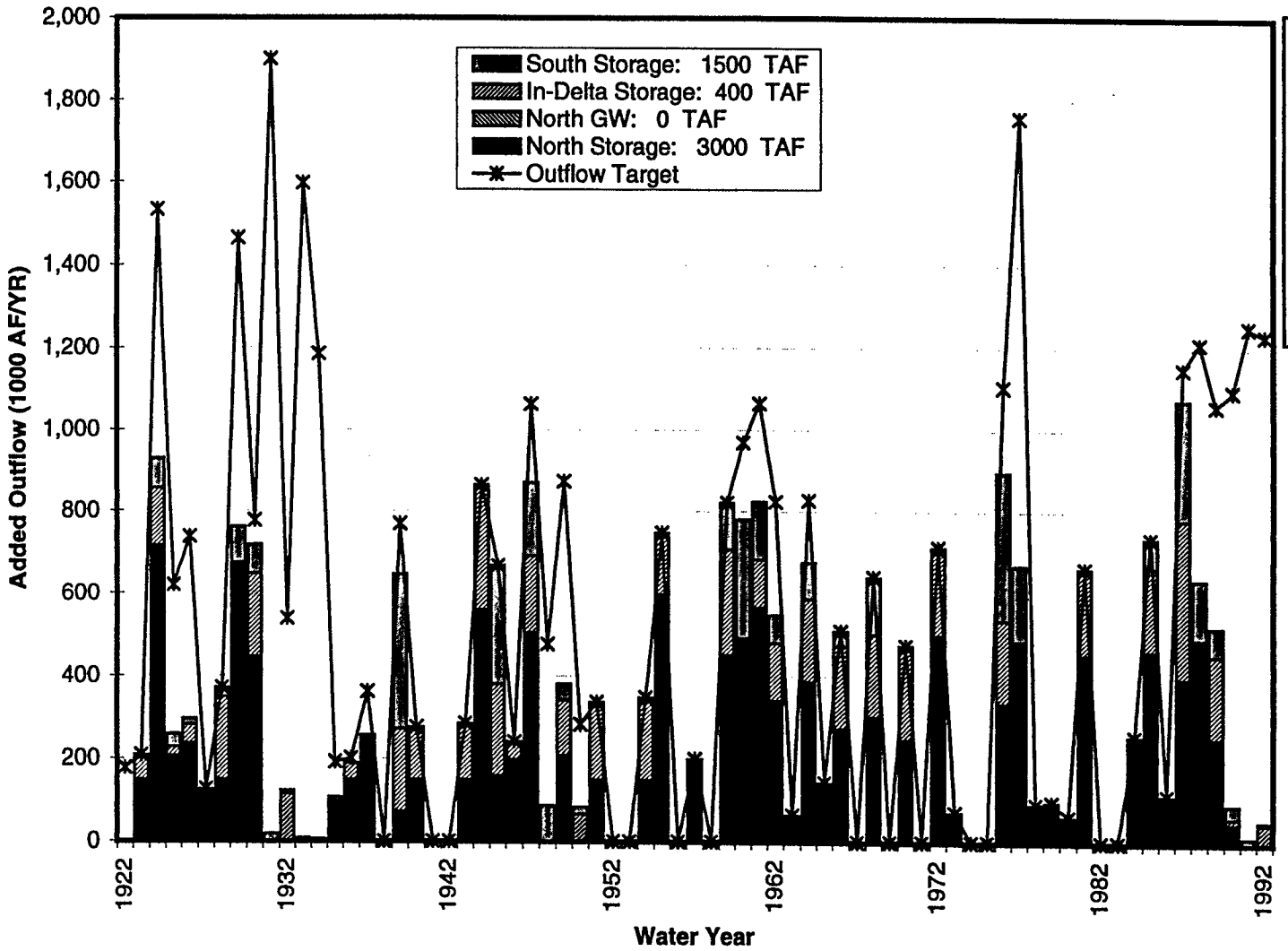


WATER SUPPLY (TAF/YR)	
NDGW	0
NDSS	258
IDSS	91
SDGW	0
SDSS	103
Interrupt	186
Total	638

CVP/SWP Shortage
22-92: 0 TAF/Yr
28-34: 0 TAF/Yr

CVP/SWP Reoperation YES
FC Transfer Level High

Supplemental Delta Outflow



ADDED OUTFLOW (TAF/YR)	
NDGW	0
NDSS	193
IDSS	79
SDSS	47
Total	319

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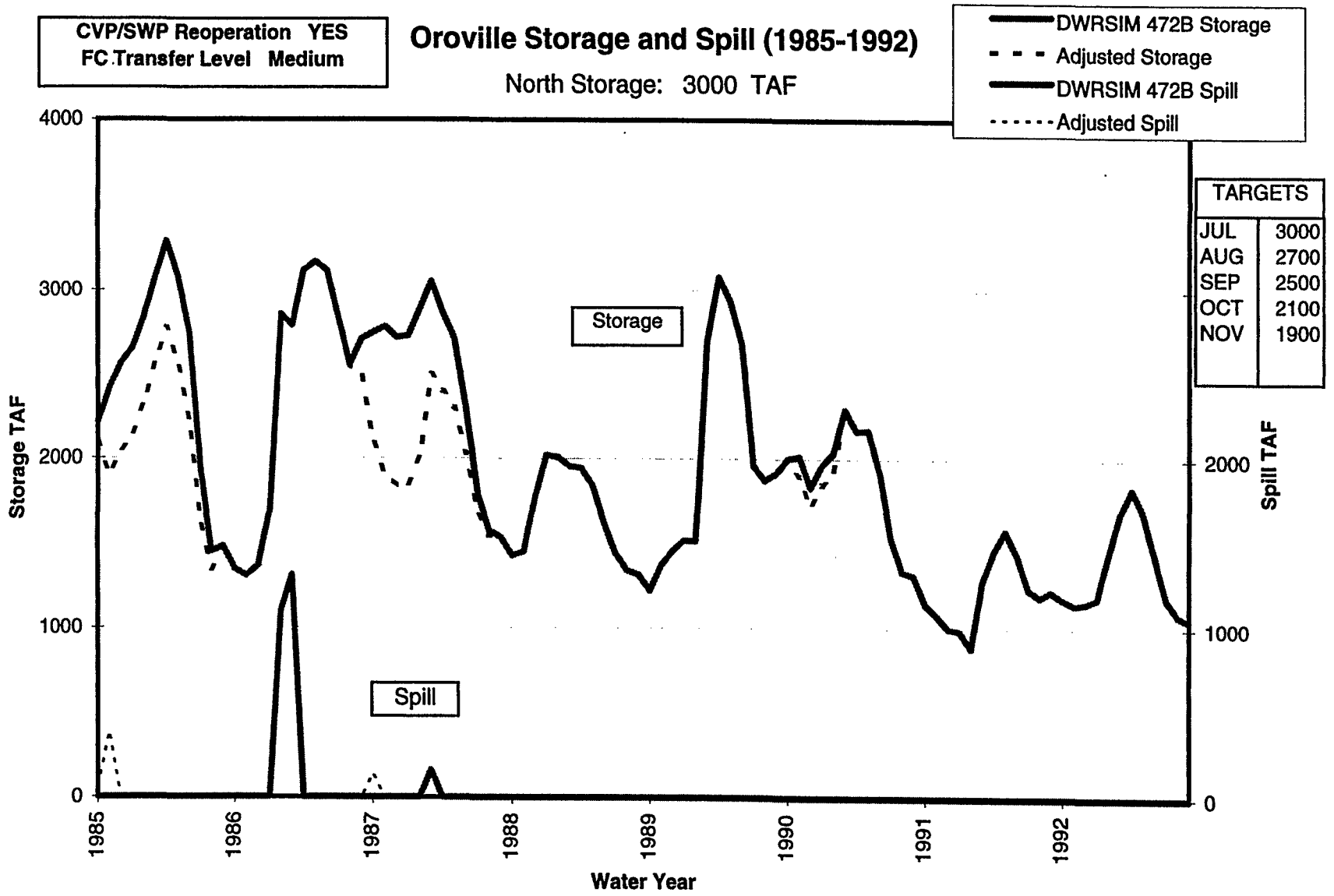
CVP/SWP Reoperation YES
FC Transfer Level Medium

Oroville Storage and Spill (1985-1992)

North Storage: 3000 TAF



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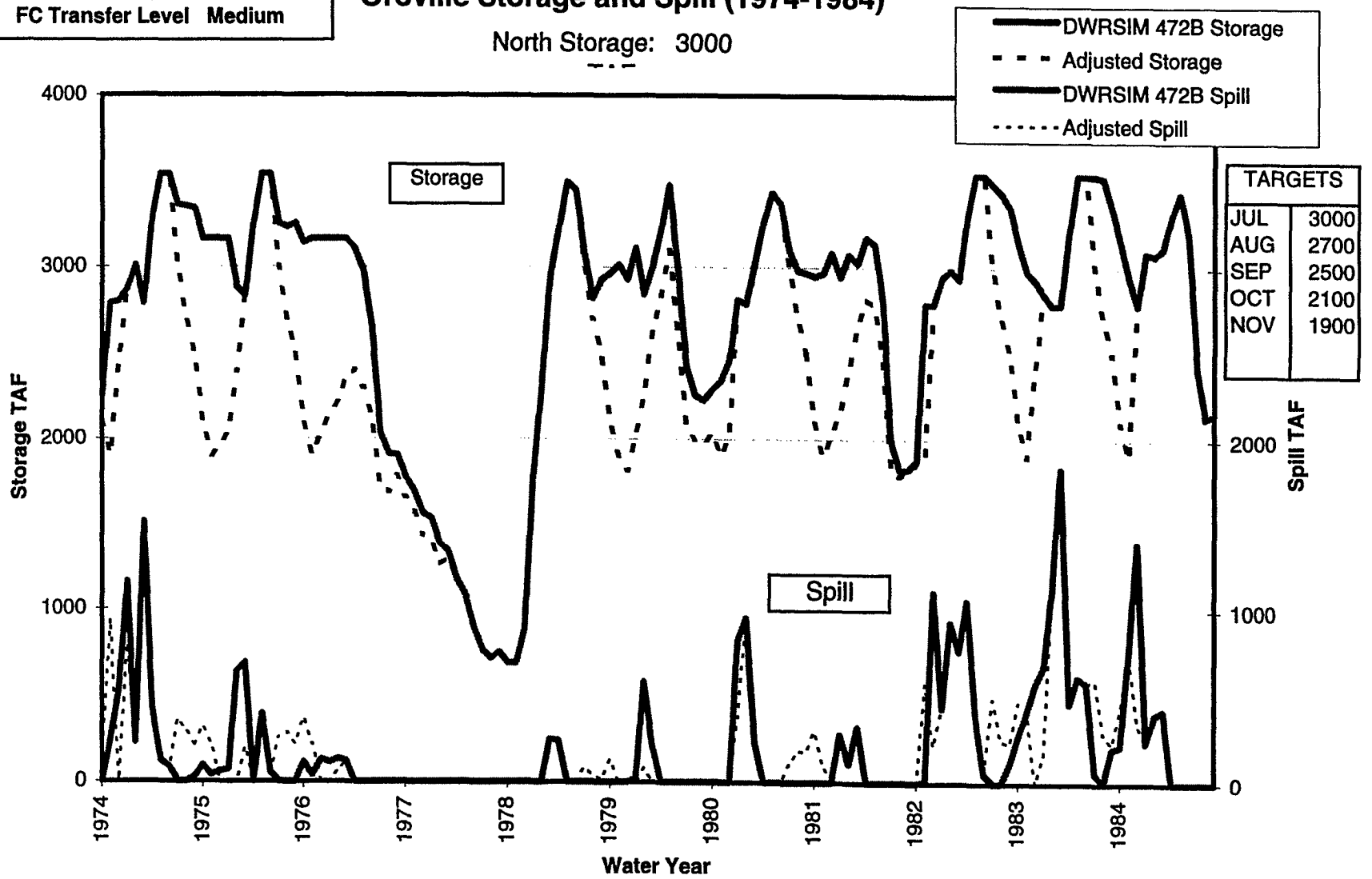
CVP/SWP Reoperation YES
FC Transfer Level Medium

Oroville Storage and Spill (1974-1984)

North Storage: 3000



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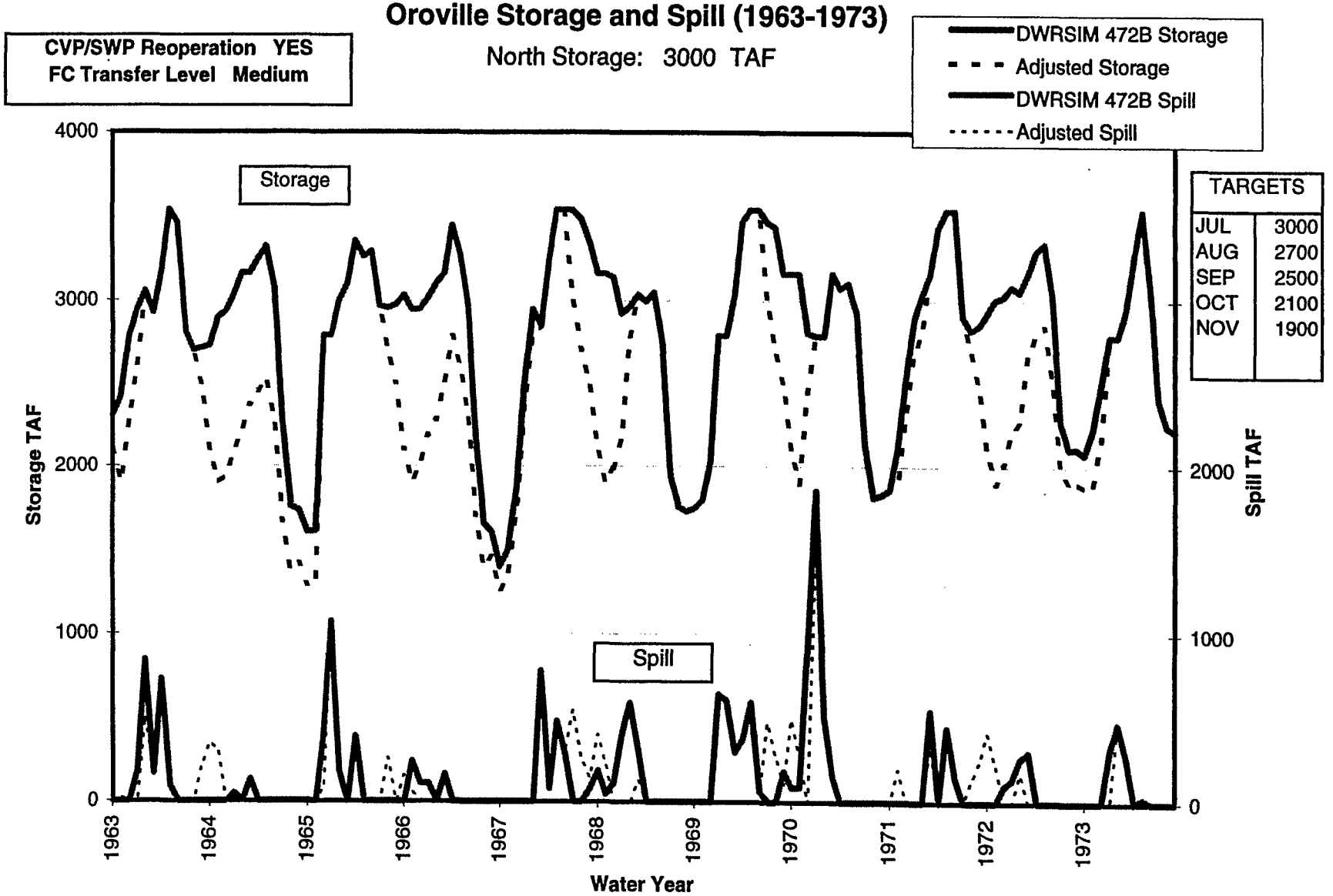
Oroville Storage and Spill (1963-1973)

North Storage: 3000 TAF

CVP/SWP Reoperation YES
FC Transfer Level Medium



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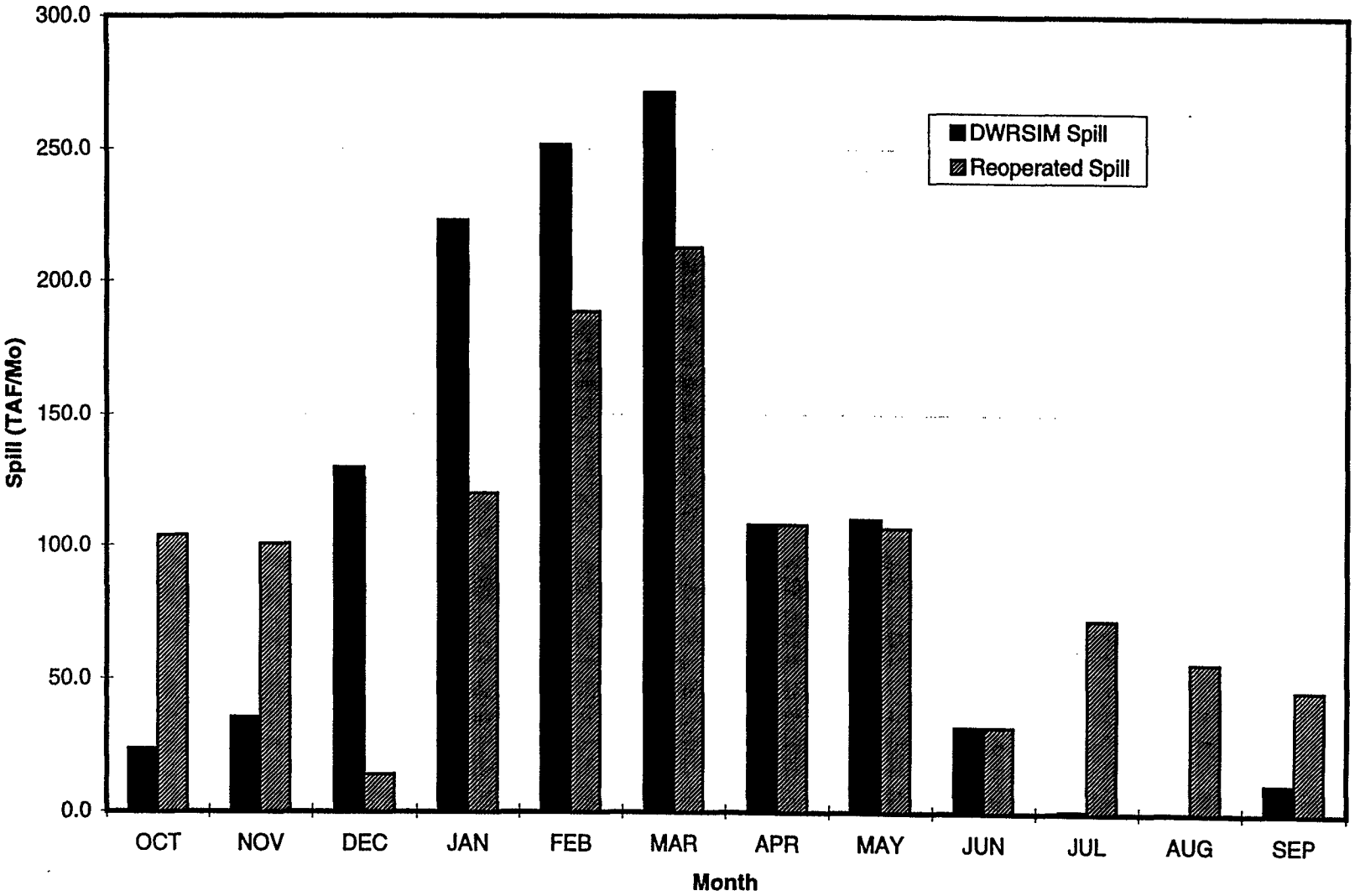
CVP/SWP Reoperation YES
FC Transfer Level Medium

Oroville Spills -- Average for 1922-1992



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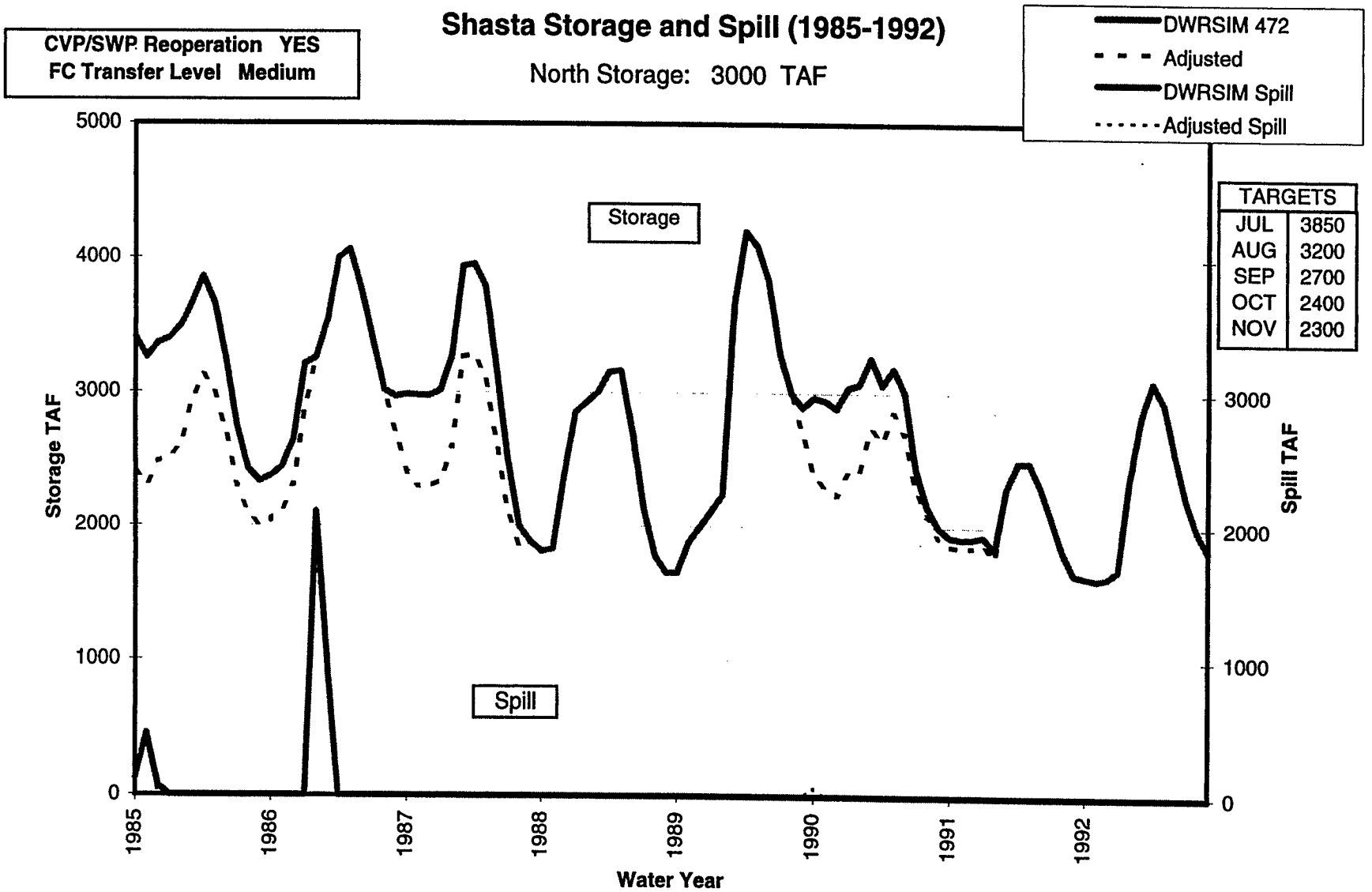

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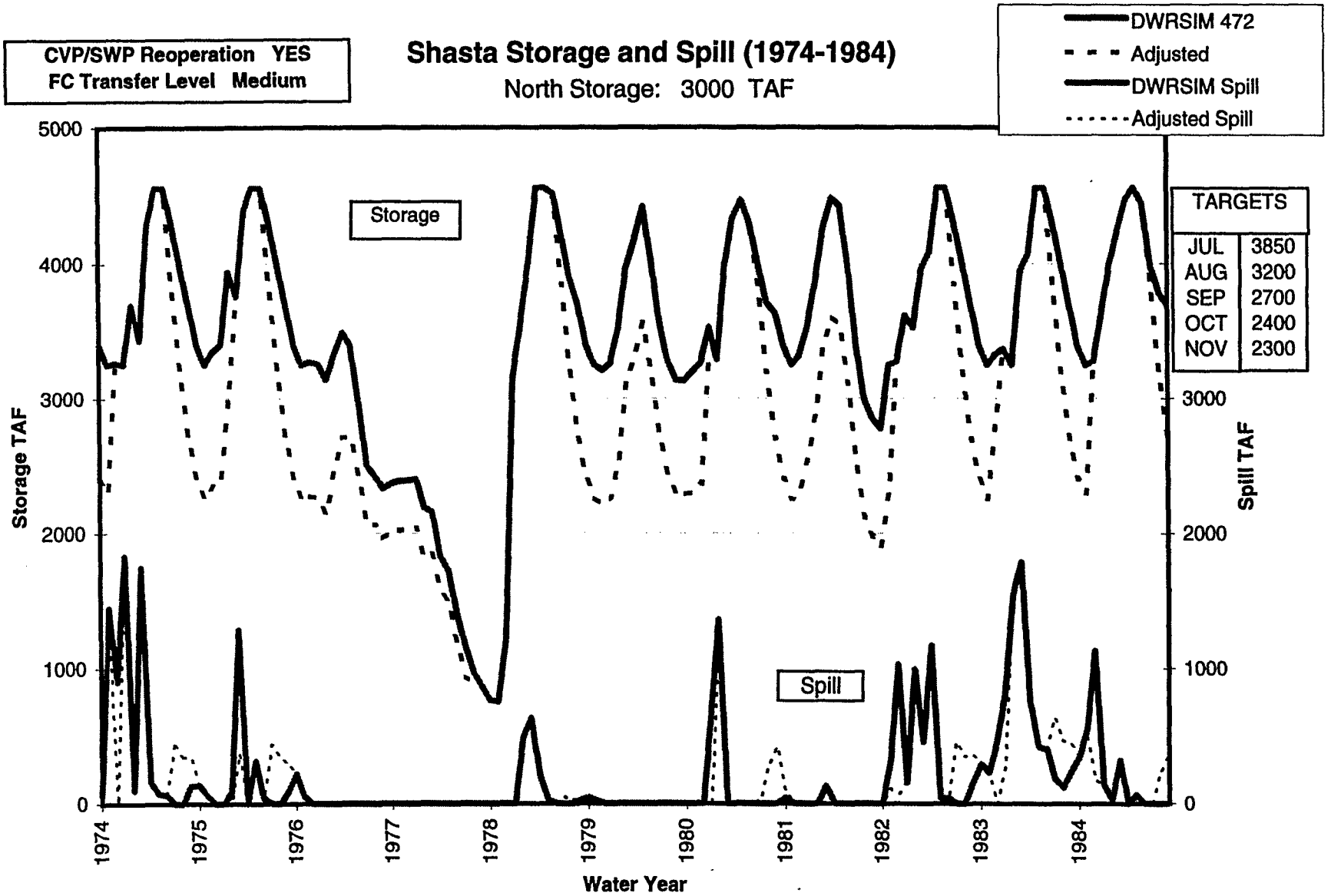

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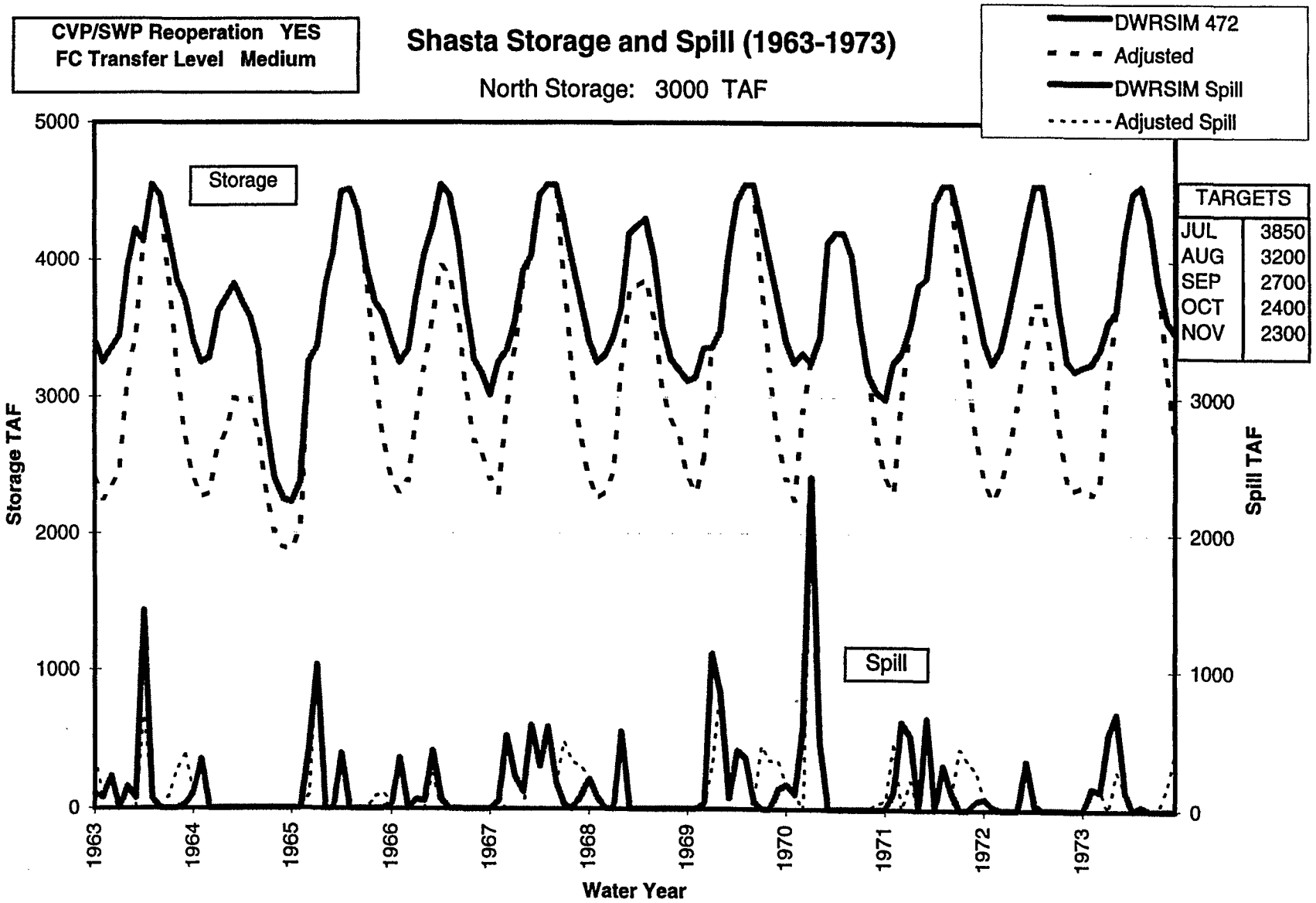
CVP/SWP Reoperation YES
FC Transfer Level Medium

Shasta Storage and Spill (1963-1973)

North Storage: 3000 TAF



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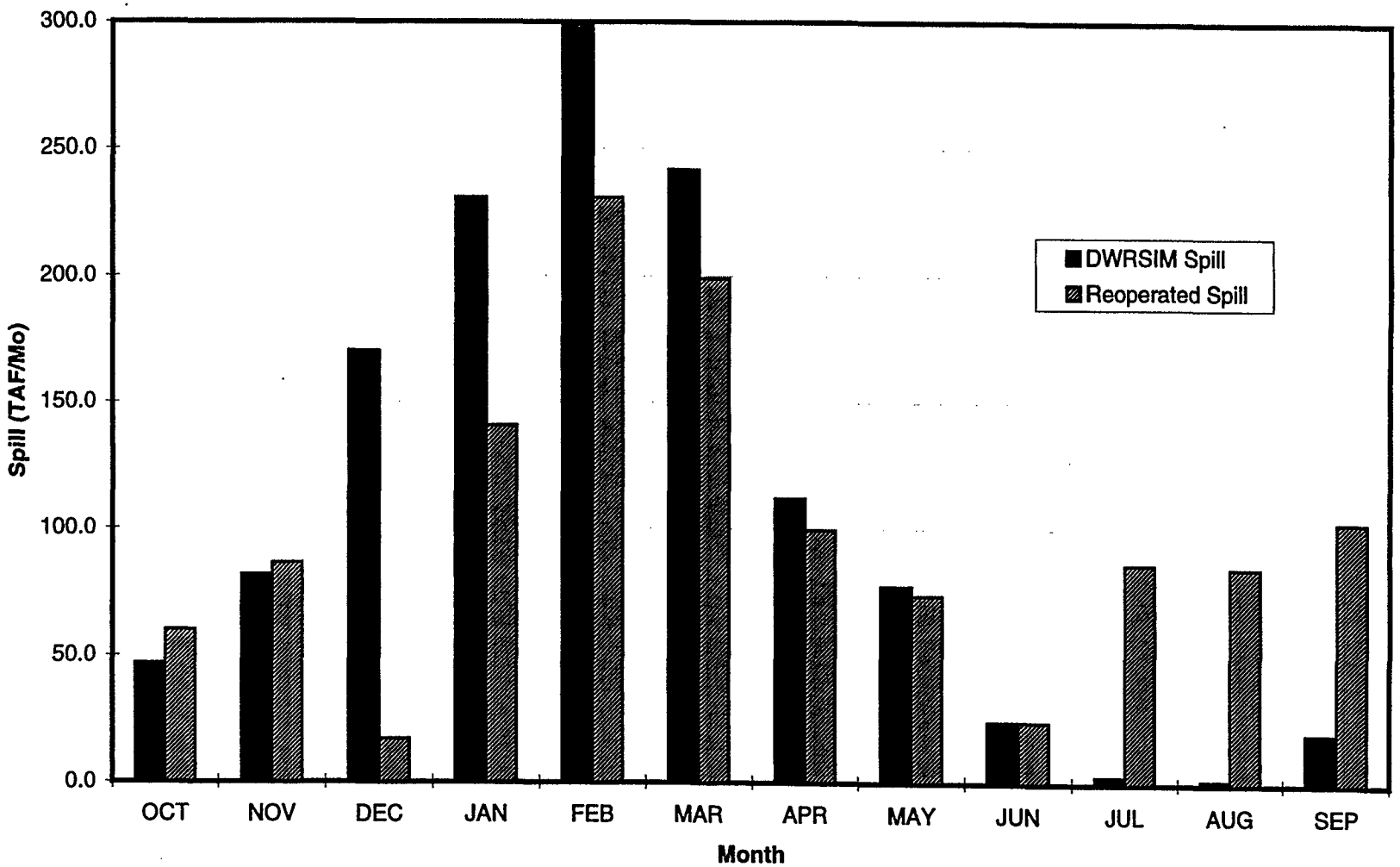
CVP/SWP Reoperation YES
FC Transfer Level Medium

Shasta Spill -- Average of 1922-1992



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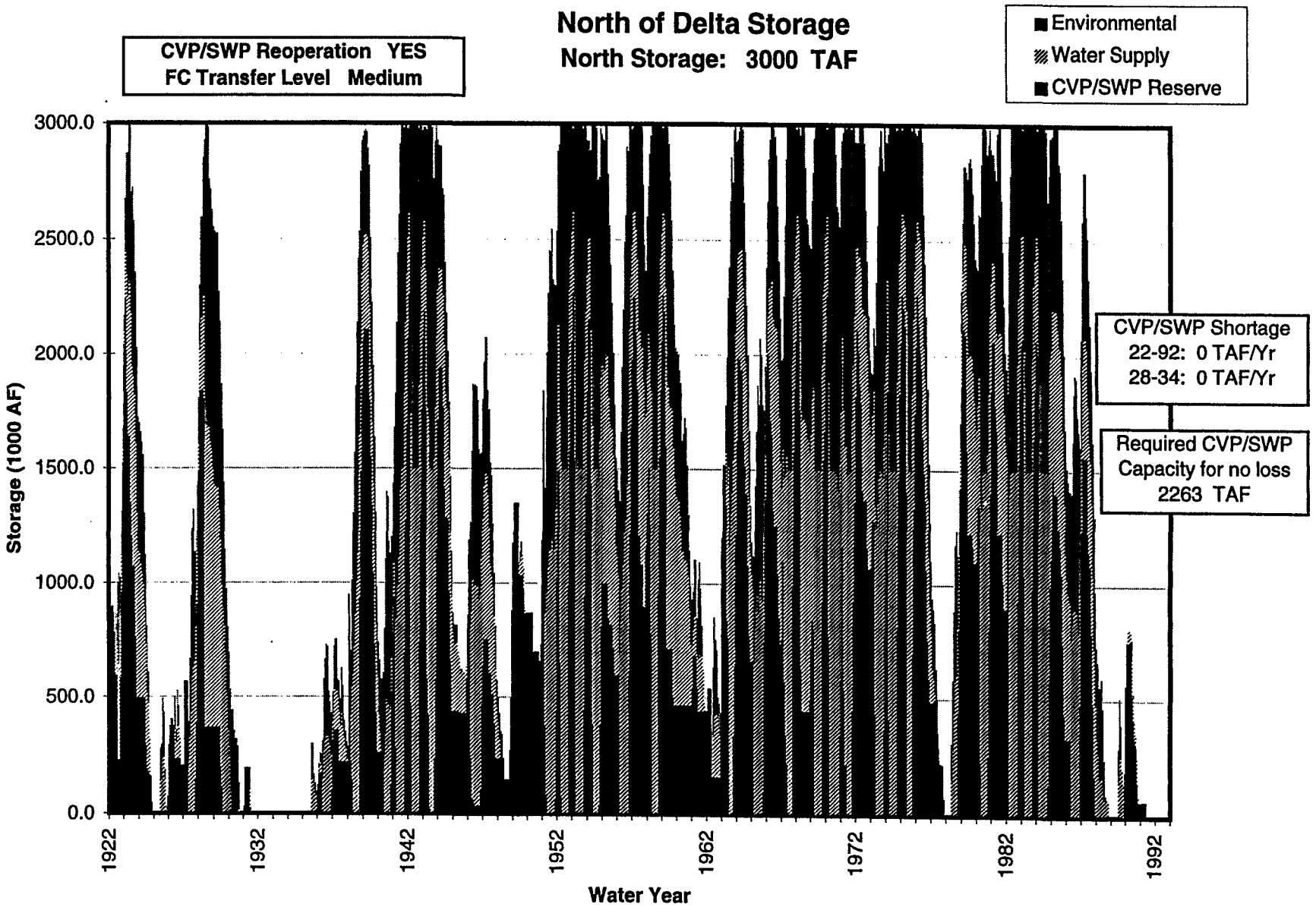
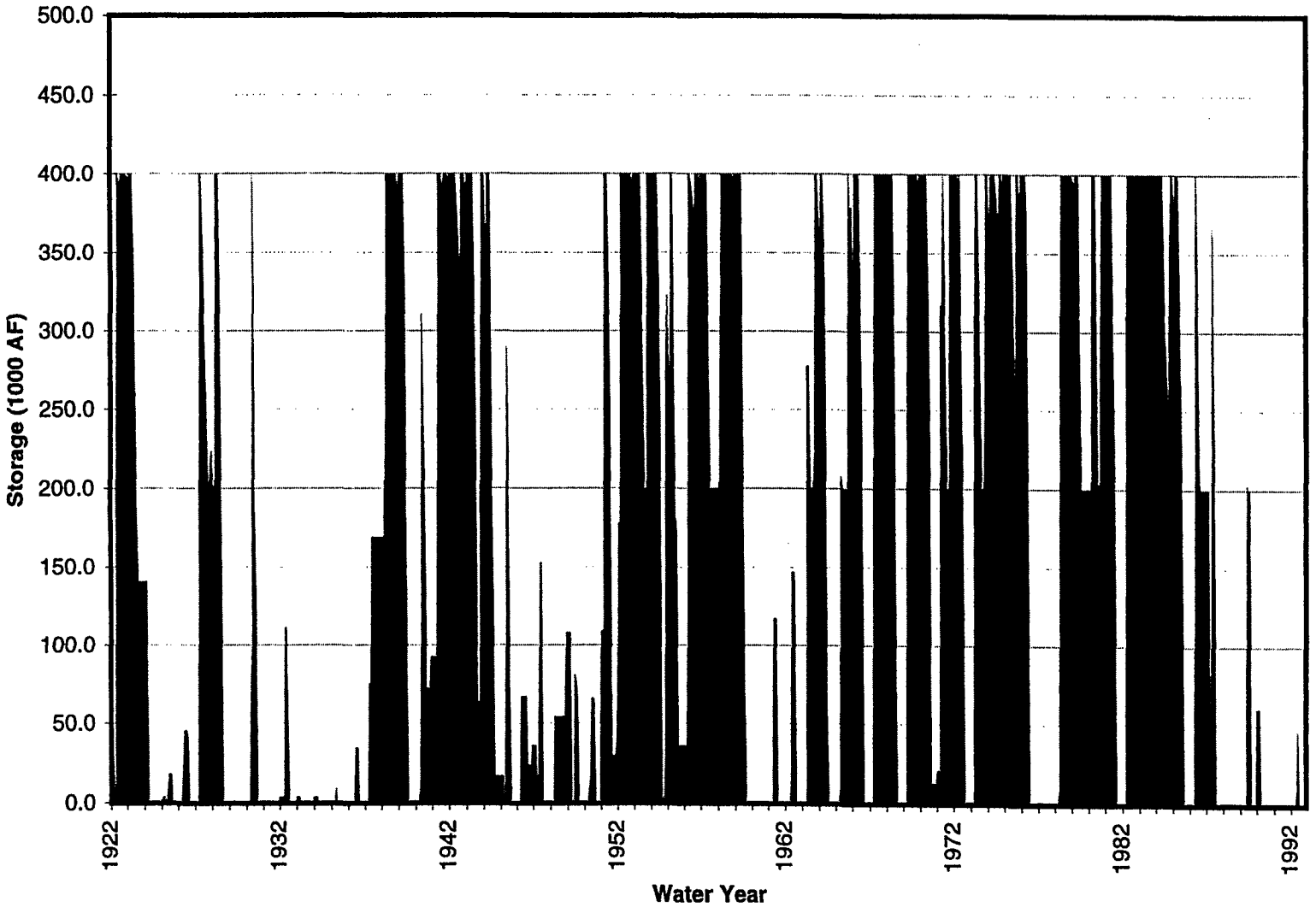


4/17/97

CVP/SWP Reoperation YES
FC Transfer Level Medium

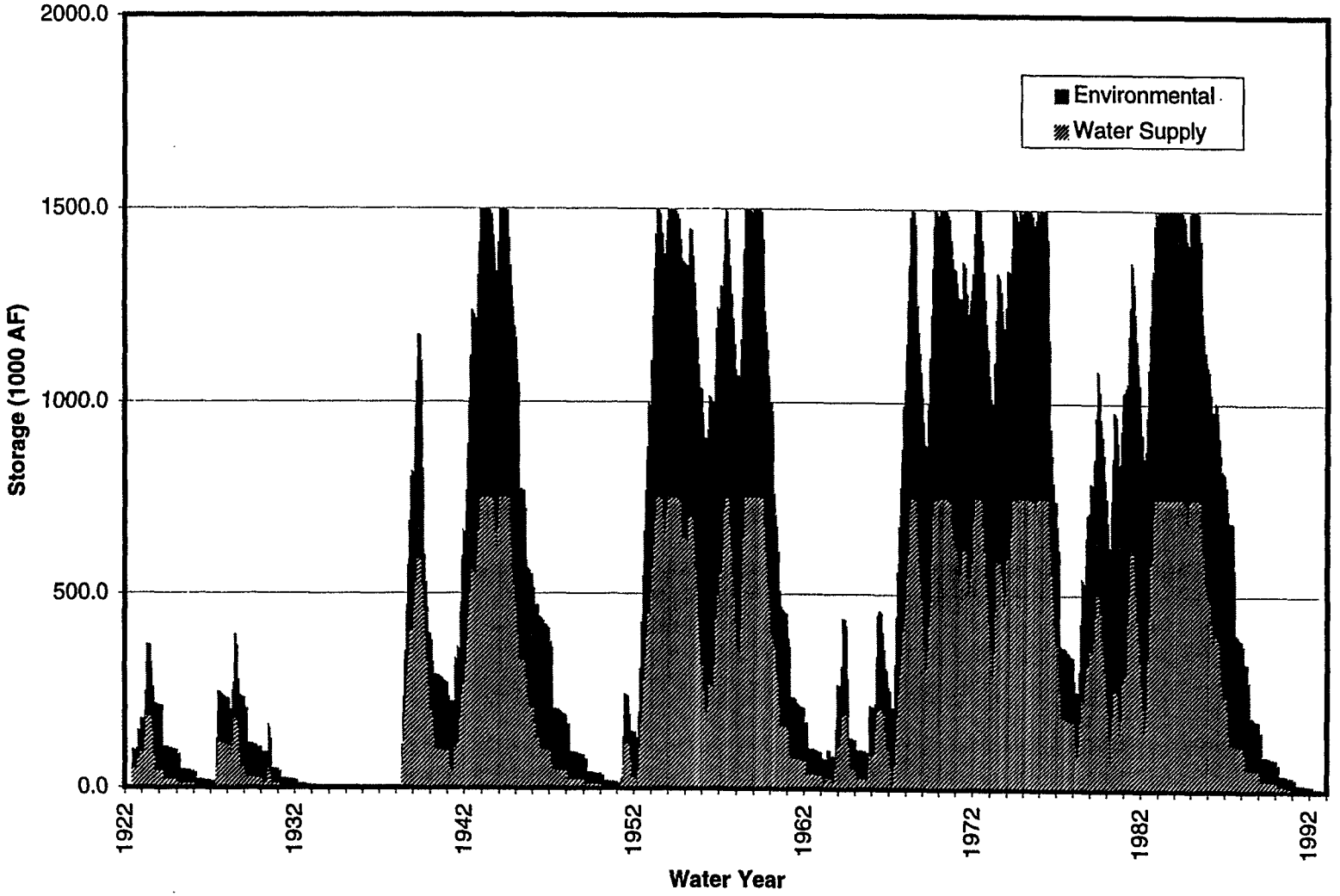
In-Delta Storage: 400 TAF



4/17/97

CVP/SWP Reoperation YES
FC Transfer Level Medium

South Offstream Storage
South Storage: 1500 TAF

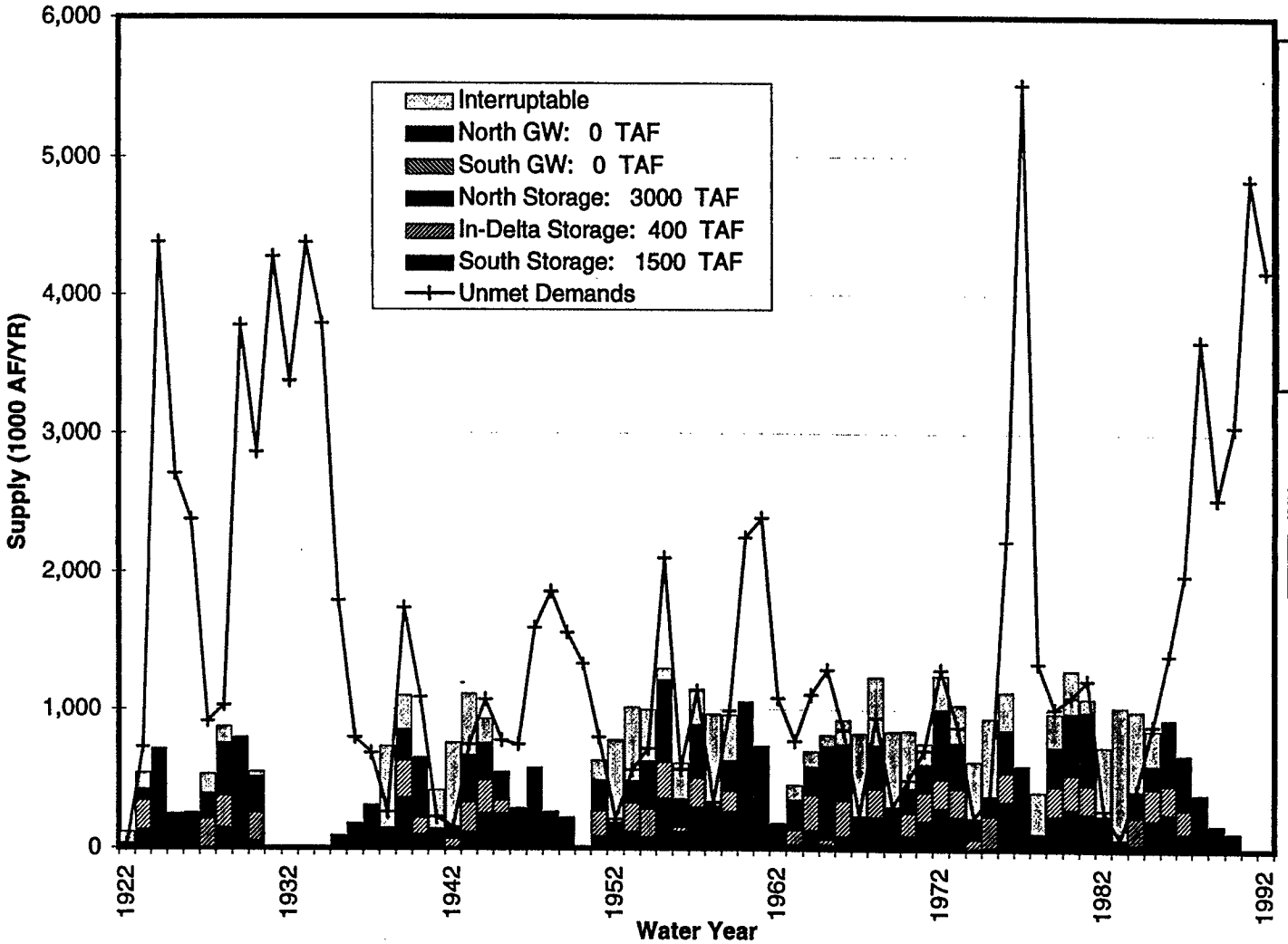


4/17/97

D—006037

Water Supply Opportunities

CVP/SWP Reoperation YES
FC Transfer Level Medium

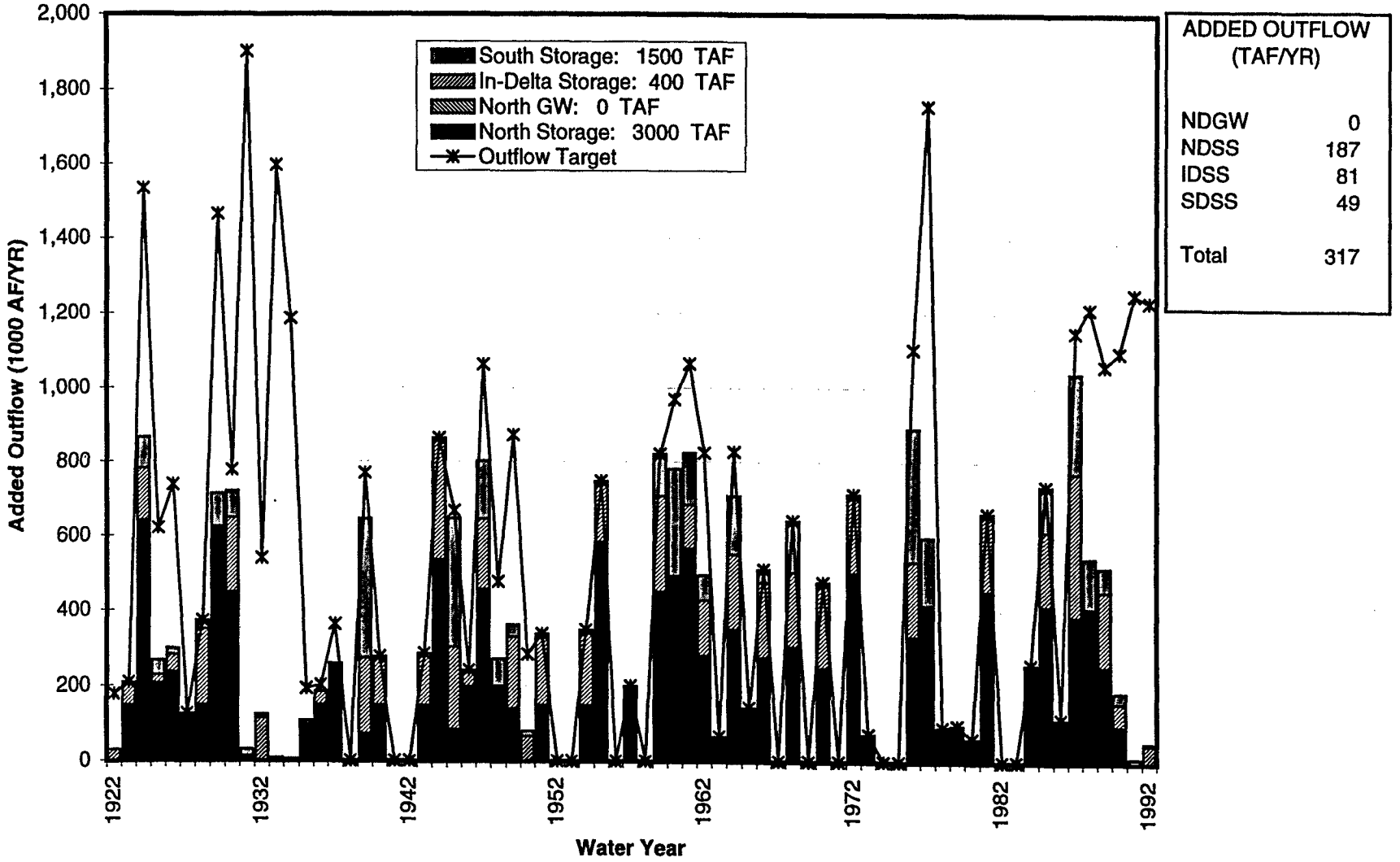


WATER SUPPLY (TAF/YR)	
NDGW	0
NDSS	254
IDSS	93
SDGW	0
SDSS	105
Interrupt	193
Total	645

CVP/SWP Shortage
22-92: 0 TAF/Yr
28-34: 0 TAF/Yr

CVP/SWP Reoperation YES
FC Transfer Level Medium

Supplemental Delta Outflow



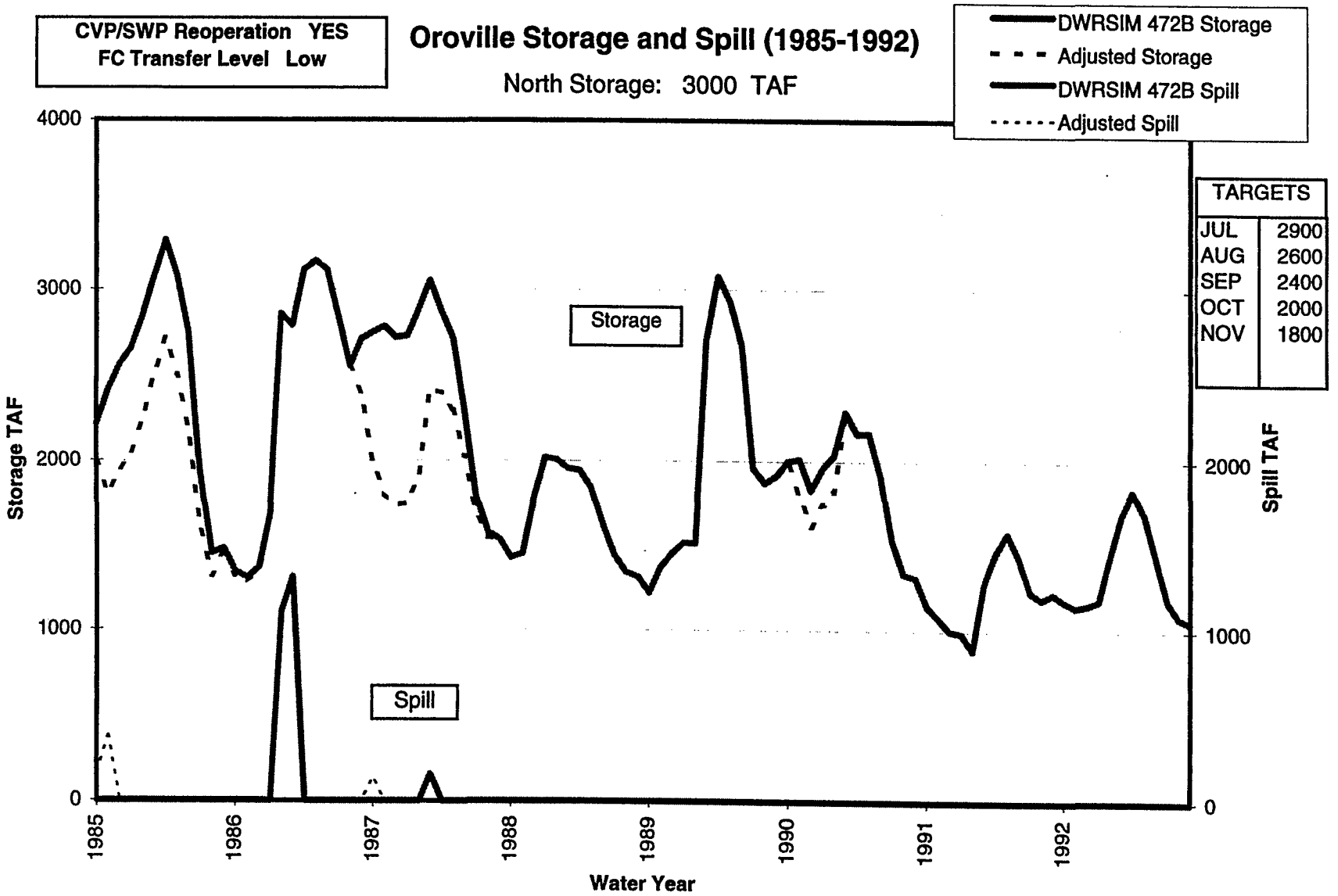
ADDED OUTFLOW (TAF/YR)	
NDGW	0
NDSS	187
IDSS	81
SDSS	49
Total	317

4/17/97

CVP/SWP Reoperation YES
FC Transfer Level Low

Oroville Storage and Spill (1985-1992)

North Storage: 3000 TAF



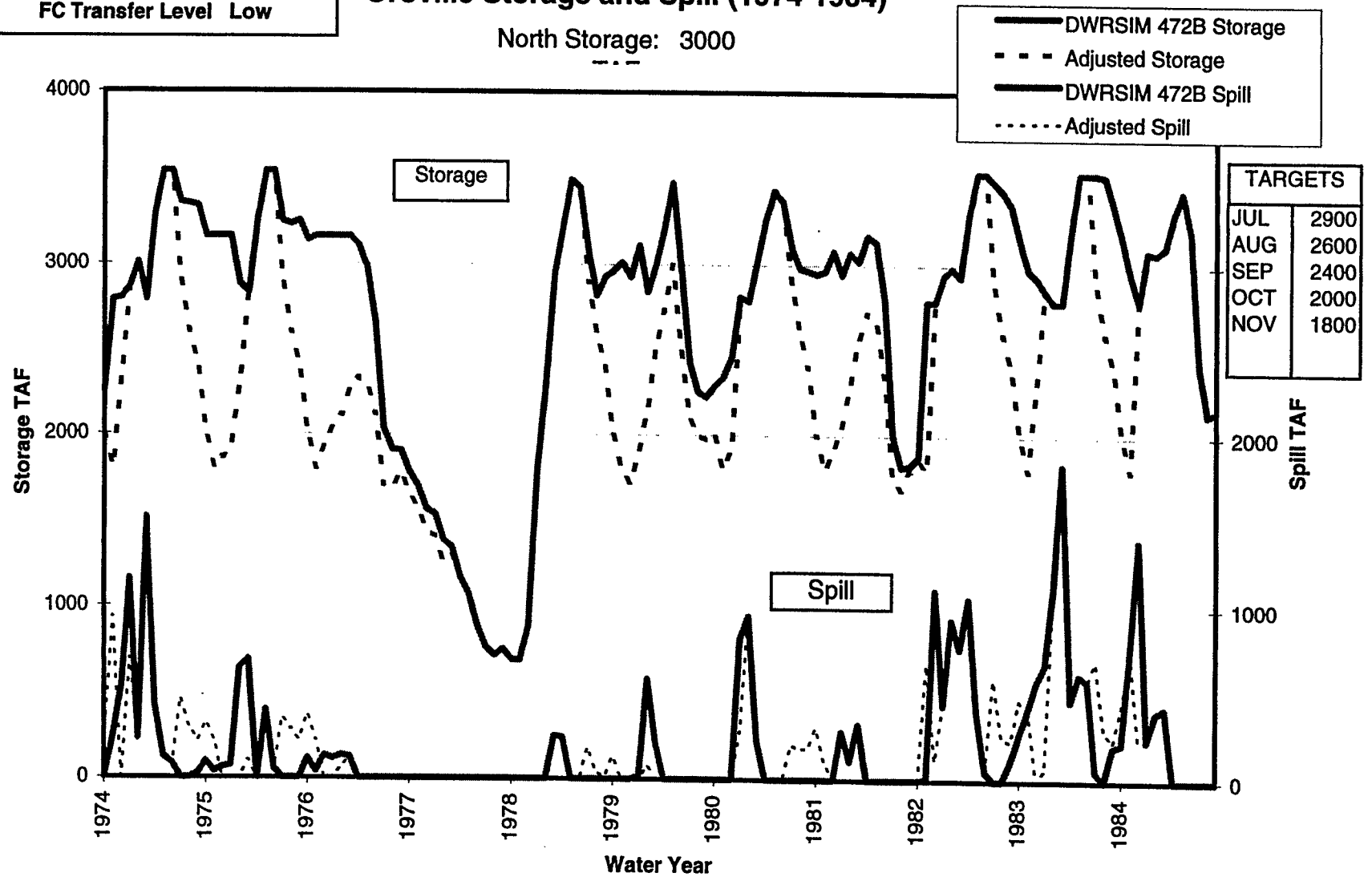
4/17/97

D-006040

CVP/SWP Reoperation YES
FC Transfer Level Low

Oroville Storage and Spill (1974-1984)

North Storage: 3000

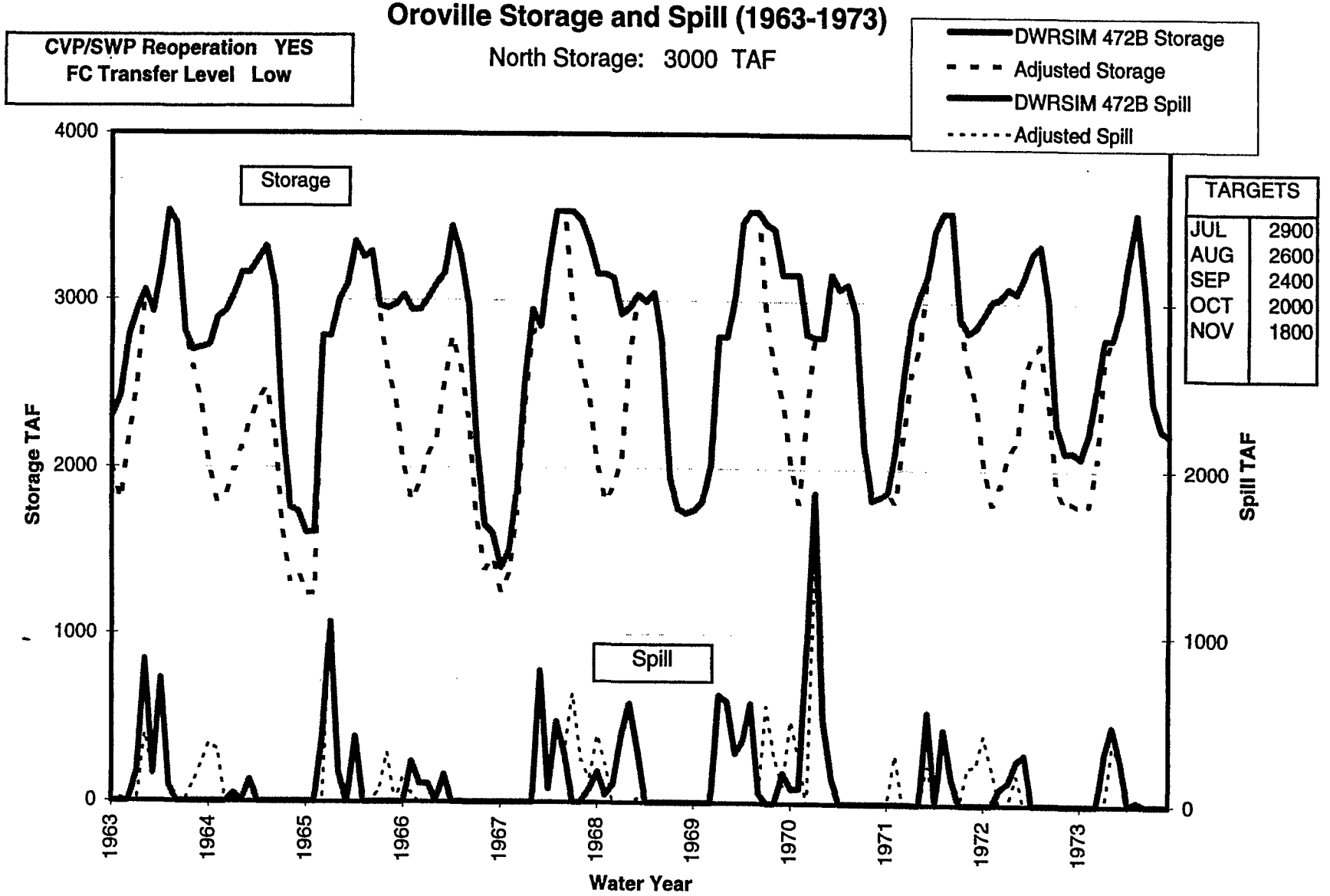


4/17/97

Oroville Storage and Spill (1963-1973)

North Storage: 3000 TAF

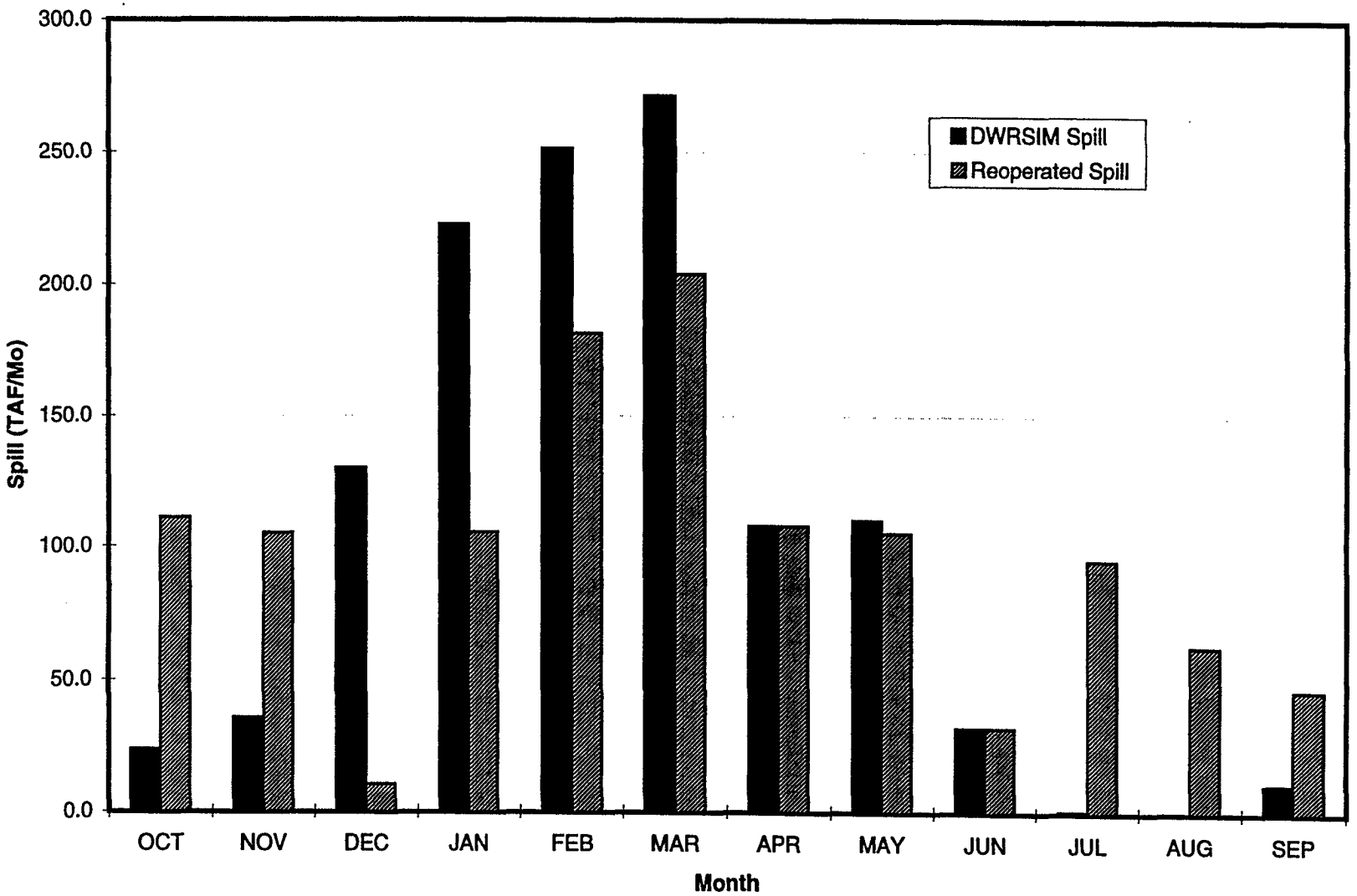
CVP/SWP Reoperation YES
FC Transfer Level Low



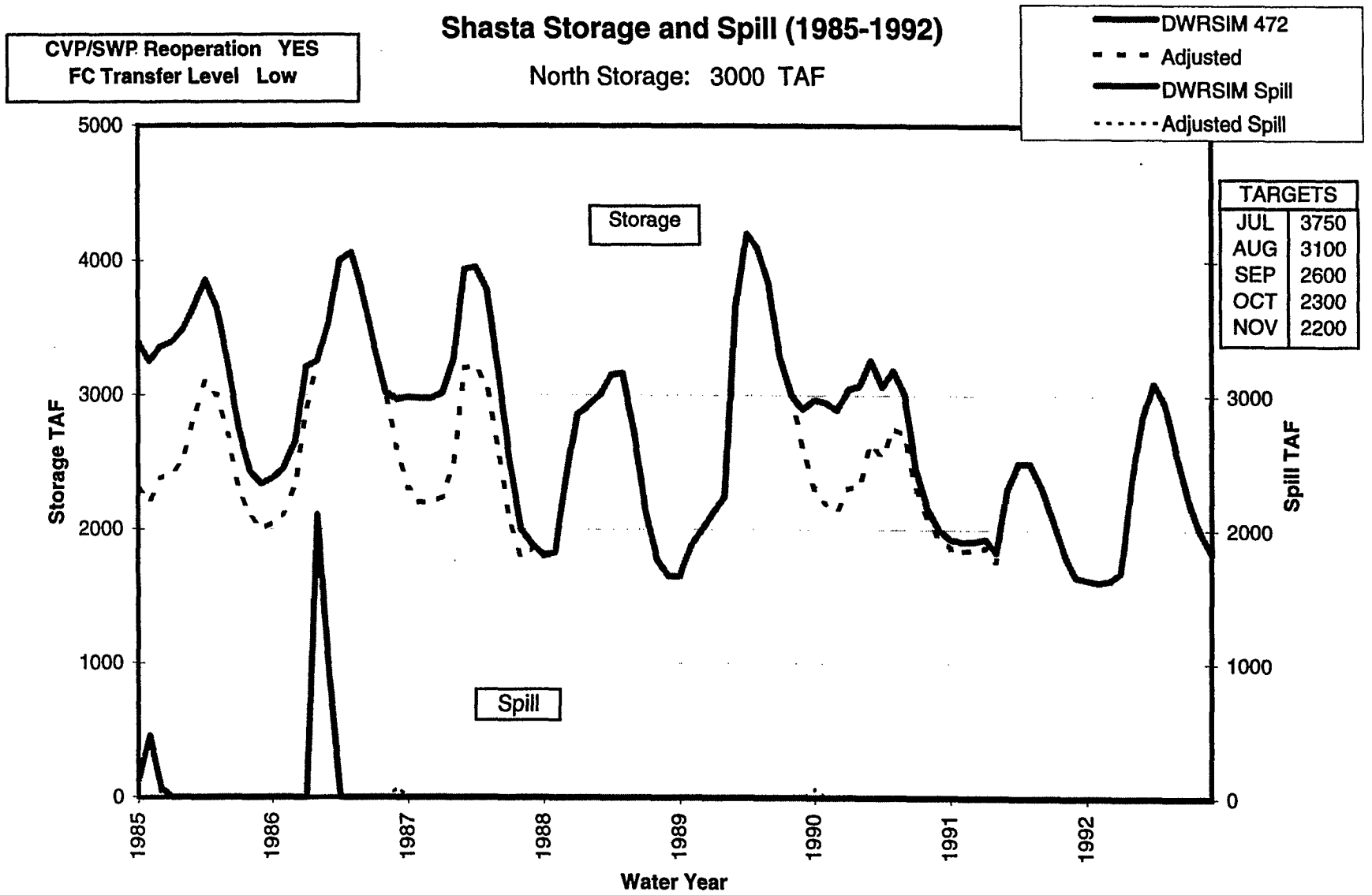
4/17/97

CVP/SWP Reoperation YES
FC Transfer Level Low

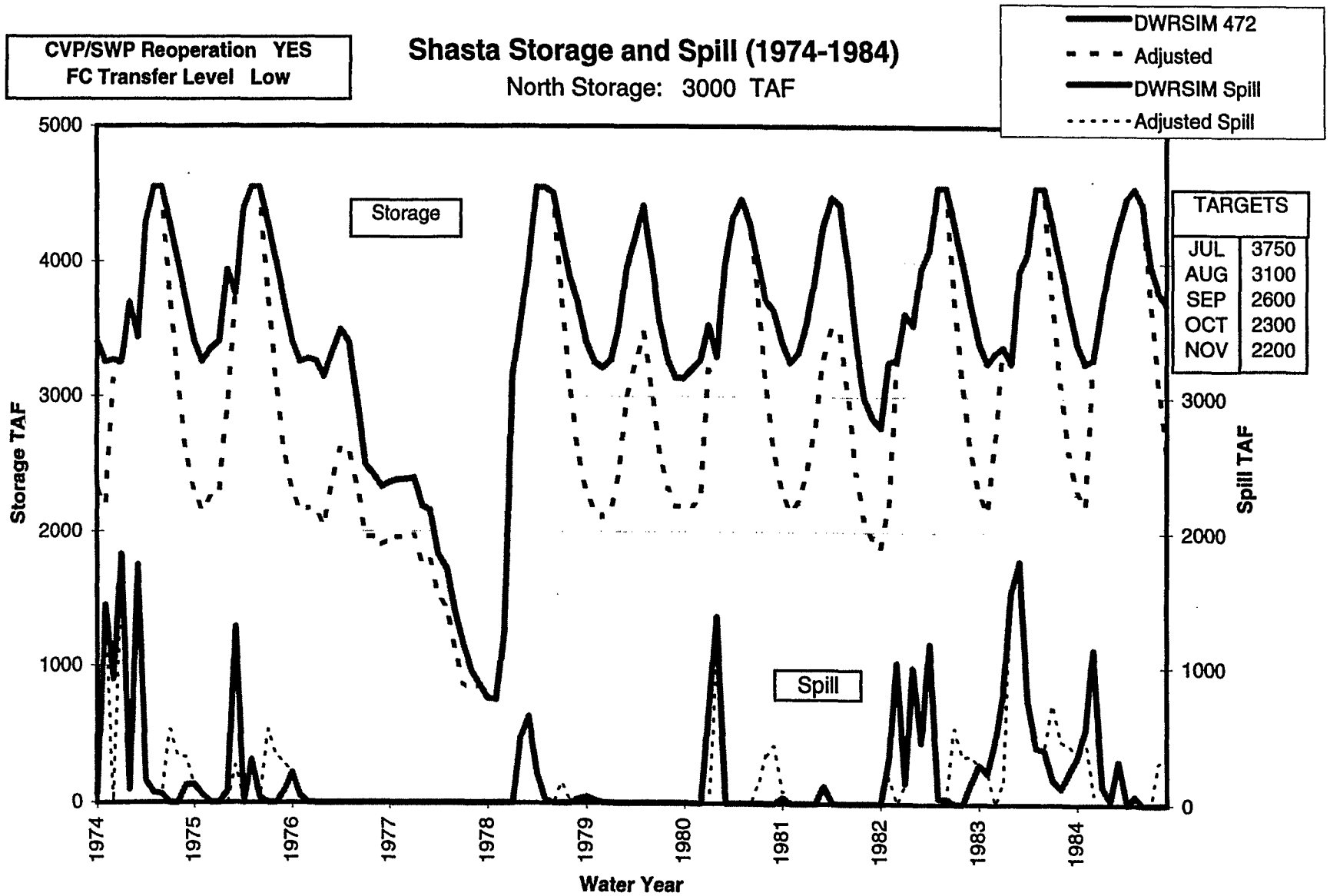
Oroville Spills -- Average for 1922-1992



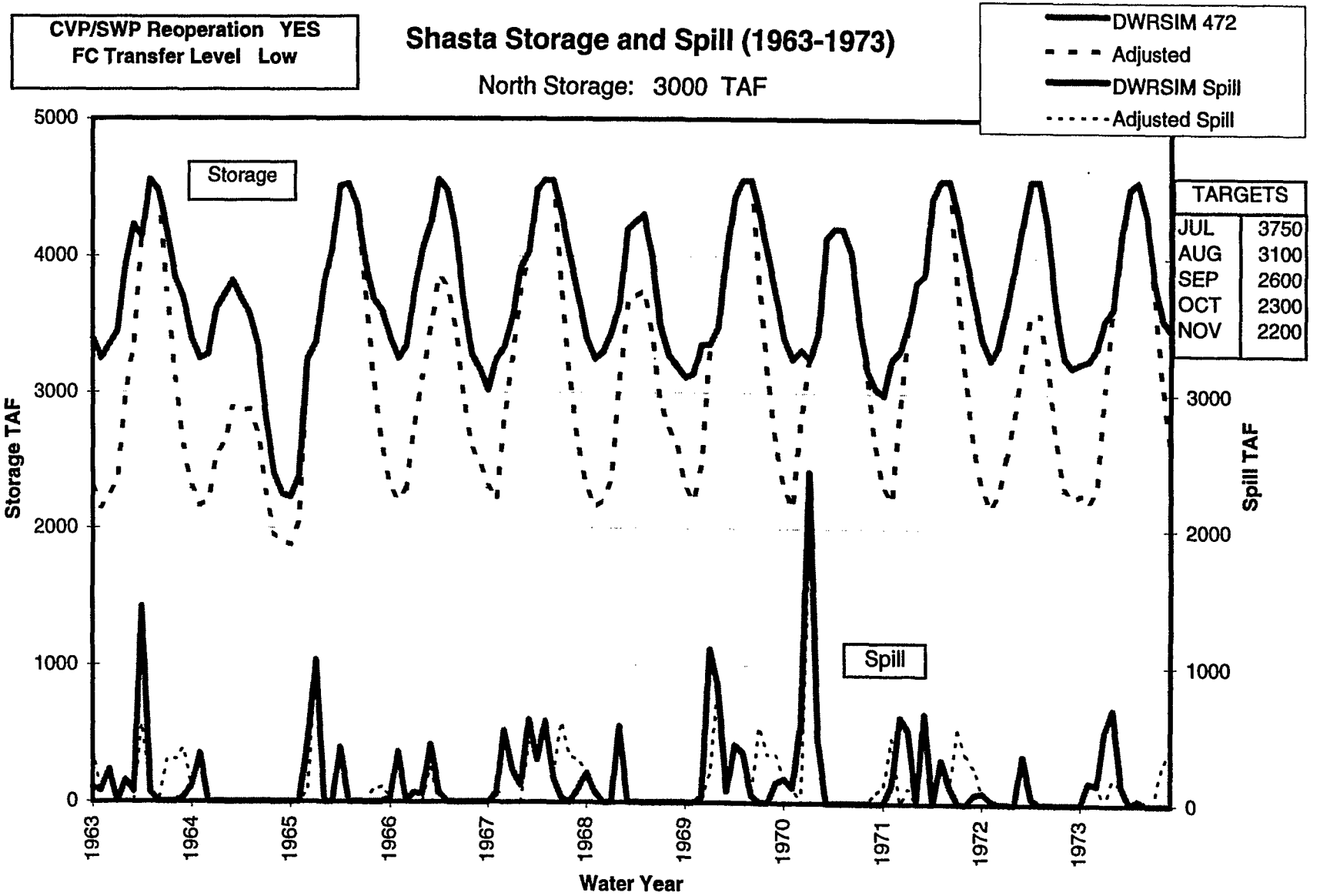
4/17/97



4/17/97



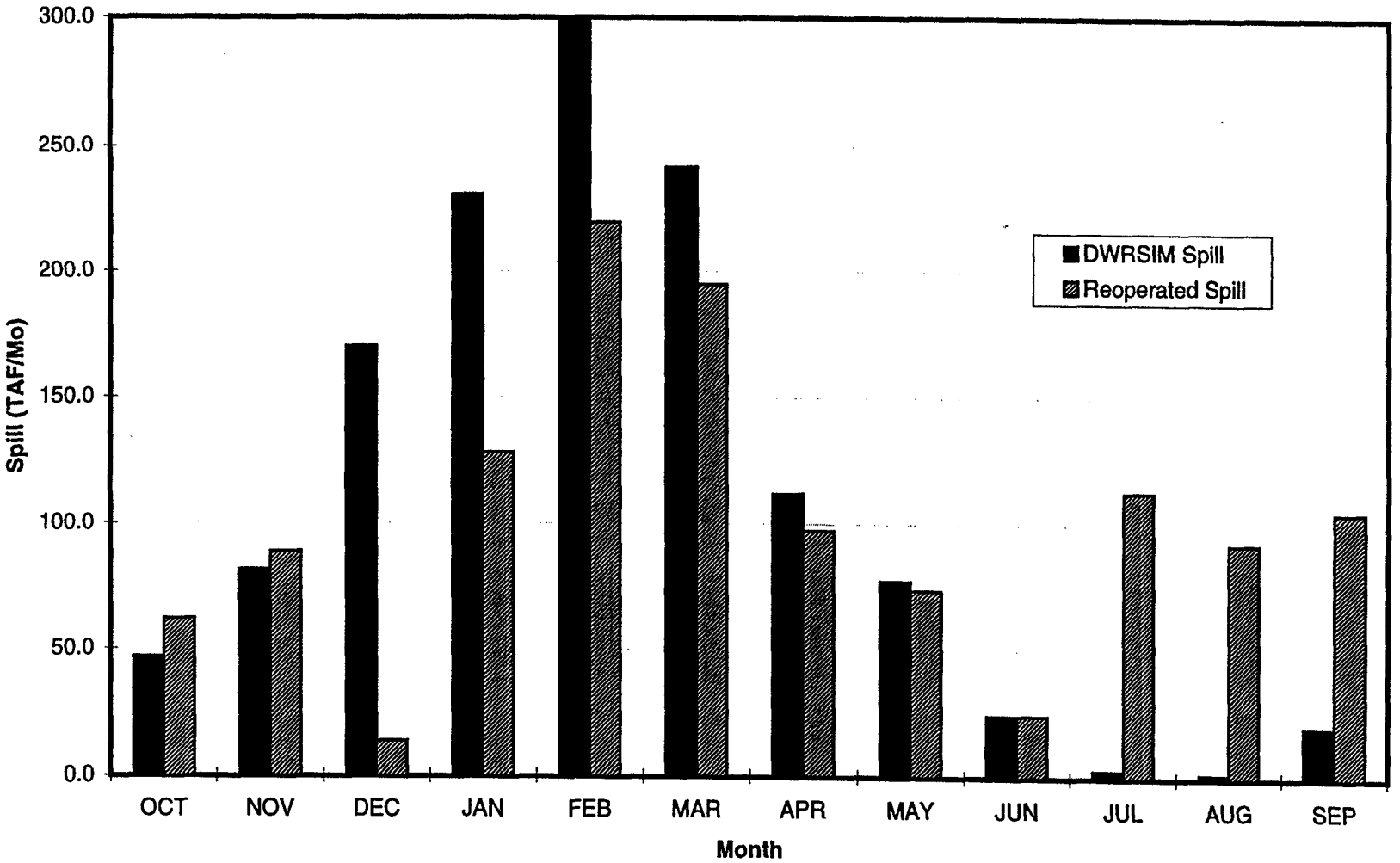
4/17/97



4/17/97

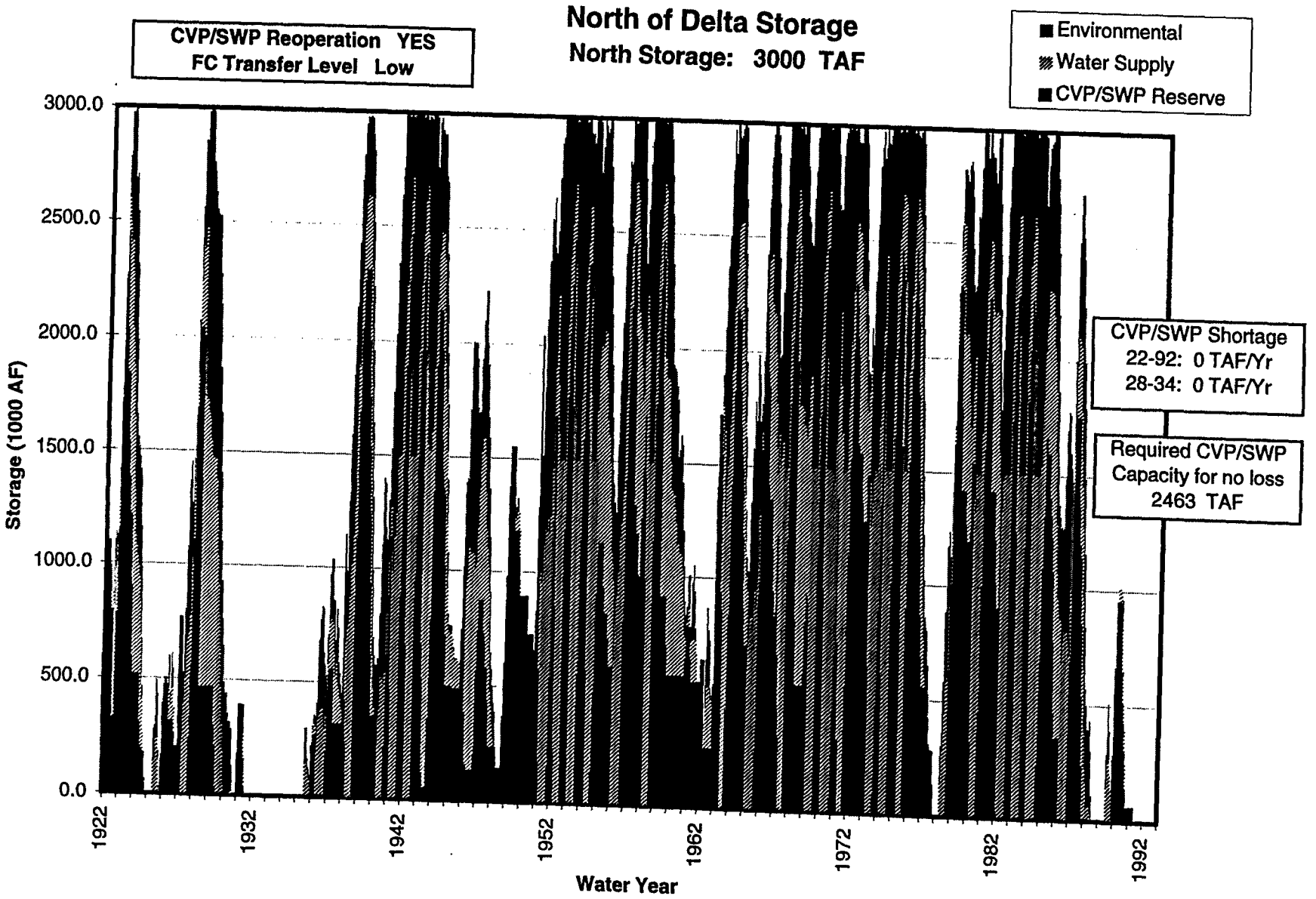
CVP/SWP Reoperation YES
FC Transfer Level Low

Shasta Spill -- Average of 1922-1992



4/17/97

D—006047

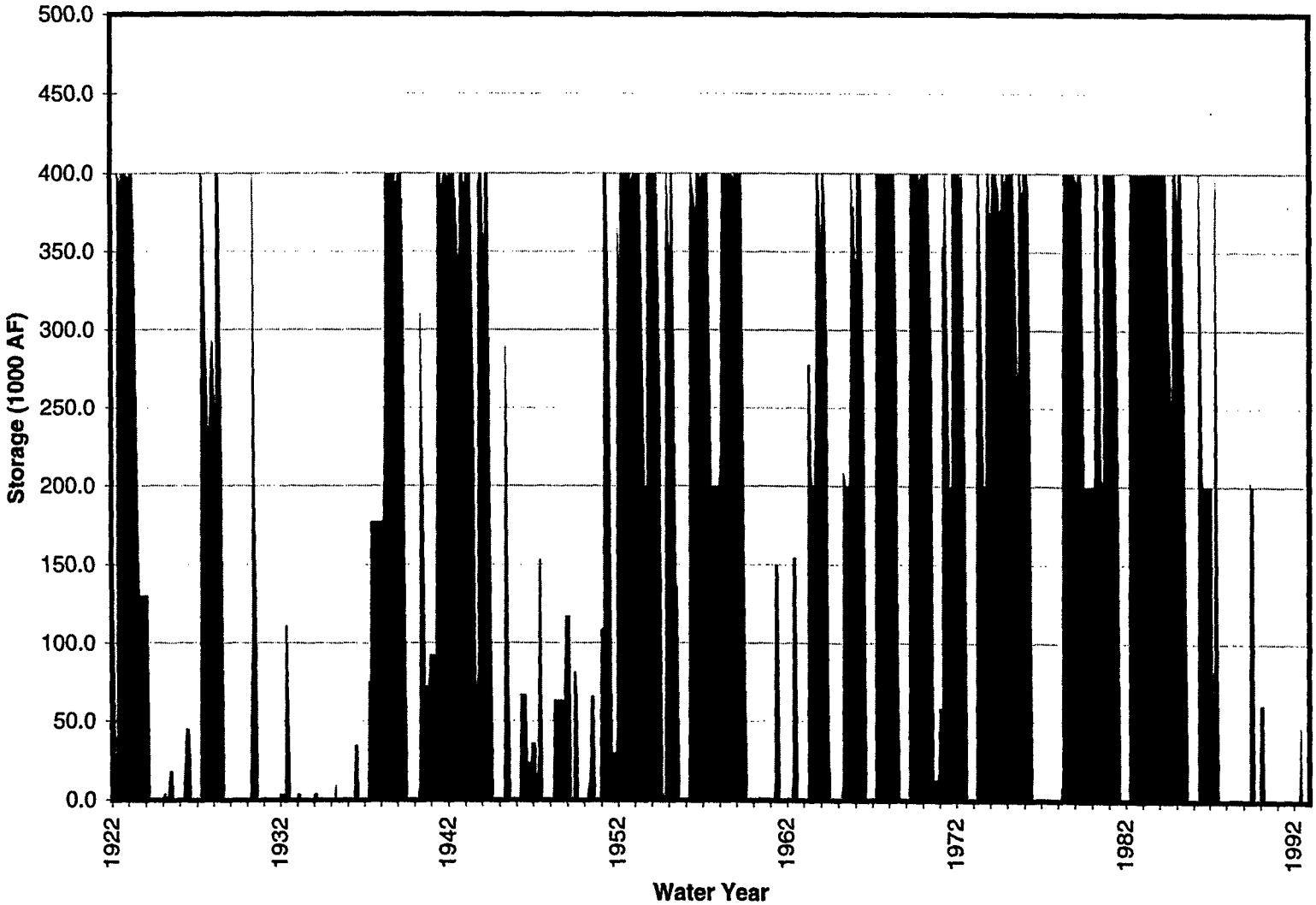


4/17/97

D-006048

CVP/SWP Reoperation YES
FC Transfer Level Low

In-Delta Storage: 400 TAF

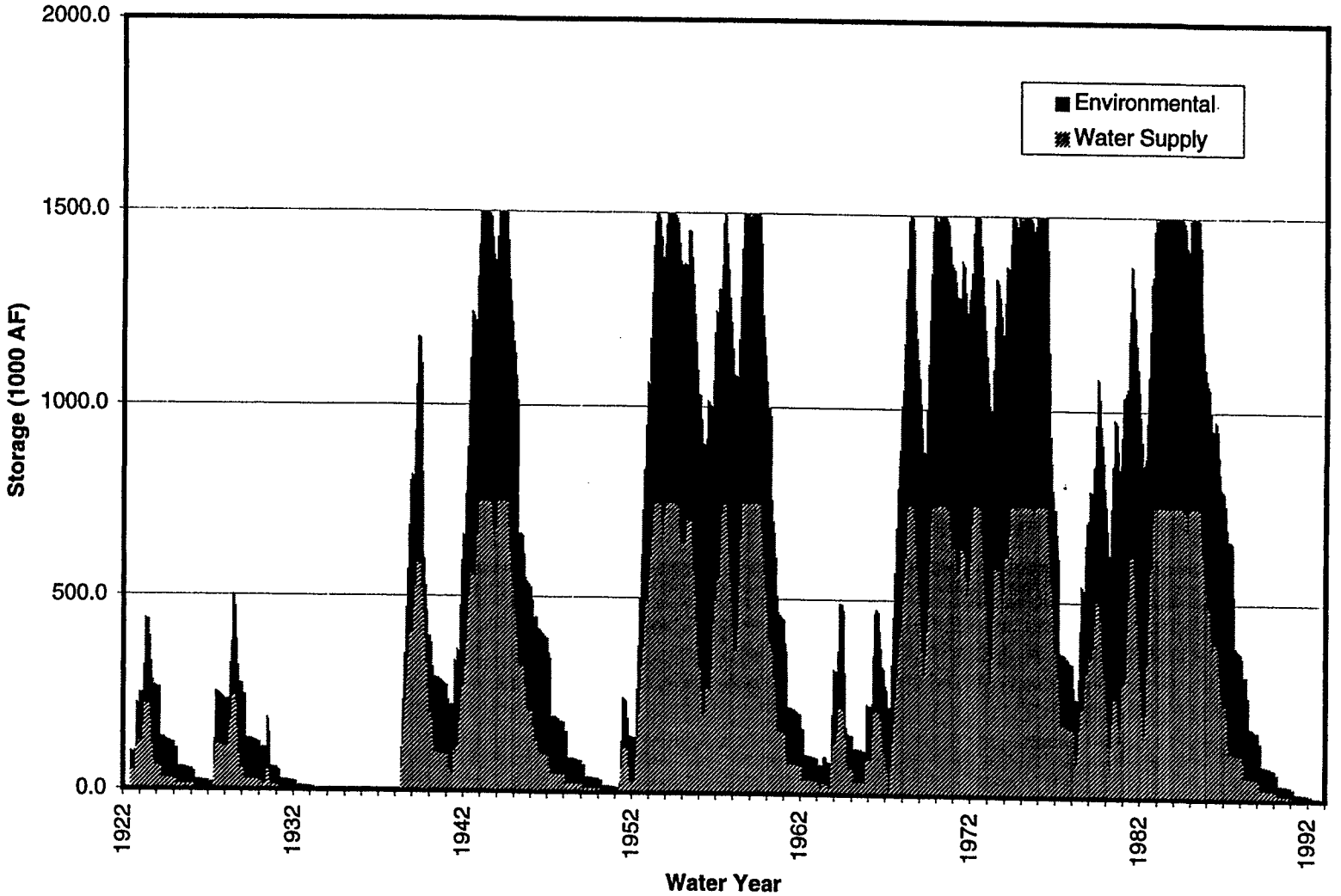


4/17/97

CVP/SWP Reoperation YES
FC Transfer Level Low

South Offstream Storage

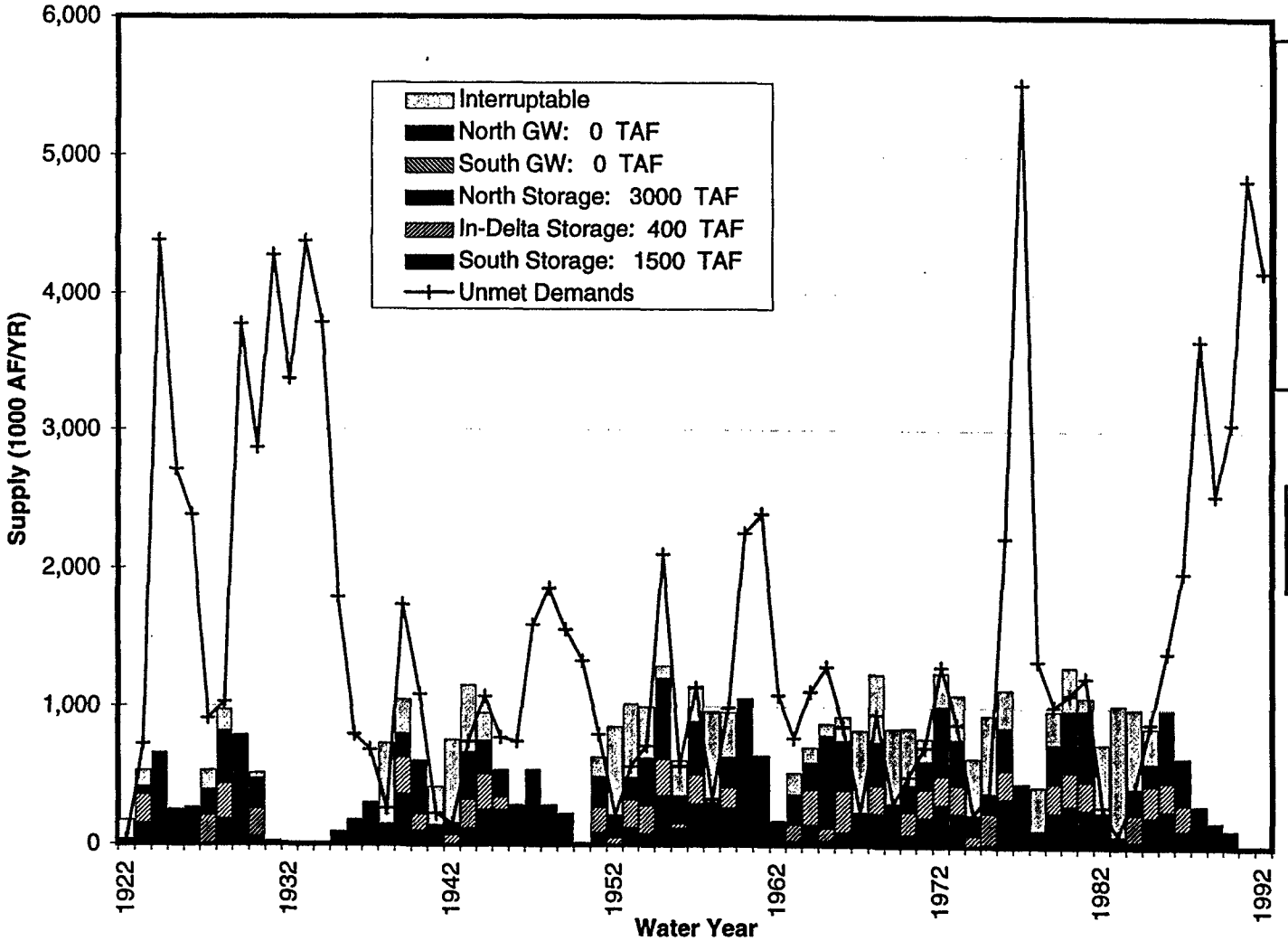
South Storage: 1500 TAF



4/17/97

Water Supply Opportunities

CVP/SWP Reoperation YES
FC Transfer Level Low

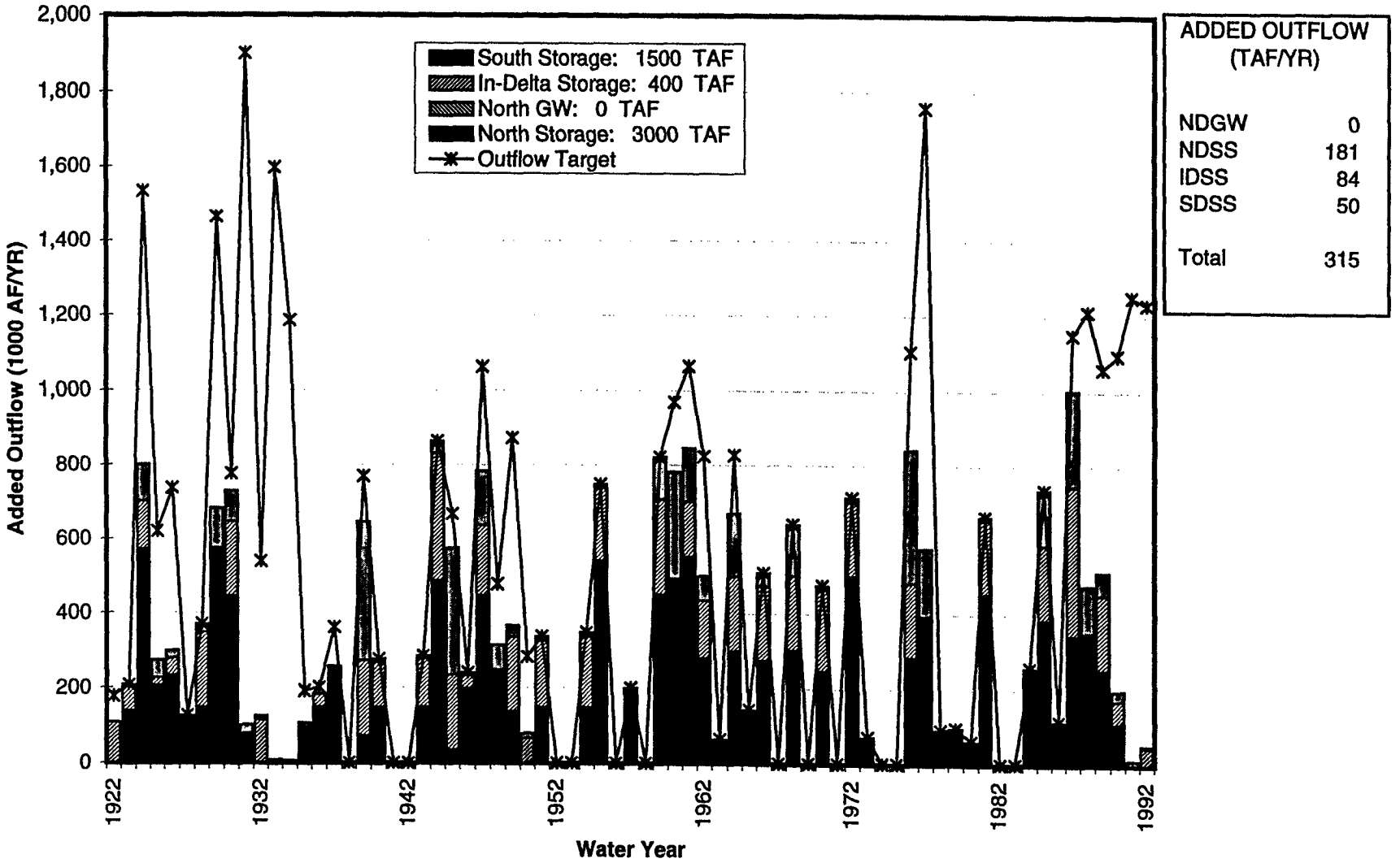


WATER SUPPLY (TAF/YR)	
NDGW	0
NDSS	245
IDSS	96
SDGW	0
SDSS	106
Interrupt	198
Total	645

CVP/SWP Shortage
22-92: 0 TAF/Yr
28-34: 0 TAF/Yr

CVP/SWP Reoperation YES
FC Transfer Level Low

Supplemental Delta Outflow



ADDED OUTFLOW (TAF/YR)	
NDGW	0
NDSS	181
IDSS	84
SDSS	50
Total	315

4/17/97

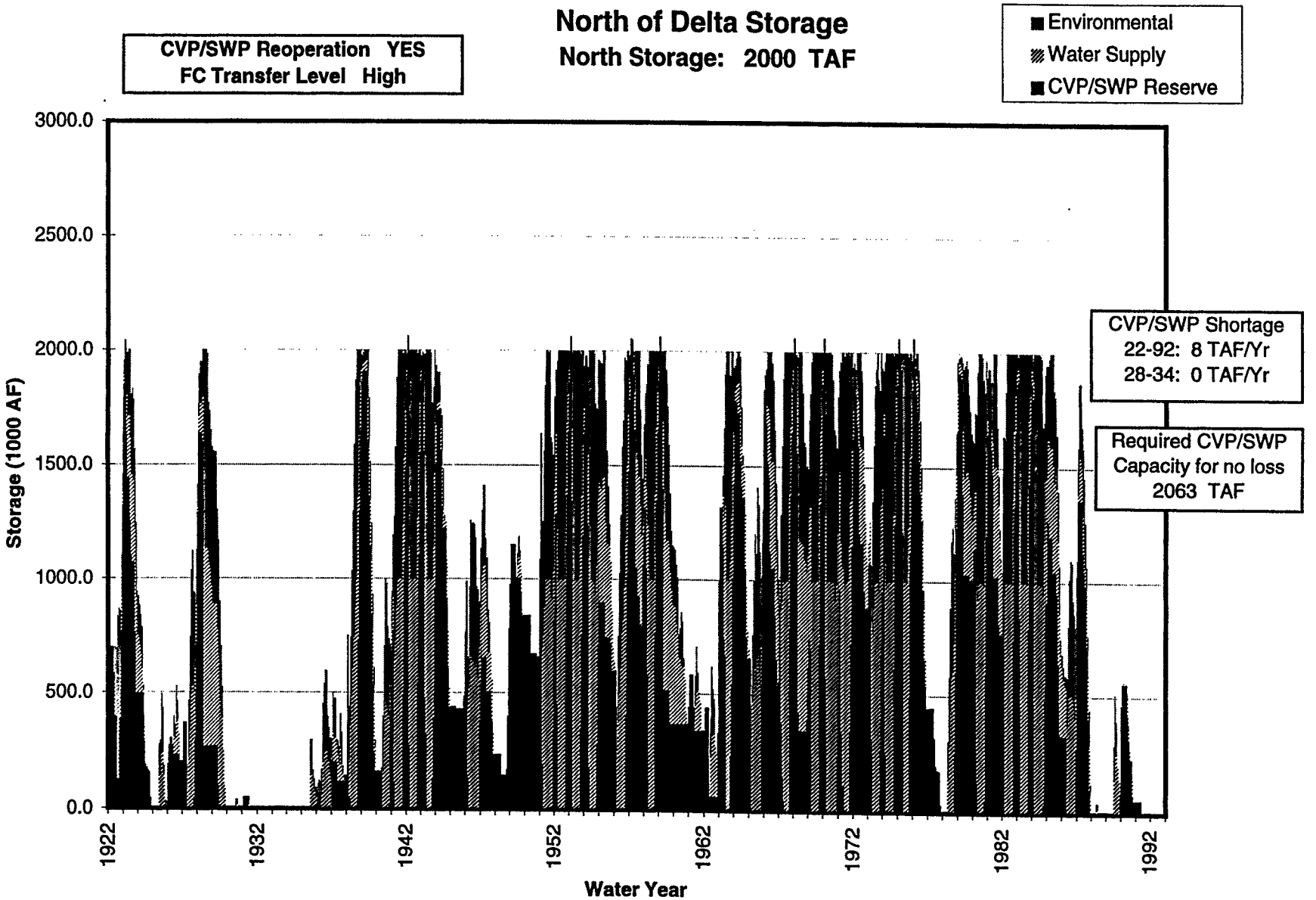
Graphs -- Reoperation

NDSS 2.0 MAF

D-006053

Graphs for the reoperations of Shasta and Oroville for the NDSS 2.0 MAF are identical to the NDSS 3.0 MAF graphs and were neither printed nor included in this report. They can be made available upon request.

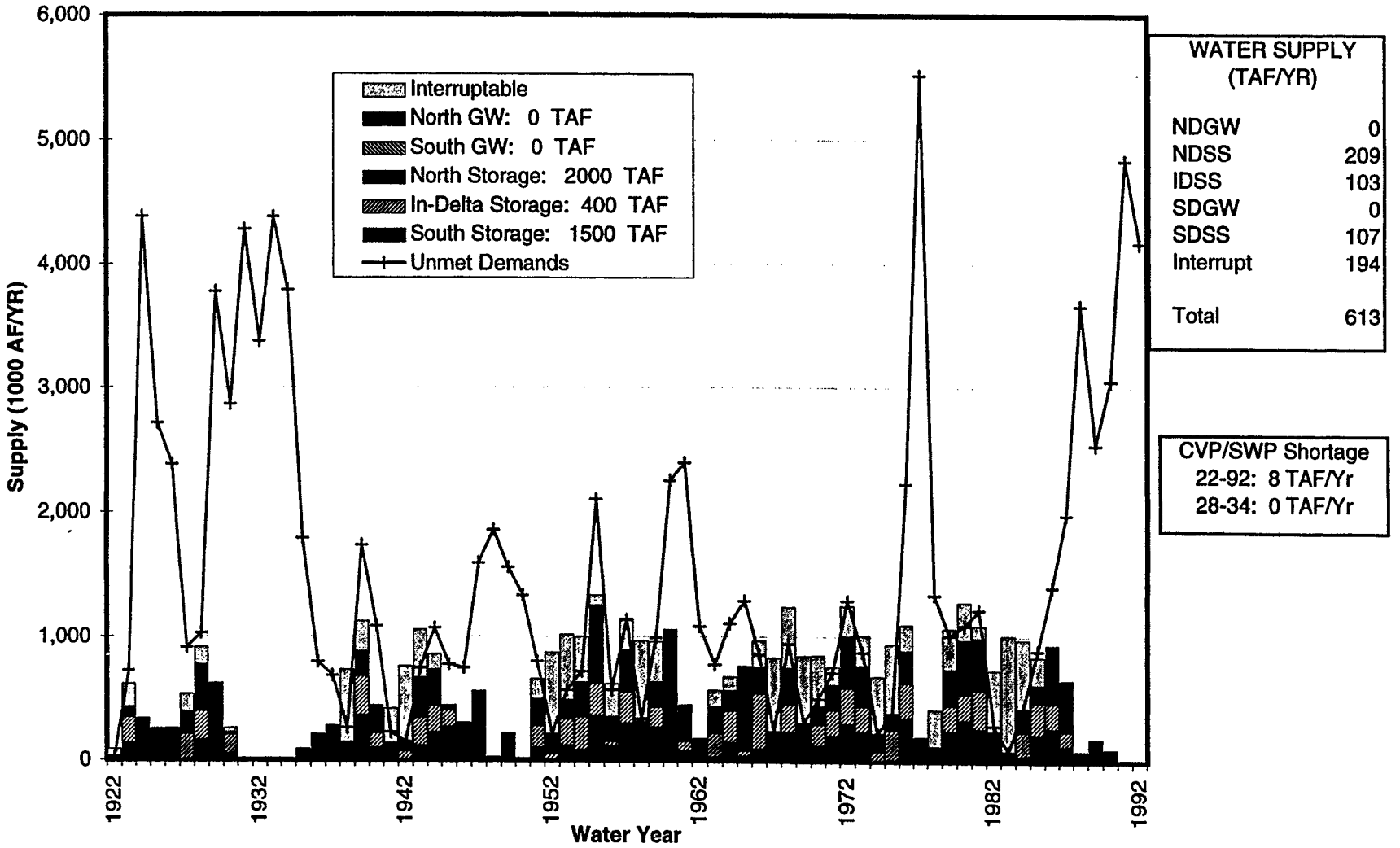
D-006054



4/17/97

Water Supply Opportunities

CVP/SWP Reoperation YES
FC Transfer Level High

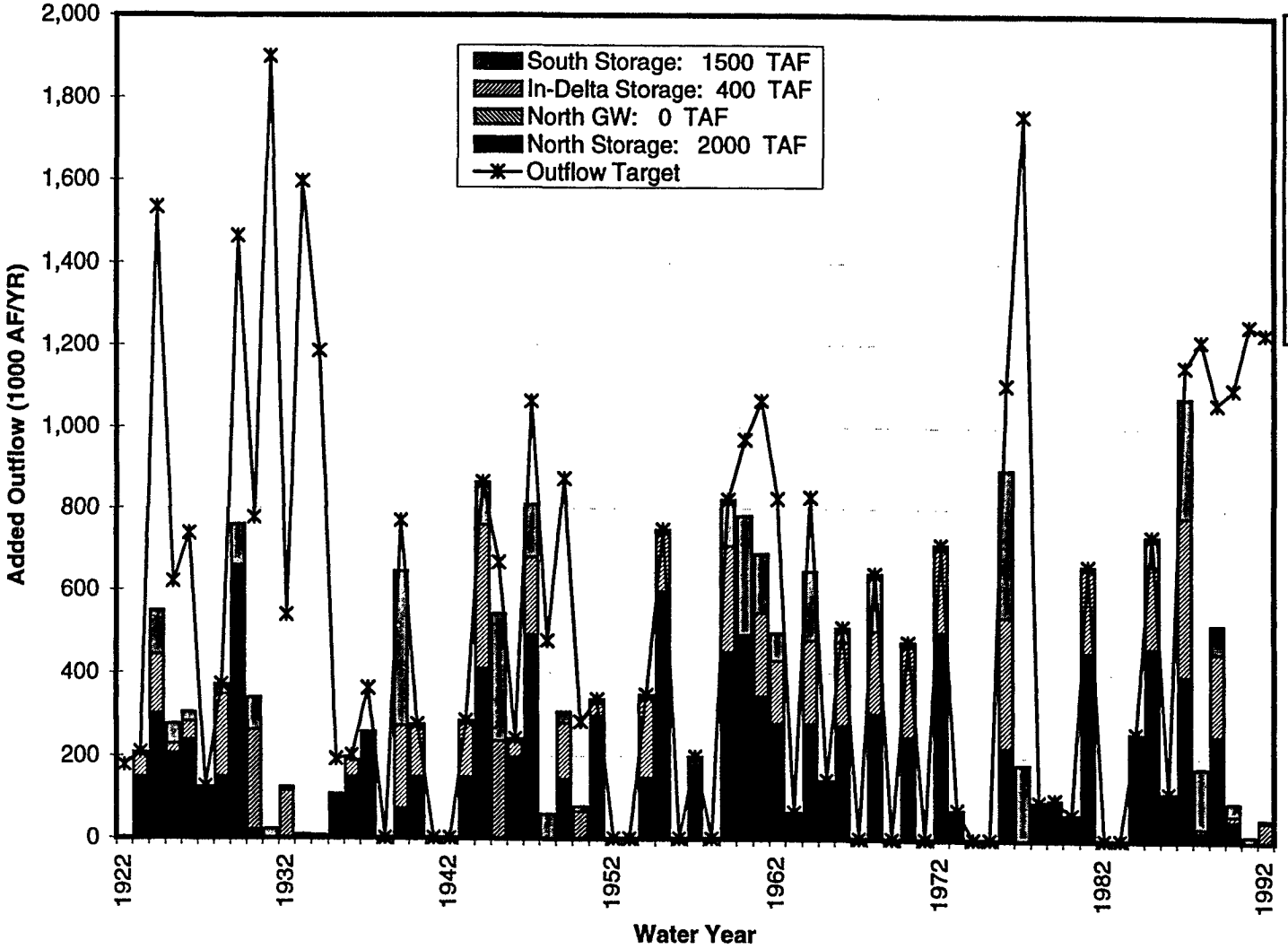


WATER SUPPLY (TAF/YR)	
NDGW	0
NDSS	209
IDSS	103
SDGW	0
SDSS	107
Interrupt	194
Total	613

CVP/SWP Shortage
22-92: 8 TAF/Yr
28-34: 0 TAF/Yr

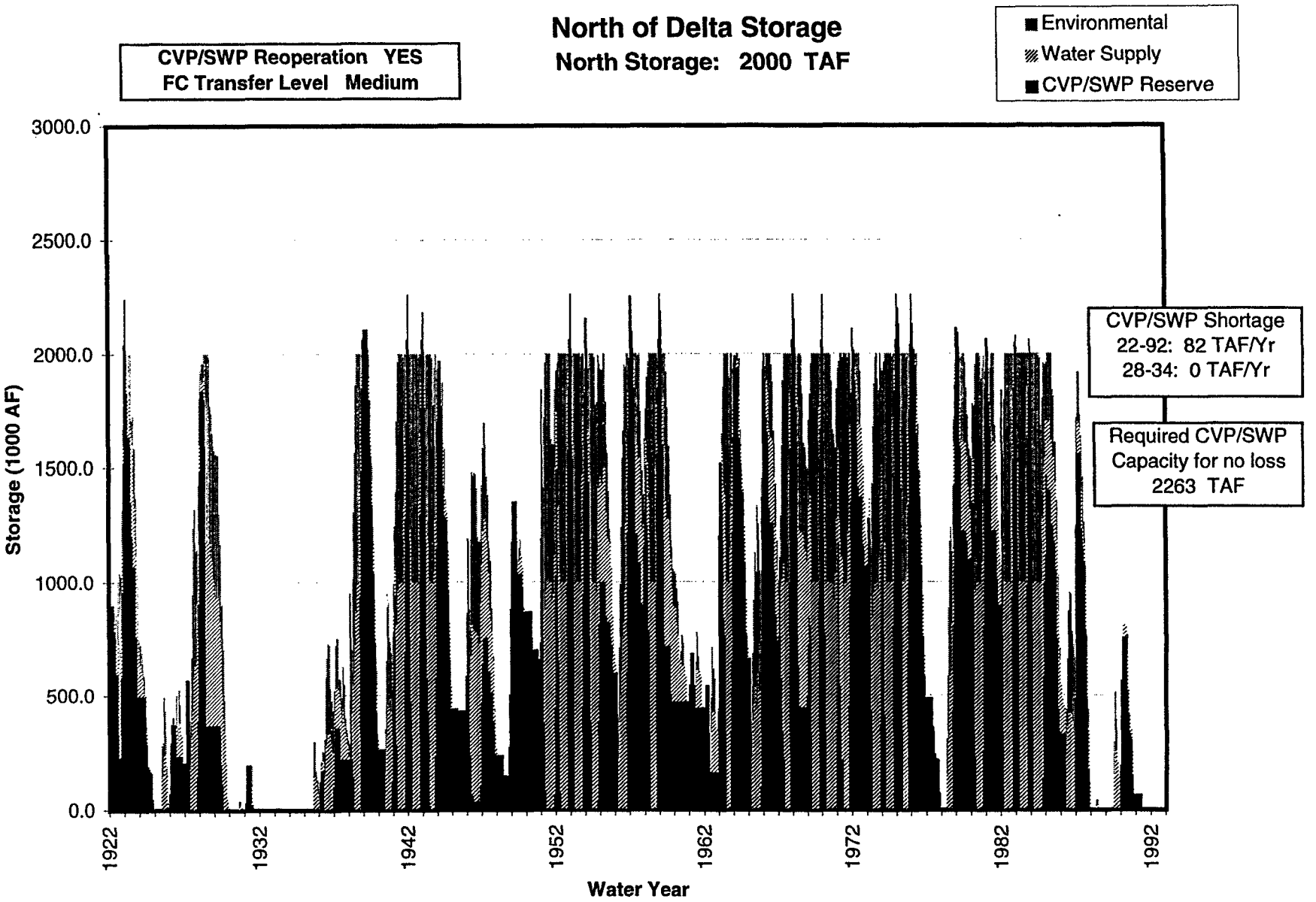
CVP/SWP Reoperation YES
FC Transfer Level High

Supplemental Delta Outflow



ADDED OUTFLOW (TAF/YR)	
NDGW	0
NDSS	157
IDSS	81
SDSS	50
Total	288

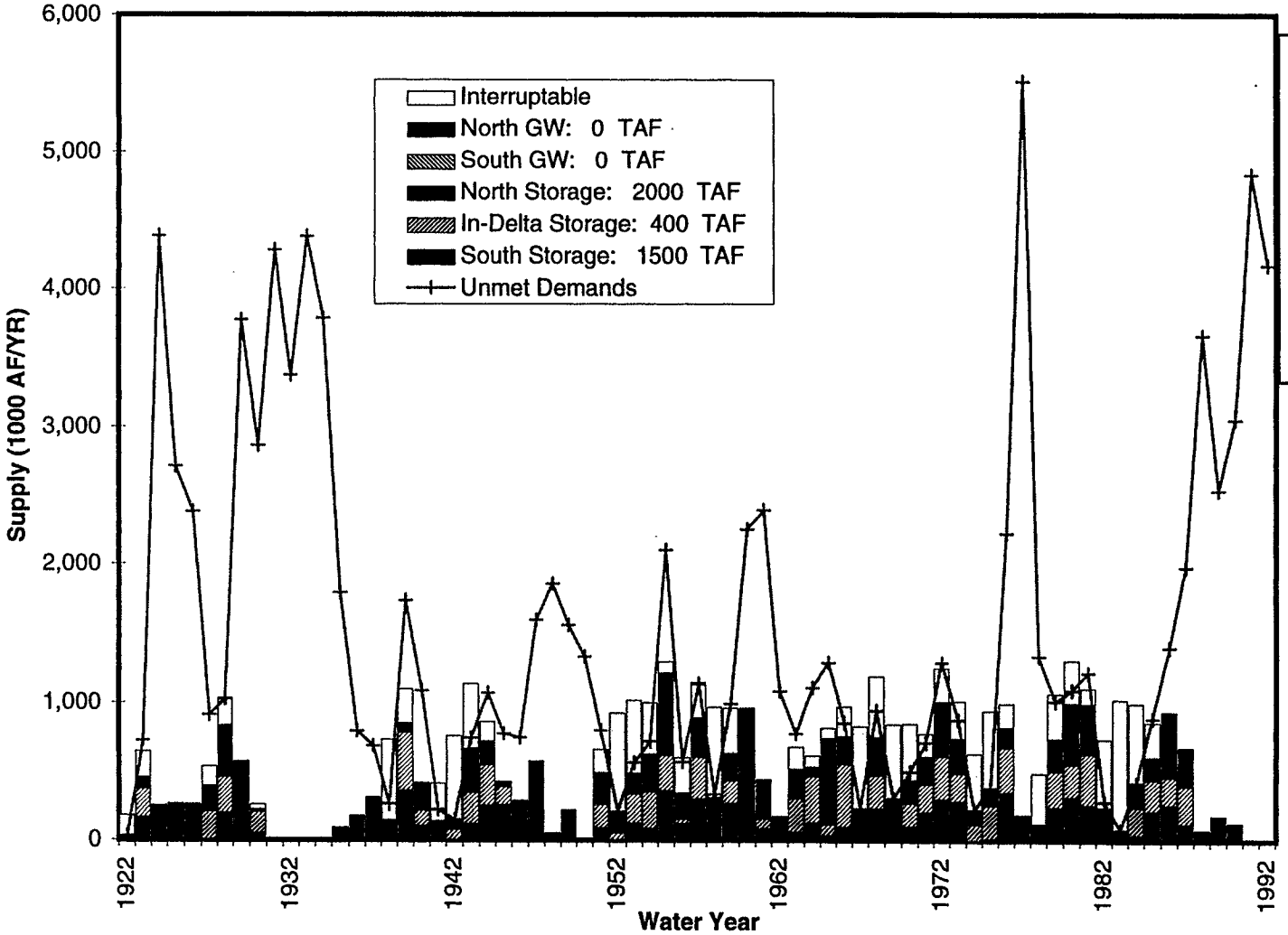
4/17/97



4/17/97

Water Supply Opportunities

CVP/SWP Reoperation YES
FC Transfer Level Medium

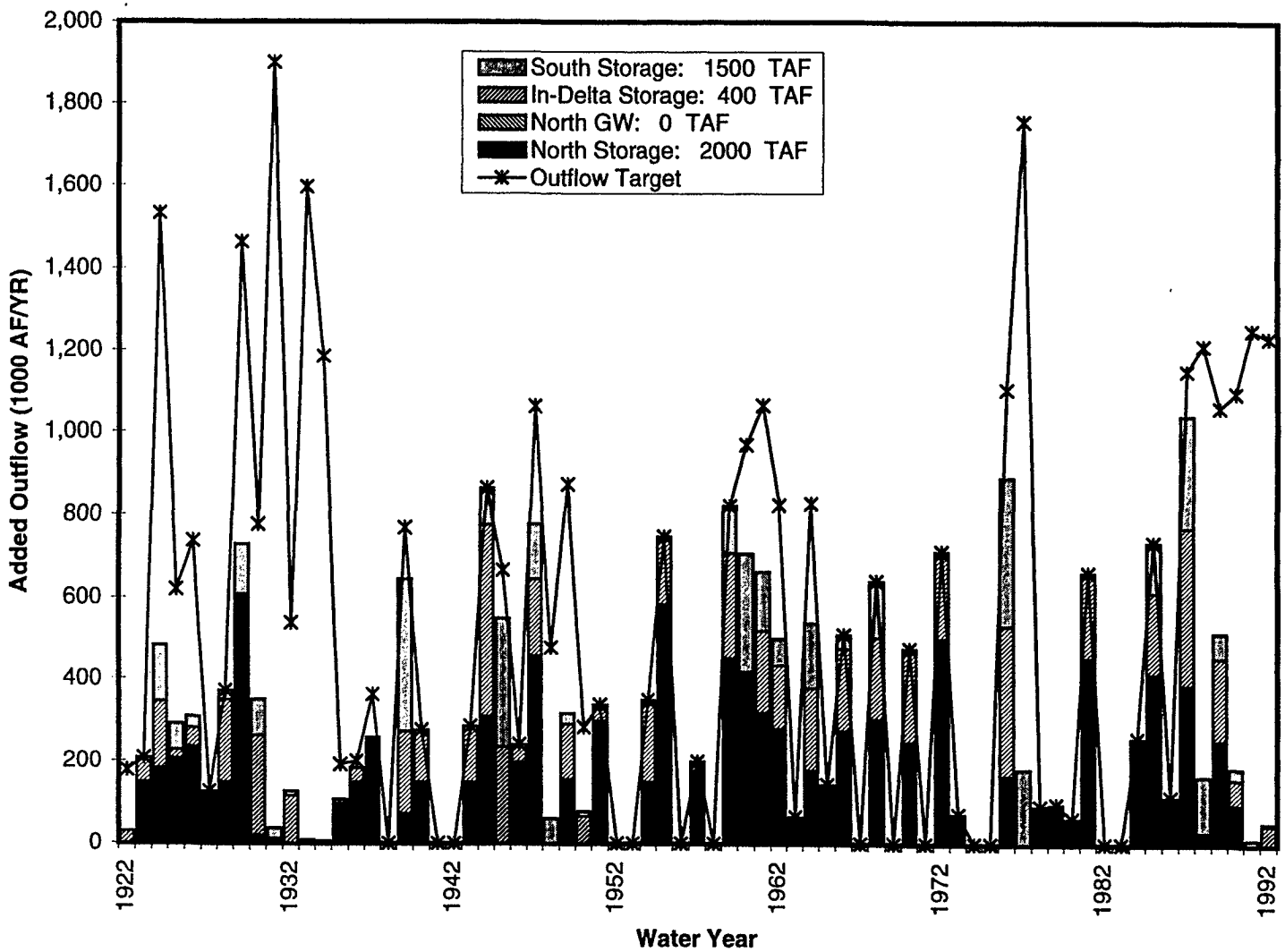


WATER SUPPLY (TAF/YR)	
NDGW	0
NDSS	192
IDSS	116
SDGW	0
SDSS	108
Interrupt	200
Total	616

CVP/SWP Shortage
22-92: 82 TAF/Yr
28-34: 0 TAF/Yr

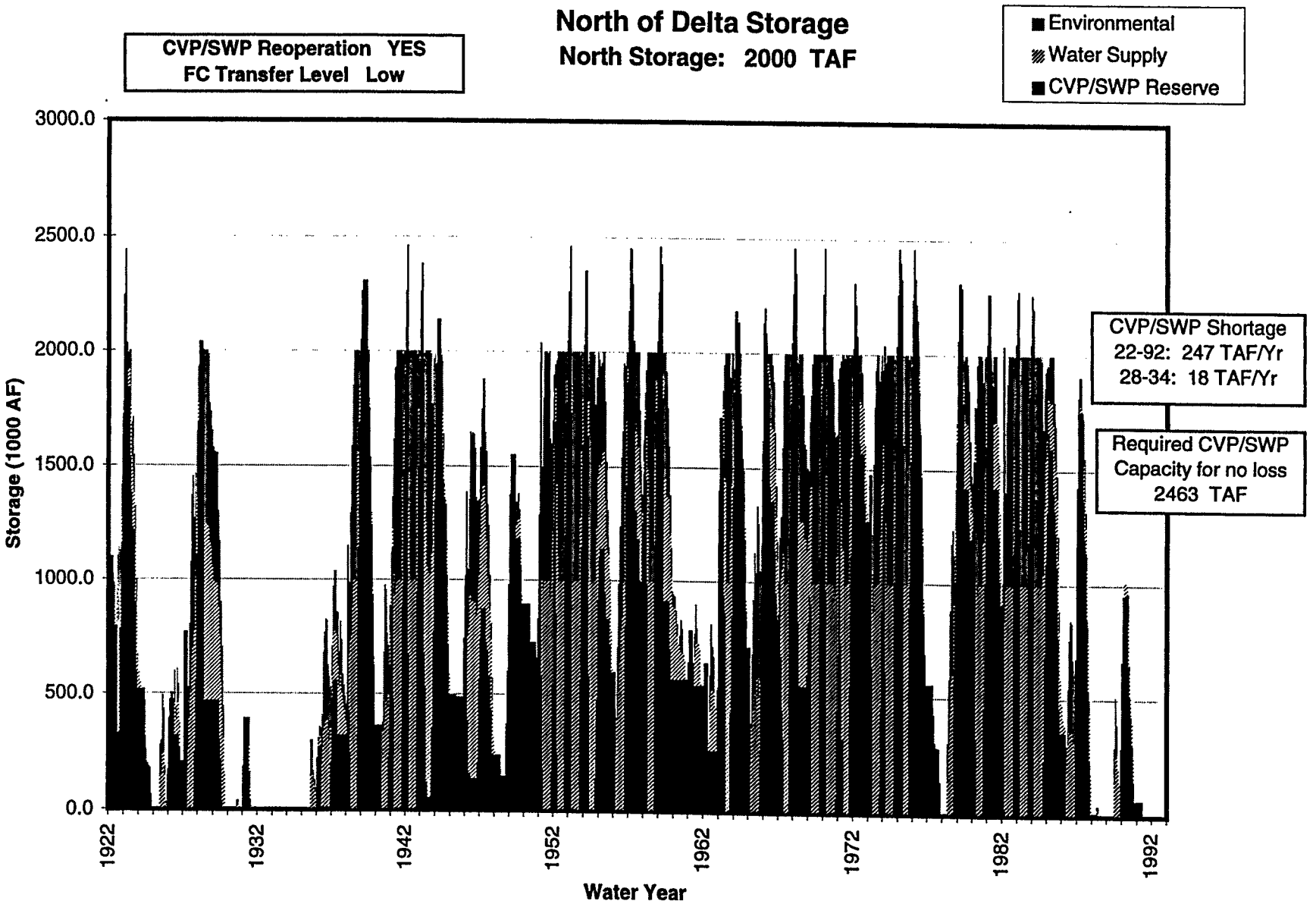
CVP/SWP Reoperation YES
FC Transfer Level Medium

Supplemental Delta Outflow



ADDED OUTFLOW (TAF/YR)	
NDGW	0
NDSS	149
IDSS	85
SDSS	51
Total	285

4/17/97

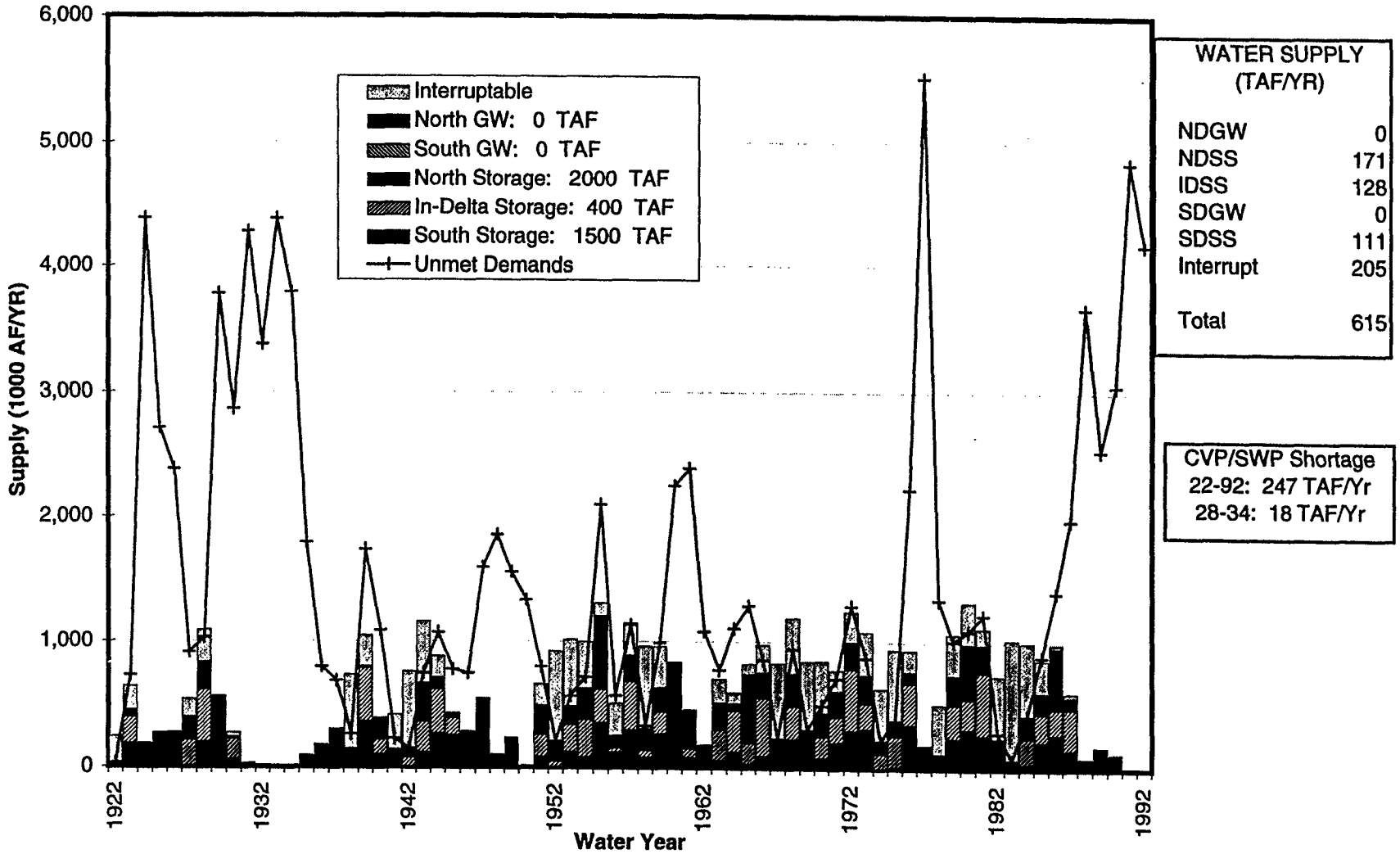


4/17/97

D—006061

Water Supply Opportunities

CVP/SWP Reoperation YES
FC Transfer Level Low

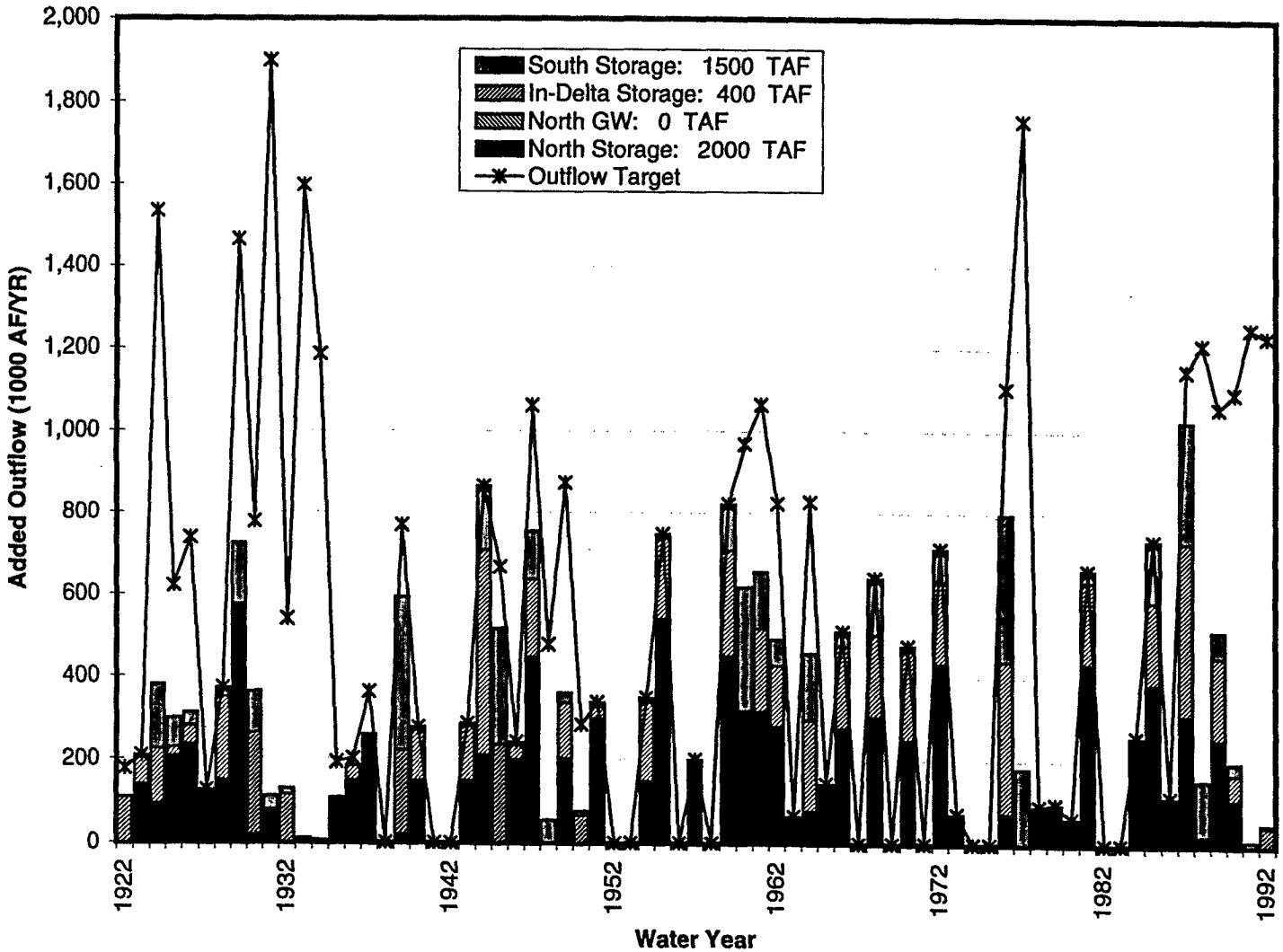


WATER SUPPLY (TAF/YR)	
NDGW	0
NDSS	171
IDSS	128
SDGW	0
SDSS	111
Interrupt	205
Total	615

CVP/SWP Shortage
22-92: 247 TAF/Yr
28-34: 18 TAF/Yr

CVP/SWP Reoperation YES
FC Transfer Level Low

Supplemental Delta Outflow



ADDED OUTFLOW (TAF/YR)	
NDGW	0
NDSS	139
IDSS	88
SDSS	55
Total	281

4/17/97

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB
1	Year/Month		Factor	Sacramento River Supply					Spills and Target Demands								Shasta Reoperations											
2																												
3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
4	Water Year	Month	Factor	Total Flow at Node 61 (Wilkens Slough)	Minimum Flow at Node 61 (Wilkens Slough)	Indicator (1=pump diff; 0= no pump)	Divertable Flow	Delta Surplus (Node 541)	Storable Sacramento River Spills	Total Delta Outflow (CFS)	Desired Minimum Delta Outflow (CFS)	Target Added Delta Outflow (1000 AF)	SWP Shortage (Annual)	Total SWP Shortage (Monthly)	CVP Shortage (Annual)	Total CVP Shortage (Monthly)	Shasta Storage - 472 Output	Change in Modeled Storage	Shasta Spill - 472 Output	Storable Spill -- Checked for Delta Surplus, NCP Surplus, and Exp/Inf Ratio	Maximum Shasta Transfer Potential to Offstream Storage	Shasta Transfer to Offstream Storage	Shasta Storage Adjusted	New Spill	Storage of Spill	Unstorable Spill	Shasta Cumm. Difference (Minimum Pool Offstream Storage)	Adjusted Shasta Spill (This is a check on Col.24)
5				(DWRSIM)	(DWRSIM Based)	(DWRSIM)	(DWRSIM)	(DWRSIM)		(DWRSIM)			(DWRSIM)	(DWRSIM Based)	(DWRSIM)	(DWRSIM Based)	(DWRSIM)		(DWRSIM)									
6																					0		0.0		0.0			
7																	2700						2700				0	
8	1922	OCT	0.0615	307	307	0	0	0	0.0	4000	0	0.0					2605	-95	0	0.0	205.0	205.0	2400.0	0.0	0.0	0.0	205.0	0.0
9		NOV	0.0595	340	297	0	0	0	0.0	4504	0	0.0					2663	58	0	0.0	158.0	158.0	2300.0	0.0	0.0	0.0	363.0	0.0
10		DEC	0.0615	622	307	0	0	164	0.0	7171	0	0.0					2811	148	0	0.0	0.0	0.0	2448.0	0.0	0.0	0.0	363.0	0.0
11		JAN	0.0615	508	307	0	0	191	0.0	9106	12000	178.0					2909	98	0	0.0	0.0	0.0	2546.0	0.0	0.0	0.0	363.0	0.0
12		FEB	0.0555	970	278	0	0	459	0.0	34016	12000	0.0					3270	361	0	0.0	0.0	0.0	2907.0	0.0	0.0	0.0	363.0	0.0
13		MAR	0.0615	708	307	0	0	1188	0.0	32054	12000	0.0					3706	436	0	0.0	0.0	0.0	3343.0	0.0	0.0	0.0	363.0	0.0
14		APR	0.0595	442	297	1	145	481	145.0	21294	12000	0.0					4323	617	0	0.0	0.0	0.0	3960.0	0.0	0.0	0.0	363.0	0.0
15		MAY	0.0615	487	307	1	180	2055	180.0	42976	12000	0.0					4552	229	133	133.0	0.0	0.0	4322.0	0.0	133.0	0.0	230.0	0.0
16		JUN	0.0595	297	297	1	0	109	0.0	25765	12000	0.0					4401	-151	0	0.0	0.0	0.0	4171.0	0.0	0.0	0.0	230.0	0.0
17		JUL	0.0615	307	307	1	0	0	0.0	8000	0	0.0					4009	-392	0	0.0	0.0	0.0	3779.0	0.0	0.0	0.0	230.0	0.0
18		AUG	0.0615	307	307	1	0	0	0.0	4000	0	0.0					3576	-433	0	0.0	146.0	146.0	3200.0	0.0	0.0	0.0	376.0	0.0
19		SEP	0.0595	297	297	1	0	16	0.0	3261	0	0.0					3428	-148	0	0.0	297.5	191.2	2700.0	160.8	0.0	160.8	728.0	160.8
20	1923	OCT	0.0615	431	307	0	0	97	0.0	5577	0	0.0					3380	-48	0	0.0	252.0	6.9	2400.0	245.1	0.0	245.1	980.0	245.1
21		NOV	0.0595	621	297	0	0	131	0.0	6706	0	0.0					3252	-128	71	0.0	0.0	0.0	2272.0	71.0	0.0	0.0	980.0	71.0
22		DEC	0.0615	991	307	0	0	1638	0.0	31198	0	0.0					3290	38	0	0.0	0.0	0.0	2310.0	0.0	0.0	0.0	980.0	0.0
23		JAN	0.0615	807	307	1	500	1511	500.0	30569	12000	0.0					3386	96	0	0.0	0.0	0.0	2406.0	0.0	0.0	0.0	980.0	0.0
24		FEB	0.0555	641	278	1	363	0	0.0	21073	12000	0.0					3321	-65	0	0.0	0.0	0.0	2341.0	0.0	0.0	0.0	980.0	0.0
25		MAR	0.0615	474	307	1	167	196	0.0	13279	12000	0.0					3372	51	0	0.0	0.0	0.0	2545.8	0.0	0.0	0.0	826.3	0.0
26		APR	0.0595	576	297	1	279	749	180.2	22874	12000	0.0					3655	283	0	0.0	0.0	0.0	2977.5	0.0	0.0	0.0	677.5	0.0
27		MAY	0.0615	307	307	1	0	165	0.0	12764	12000	0.0					3544	-111	0	0.0	0.0	0.0	3000.0	0.0	0.0	0.0	544.0	0.0
28		JUN	0.0595	297	297	1	0	0	0.0	8504	12000	208.0					3303	-241	0	0.0	0.0	0.0	2759.0	0.0	0.0	0.0	544.0	0.0
29		JUL	0.0615	365	307	1	58	0	0.0	6504	0	0.0					2841	-462	0	0.0	0.0	0.0	2392.1	0.0	0.0	0.0	448.9	0.0
30		AUG	0.0615	307	307	1	0	0	0.0	4000	0	0.0					2456	-385	0	0.0	0.0	0.0	2100.0	0.0	0.0	0.0	356.0	0.0
31		SEP	0.0595	419	297	1	122	0	0.0	3008	0	0.0					2309	-147	0	0.0	0.0	0.0	1953.0	0.0	0.0	0.0	356.0	0.0
32	1924	OCT	0.0615	271	246	0	0	0	0.0	4000	0	0.0					2333	24	0	0.0	0.0	0.0	1977.0	0.0	0.0	0.0	356.0	0.0
33		NOV	0.0595	254	238	0	0	0	0.0	4504	0	0.0					2337	4	0	0.0	0.0	0.0	1981.0	0.0	0.0	0.0	356.0	0.0
34		DEC	0.0615	282	246	0	0	0	0.0	4504	0	0.0					2336	-1	0	0.0	0.0	0.0	1980.0	0.0	0.0	0.0	356.0	0.0
35		JAN	0.0615	304	246	0	0	82	0.0	5837	12000	379.0					2342	6	0	0.0	0.0	0.0	1986.0	0.0	0.0	0.0	356.0	0.0
36		FEB	0.0555	466	222	0	0	211	0.0	9789	12000	122.7					2482	140	0	0.0	0.0	0.0	2126.0	0.0	0.0	0.0	356.0	0.0
37		MAR	0.0615	295	246	0	0	0	0.0	1189	12000	49.9					2489	7	0	0.0	0.0	0.0	2217.0	0.0	0.0	0.0	272.0	0.0
38		APR	0.0595	238	238	0	0	0	0.0	5882	12000	364.0					2265	-224	0	0.0	0.0	0.0	2075.0	0.0	0.0	0.0	190.0	0.0
39		MAY	0.0615	246	246	0	0	0	0.0	6894	12000	314.0					2021	-244	0	0.0	0.0	0.0	1843.0	0.0	0.0	0.0	178.0	0.0
40		JUN	0.0595	344	238	0	0	0	0.0	6891	12000	304.0					1659	-362	0	0.0	0.0	0.0	1494.0	0.0	0.0	0.0	165.0	0.0
41		JUL	0.0615	280	246	0	0	0	0.0	4000	0	0.0					1351	-308	0	0.0	0.0	0.0	1192.0	0.0	0.0	0.0	159.0	0.0
42		AUG	0.0615	246	246	0	0	0	0.0	2992	0	0.0					1106	-245	0	0.0	0.0	0.0	1059.0	0.0	0.0	0.0	47.0	0.0
43		SEP	0.0595	291	238	0	0	2	0.0	3042	0	0.0					918	-188	0	0.0	0.0	0.0	918.0	0.0	0.0	0.0	0.0	0.0
44	1925	OCT	0.0615	255	200	0	0	0	0.0	3366	0	0.0					959	41	0	0.0	0.0	0.0	959.0	0.0	0.0	0.0	0.0	0.0
45		NOV	0.0595	279	193	0	0	2	0.0	3529	0	0.0					1109	150	0	0.0	0.0	0.0	1109.0	0.0	0.0	0.0	0.0	0.0
46		DEC	0.0615	367	200	0	0	77	0.0	4748	0	0.0					1225	116	0	0.0	0.0	0.0	1225.0	0.0	0.0	0.0	0.0	0.0
47		JAN	0.0615	320	200	0	0	0	0.0	5000	12000	369.0					1360	135	0	0.0	0.0	0.0	1360.0	0.0	0.0	0.0	0.0	0.0
48		FEB	0.0555	2081	180	0	1031	2356	497.1	47236	12000	0.0					2642	1282	0	0.0	0.0	0.0	2642.0	0.0	0.0	0.0	0.0	0.0
49		MAR	0.0615	1540	200	1	340	304	16.2	15658	12000	0.0					3002	360	0	0.0	0.0	0.0	3002.0	0.0	0.0	0.0	0.0	0.0
50		APR	0.0595	715	193	1	522	674	201.2	21950	12000	0.0					3749	747	0	0.0	0.0	0.0	3749.0	0.0	0.0	0.0	0.0	0.0
51		MAY	0.0615	203	200	1	3	55	3.0	11073	12000	57.0					4045	296	0	0.0	0.0	0.0	4045.0	0.0	0.0	0.0	0.0	0.0
52		JUN	0.0595	354	193	1	161	0	0.0	8739	12000	194.0					3796	-249	0	0.0	0.0	0.0	3796.0	0.0	0.0	0.0	0.0	0.0
53		JUL	0.0615	481	200	1	281	0	0.0	4992	0	0.0					3246	-550	0	0.0	0.0	0.0	3246.0	0.0	0.0	0.0	0.0	0.0
54		AUG	0.0615	272	200	1	72	0	0.0	3496	0	0.0					2908	-338	0	0.0	0.0	0.0	2908.0	0.0	0.0	0.0	0.0	0.0
55		SEP	0.0595	355	193	1	162	0	0.0	3008	0	0.0					2772	-136	0	0.0	72.0	72.0	2700.0	0.0	0.0	0.0	72.0	0.0
56	1926	OCT	0.0615	317	307	0	0	0	0.0	4000	0	0.0					2693	-79	0	0.0	221.0	221.0	2400.0	0.0	0.0	0.0	293.0	0.0

	A	B	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB
1	Year/Month		Sacramento River Adjustments						Oroville Reoperations												Summary						
2																											
3	1	2	30	31	32	33	34		36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
4	Water Year	Month	Adjusted Flow at Wilkens Slough	Minimum Flow at Node 61 (Wilkens Slough)	Adjusted Indicator (1=pump diff; 0= no pump)	Adjusted Divertable Flow	Adjusted Storable Flow		Oroville Storage - 472 Output	Change in Modeled Storage	Oroville Spill - 472 Output	Storable Spill -- Checked for Delta Surplus and Exp/Inf Ratio	Maximum Oroville Transfer Potential to Offstream Storage	Oroville Transfer to Offstream Storage	Oroville Storage Adjusted	New Spill	Storage of Spill	Unstorable Spill	Oroville Cumm. Difference (Minimum Pool Offstream Storage)	Adjusted Oroville Spill	Total Transfer to Offstream Storage	Total Required Carryover for Offstream Storage for CVP/SWP Operations	Release From Offstream Storage for CVP Tracy Pumping	Release From Offstream Storage for SWP Banks Pumping	Adjusted Delta Surplus	DWRSIM Delta Inflow	Adjusted Delta Inflow before Operation of North Facilities
5				(DWRSIM)					(DWRSIM)		(DWRSIM)															(DWRSIM)	
6															0.0												
7									2700						2700				0			0					
8	1922	OCT	307.0	307	0	0.0	0.0		2437	-263	0	0	307.5	307.5	2100.0	29.5	0.0	29.5	337.0	29.5	512.5	542.0	0.0	0.0	29.5	966	995.5
9		NOV	340.0	297	0	0.0	0.0		2437	0	0	0	200.0	200.0	1900.0	0.0	0.0	0.0	537.0	0.0	358.0	900.0	0.0	0.0	0.0	895	895.0
10		DEC	622.0	307	0	0.0	0.0		2464	27	0	0	0.0	0.0	1927.0	0.0	0.0	0.0	537.0	0.0	0.0	900.0	0.0	0.0	164.0	1323	1323.0
11		JAN	508.0	307	0	0.0	0.0		2591	127	0	0	0.0	0.0	2054.0	0.0	0.0	0.0	537.0	0.0	0.0	900.0	0.0	0.0	191.0	1337	1337.0
12		FEB	970.0	278	0	0.0	0.0		2813	222	113	113	0.0	0.0	2389.0	0.0	113.0	0.0	424.0	0.0	0.0	787.0	0.0	0.0	1346.0	2500	2387.0
13		MAR	708.0	307	0	0.0	0.0		2922	109	189	189	0.0	0.0	2687.0	0.0	189.0	0.0	235.0	0.0	0.0	598.0	0.0	0.0	999.0	2447	2258.0
14		APR	442.0	297	1	145.0	145.0		3440	518	0	0	0.0	0.0	3205.0	0.0	0.0	0.0	235.0	0.0	0.0	598.0	0.0	0.0	336.0	1856	1856.0
15		MAY	354.0	307	1	47.0	47.0		3538	98	946	554	0.0	0.0	3538.0	711.0	235.0	0.0	0.0	711.0	0.0	230.0	0.0	0.0	1640.0	3440	3072.0
16		JUN	297.0	297	1	0.0	0.0		3538	0	31	31	0.0	0.0	3538.0	31.0	0.0	0.0	0.0	31.0	0.0	230.0	0.0	0.0	109.0	2680	2680.0
17		JUL	307.0	307	1	0.0	0.0		3357	-181	0	0	307.5	307.5	3000.0	49.5	0.0	49.5	357.0	49.5	307.5	587.0	0.0	0.0	49.5	1415	1464.5
18		AUG	307.0	307	1	0.0	0.0		3285	-72	0	0	228.0	228.0	2700.0	0.0	0.0	0.0	585.0	0.0	374.0	961.0	0.0	0.0	0.0	1089	1089.0
19		SEP	457.8	297	1	160.8	0.1		3296	11	0	0	211.0	135.6	2500.0	75.4	0.0	75.4	796.0	75.4	326.8	1524.0	0.0	0.0	252.1	927	1163.2
20	1923	OCT	676.1	307	0	0.0	0.0		3163	-133	71	0.85	267.9	7.4	2100.0	330.6	0.0	259.6	1063.0	330.6	14.3	2043.0	0.0	0.0	601.7	1104	1608.7
21		NOV	621.0	297	0	0.0	0.0		3163	0	99	0	200.0	13.7	1900.0	225.3	0.0	186.3	1263.0	225.3	13.7	2243.0	0.0	0.0	317.3	1230	1416.3
22		DEC	991.0	307	0	0.0	0.0		2922	-241	410	410	0.0	0.0	2069.0	0.0	410.0	0.0	853.0	0.0	0.0	1833.0	0.0	0.0	1228.0	2416	2006.0
23		JAN	807.0	307	1	500.0	500.0		2976	54	193	193	0.0	0.0	2316.0	0.0	193.0	0.0	660.0	0.0	0.0	1640.0	0.0	0.0	1308.3	2440	2247.0
24		FEB	641.0	278	1	363.0	0.0		2838	-138	0	0	0.0	0.0	2178.0	0.0	0.0	0.0	660.0	0.0	0.0	1640.0	0.0	0.0	0.0	1916	1916.0
25		MAR	474.0	307	1	167.0	0.0		3028	190	0	0	0.0	0.0	2500.0	0.0	0.0	0.0	528.0	0.0	0.0	1354.3	153.8	132.0	196.0	1234	1234.0
26		APR	576.0	297	1	279.0	180.2		3361	333	0	0	0.0	0.0	2833.0	0.0	0.0	0.0	528.0	0.0	0.0	1205.5	148.8	0.0	568.9	1832	1832.0
27		MAY	307.0	307	1	0.0	0.0		3453	92	0	0	0.0	0.0	2925.0	0.0	0.0	0.0	528.0	0.0	0.0	1072.0	133.5	0.0	165.0	1336	1336.0
28		JUN	297.0	297	1	0.0	0.0		3170	-283	0	0	0.0	0.0	2642.0	0.0	0.0	0.0	528.0	0.0	0.0	1072.0	0.0	0.0	0.0	1167	1167.0
29		JUL	365.0	307	1	58.0	0.0		2378	-792	0	0	0.0	0.0	2062.4	0.0	0.0	0.0	315.6	0.0	0.0	764.5	95.1	212.4	0.0	1375	1375.0
30		AUG	307.0	307	1	0.0	0.0		1919	-459	0	0	0.0	0.0	1777.2	0.0	0.0	0.0	141.8	0.0	0.0	497.8	92.9	173.8	0.0	1137	1137.0
31		SEP	419.0	297	1	122.0	0.0		1945	26	0	0	0.0	0.0	1803.2	0.0	0.0	0.0	141.8	0.0	0.0	497.8	0.0	0.0	0.0	843	843.0
32	1924	OCT	271.0	246	0	0.0	0.0		1852	-93	0	0	0.0	0.0	1710.2	0.0	0.0	0.0	141.8	0.0	0.0	497.8	0.0	0.0	0.0	978	978.0
33		NOV	254.0	238	0	0.0	0.0		1738	-114	0	0	0.0	0.0	1596.2	0.0	0.0	0.0	141.8	0.0	0.0	497.8	0.0	0.0	0.0	759	759.0
34		DEC	282.0	246	0	0.0	0.0		1601	-137	0	0	0.0	0.0	1459.2	0.0	0.0	0.0	141.8	0.0	0.0	497.8	0.0	0.0	0.0	818	818.0
35		JAN	304.0	246	0	0.0	0.0		1648	47	0	0	0.0	0.0	1506.2	0.0	0.0	0.0	141.8	0.0	0.0	497.8	0.0	0.0	82.0	1016	1016.0
36		FEB	466.0	222	0	0.0	0.0		1830	182	0	0	0.0	0.0	1688.2	0.0	0.0	0.0	141.8	0.0	0.0	497.8	0.0	0.0	211.0	1114	1114.0
37		MAR	295.0	246	0	0.0	0.0		1710	-120	0	0	0.0	0.0	1692.2	0.0	0.0	0.0	17.8	0.0	0.0	289.8	84.0	124.0	0.0	880	880.0
38		APR	238.0	238	0	0.0	0.0		1585	-125	0	0	0.0	0.0	1585.0	0.0	0.0	0.0	0.0	0.0	0.0	190.0	82.0	17.8	0.0	618	618.0
39		MAY	246.0	246	0	0.0	0.0		1460	-125	0	0	0.0	0.0	1460.0	0.0	0.0	0.0	0.0	0.0	0.0	178.0	12.0	0.0	0.0	648	648.0
40		JUN	344.0	238	0	0.0	0.0		1271	-189	0	0	0.0	0.0	1271.0	0.0	0.0	0.0	0.0	0.0	0.0	165.0	13.0	0.0	0.0	705	705.0
41		JUL	280.0	246	0	0.0	0.0		1093	-178	0	0	0.0	0.0	1093.0	0.0	0.0	0.0	0.0	0.0	0.0	159.0	6.0	0.0	0.0	546	546.0
42		AUG	246.0	246	0	0.0	0.0		1021	-72	0	0	0.0	0.0	1021.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	112.0	0.0	0.0	491	491.0
43		SEP	291.0	238	0	0.0	0.0		981	-40	0	0	0.0	0.0	981.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	0.0	2.0	570	570.0
44	1925	OCT	256.0	200	0	0.0	0.0		989	8	0	0	0.0	0.0	989.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	626	626.0
45		NOV	279.0	193	0	0.0	0.0		1020	31	0	0	0.0	0.0	1020.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	533	533.0
46		DEC	367.0	200	0	0.0	0.0		1075	55	0	0	0.0	0.0	1075.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	77.0	860	860.0
47		JAN	320.0	200	0	0.0	0.0		1208	133	0	0	0.0	0.0	1208.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	751	751.0
48		FEB	2031.0	180	0	1031.0	497.1		1821	613	0	0	0.0	0.0	1821.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2078.5	3522	3522.0
49		MAR	540.0	200	1	340.0	16.2		2092	271	0	0	0.0	0.0	2092.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	287.9	2076	2076.0
50		APR	715.0	193	1	522.0	201.2		2368	276	0	0	0.0	0.0	2368.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	472.8	1625	1625.0
51		MAY	203.0	200	1	3.0	3.0		2473	105	0	0	0.0	0.0	2473.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	52.0	1030	1030.0
52		JUN	354.0	193	1	161.0	0.0		2195	-278	0	0	0.0	0.0	2195.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	987	987.0
53		JUL	481.0	200	1	281.0	0.0		1845	-350	0	0	0.0	0.0	1845.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1090	1090.0
54		AUG	272.0	200	1	72.0	0.0		1735	-110	0	0	0.0	0.0	1735.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	738	738.0
55		SEP	355.0	193	1	162.0	0.0		1730	-5	0	0	0.0	0.0	1730.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	711	711.0
56	1926	OCT	317.0	307	0	0.0	0.0		1696	-34	0	0	0.0	0.0	1696.0	0.0	0.0	0.0	0.0	0.0	72.0	72.0	0.0	0.0	0.0	752	752.0
																					221.0	293.0	0.0	0.0	0.0		

	A	B	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT	BU	BV	BW	BX	BY	BZ	CA	CB	CC	CD	CE
1	Year/Month		North of Delta Groundwater Storage																		North of Delta Offstream Storage										
2			Max Recharge		Environmental			Water Supply			Actual Recharge			CVP/SWP							Environmental					Evap	Water Supply				
3	1	2	55	56	57	58	59	60	61	62	63	64		66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83
4	Water Year	Month	Maximum Non-Project Recharge	Maximum Potential Recharge from River	Recharge to Basin for Enviro.	Enviro. Groundwater EOM Storage (TAF)	Extraction from Basin for Delta Outflow	Recharge to Basin for Water Supply	Water Supply Groundwater EOM Storage (TAF)	Extraction from Basin for Water Supply	Actual Recharge from River	Recharge from Non-Project sources		Water Transfer from CVP/SWP	Release for CVP/SWP	Offstream E.O.M Storage Required for CVP/SWP	Maximum Potential Offstream Storage Available for CVP/SWP	Shortage to CVP/SWP	Offstream CVP/SWP Storage Evap	Potential Water Banked for new Use	Pumping of Sacto River Spill	Offstream E.O.M Storage	Available Carryover Storage for new Enviro. Demands	Outflow Demand met from Storage	Enviro. Evap.	Total Evaporation	Water Supply Evap.	Pumping of Sacto River Spill	Offstream E.O.M Storage	Available Carryover Storage for new Water Supply Demands	Demand met from Storage
5																															
6																															
7						0			0							0						0	0						0	0	
8	1922	OCT	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		512.5	0.0	542.0	542.0	0.0	0.0	0.0	0.0	256.3	0.0	0.0	0.0	0.0	0.0	0.0	256.3	0.0	0.0
9		NOV	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		358.0	0.0	900.0	900.0	0.0	2.1	0.0	0.0	434.2	0.0	0.0	0.0	2.1	0.0	0.0	434.2	0.0	0.0
10		DEC	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	900.0	900.0	0.0	0.0	0.0	0.0	434.2	0.0	0.0	0.0	0.0	0.0	0.0	434.2	0.0	0.0
11		JAN	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	900.0	900.0	0.0	0.0	0.0	0.0	434.2	0.0	0.0	0.0	0.0	0.0	0.0	434.2	0.0	0.0
12		FEB	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	787.0	787.0	0.0	0.0	113.0	0.0	434.2	40.7	0.0	0.0	0.0	0.0	0.0	434.2	40.7	0.0
13		MAR	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	598.0	598.0	0.0	3.0	189.0	0.0	432.6	135.2	0.0	0.2	3.3	0.2	0.0	430.7	135.2	1.8
14		APR	0	29.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	598.0	598.0	0.0	3.6	0.0	72.5	502.4	133.6	0.0	0.8	5.2	0.8	72.5	500.6	131.7	0.0
15		MAY	0	30.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	230.0	230.0	0.0	5.9	368.0	23.5	521.6	387.4	0.0	1.3	8.6	1.3	23.5	519.8	385.6	0.0
16		JUN	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	230.0	230.0	0.0	2.5	0.0	0.0	516.2	406.6	0.0	4.2	10.9	4.2	0.0	510.4	404.8	4.0
17		JUL	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		307.5	0.0	587.0	587.0	0.0	3.1	0.0	0.0	663.0	222.7	0.0	5.4	13.9	5.4	0.0	653.0	216.9	4.3
18		AUG	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		374.0	0.0	961.0	961.0	0.0	7.3	0.0	0.0	843.5	182.5	0.0	2.8	12.8	2.7	0.0	829.7	172.5	3.9
19		SEP	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		326.8	0.0	1524.0	1524.0	0.0	7.8	0.0	0.0	1000.0	81.5	0.0	1.5	10.7	1.4	0.1	985.7	67.7	2.2
20	1923	OCT	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		14.3	0.0	2043.0	2000.0	43.0	8.8	0.0	0.0	1000.0	0.0	0.0	0.5	9.7	0.4	0.0	986.3	0.0	1.7
21		NOV	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		13.7	0.0	2243.0	2000.0	243.0	4.5	0.0	0.0	1000.0	0.0	0.0	0.0	4.5	0.0	0.0	990.9	0.0	0.0
22		DEC	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	1833.0	1833.0	0.0	0.0	410.0	0.0	1000.0	83.5	0.0	0.0	0.0	0.0	0.0	990.9	74.4	0.0
23		JAN	0	30.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	1640.0	1640.0	0.0	0.0	193.0	0.0	1000.0	180.0	0.0	0.0	0.0	0.0	0.0	9.7	1000.0	170.9	0.5
24		FEB	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	1640.0	1640.0	0.0	0.0	0.0	0.0	1000.0	180.0	0.0	0.0	0.0	0.0	0.0	999.4	180.0	0.6
25		MAR	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	285.8	1354.3	1354.3	0.0	4.3	0.0	0.0	854.5	322.9	0.0	0.5	5.2	0.5	0.0	854.0	322.3	0.0
26		APR	0	29.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	148.8	1205.5	1205.5	0.0	5.2	0.0	90.1	866.4	251.8	0.0	1.2	7.7	1.2	90.1	865.8	251.2	0.0
27		MAY	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	133.5	1072.0	1072.0	0.0	8.3	0.0	0.0	793.7	330.4	0.0	1.7	11.8	1.7	0.0	793.2	329.8	0.0
28		JUN	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	1072.0	1072.0	0.0	8.5	0.0	0.0	638.1	257.7	148.8	2.6	13.7	2.6	0.0	733.8	257.2	52.5
29		JUL	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	307.5	764.5	764.5	0.0	11.0	0.0	0.0	476.2	255.9	0.0	2.6	16.3	2.6	0.0	571.9	351.6	0.0
30		AUG	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	266.7	497.8	497.8	0.0	7.8	0.0	0.0	336.4	227.4	0.0	2.6	13.9	3.6	0.0	410.7	323.0	20.4
31		SEP	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	497.8	497.8	0.0	4.7	0.0	0.0	331.9	87.5	0.0	2.1	9.8	3.0	0.0	396.3	161.8	9.1
32	1924	OCT	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	497.8	497.8	0.0	4.2	0.0	0.0	329.1	83.1	0.0	0.7	6.4	1.4	0.0	360.5	147.4	32.3
33		NOV	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	497.8	497.8	0.0	1.8	0.0	0.0	327.9	80.2	0.0	0.3	2.6	0.5	0.0	317.5	111.6	41.5
34		DEC	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	497.8	497.8	0.0	0.0	0.0	0.0	327.9	79.0	0.0	0.0	0.0	0.0	0.0	263.7	68.7	53.8
35		JAN	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	497.8	497.8	0.0	0.0	0.0	0.0	248.9	79.0	79.0	0.0	0.0	0.0	0.0	212.0	14.8	51.7
36		FEB	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	497.8	497.8	0.0	0.0	0.0	0.0	169.9	0.0	79.0	0.0	0.0	0.0	0.0	197.2	0.0	14.8
37		MAR	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	208.0	289.8	289.8	0.0	2.4	0.0	0.0	64.7	25.0	0.0	0.0	2.4	0.0	0.0	92.0	52.3	0.0
38		APR	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	99.8	190.0	190.0	0.0	2.6	0.0	0.0	0.0	0.0	24.8	0.2	3.3	0.5	0.0	40.3	0.0	0.0
39		MAY	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	12.0	178.0	178.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.0	32.9	0.0	0.0
40		JUN	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	13.0	165.0	165.0	0.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	3.2	0.0	0.0	24.8	0.0	0.0
41		JUL	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	6.0	159.0	159.0	0.0	4.1	0.0	0.0	0.0	0.0	0.0	0.0	4.1	0.0	0.0	19.7	0.0	0.0
42		AUG	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	112.0	47.0	47.0	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0	3.8	0.0	0.0	0.0	0.0	0.0
43		SEP	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	47.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
44	1925	OCT	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45		NOV	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46		DEC	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47		JAN	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48		FEB	0	27.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49		MAR	0	16.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	138.8	138.8	0.0	0.0	0.0	0.0	0.0	138.8	138.8	0.0	0.0
50		APR	0	29.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.1	146.8	138.8	0.0	0.0	0.0	0.0	8.1	146.8	138.8	0.0
51		MAY	0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.6	246.0	146.8	0.0	1.4	2.8	1.4	100.6	246.0	146.8	0.0
52		JUN	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	188.3	246.0	57.0	2.3	4.5	2.3	1.5	245.3	246.0	0.0
53		JUL	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	188.3	148.8	3.6	7.1	3.6	0.0	152.1	245.3	89.6
54		AUG	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.5	36.0	0.0	3.4	7.9	4.5	0.0	0.0	152.1	147.7
55		SEP	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.8	32.5	0.0	0.7	3.8	3.1	0.0	0.0	0.0	0.0
56	1926	OCT	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		72.0	0.0	72.0	72.0	0.0	0.0	0.0	0.0	67.6	0.0	0.0	0.2	0.2	0.0	0.0	36.0	0.0	0.0
														221.0	0.0	293.0	293.0	0.0	0.8	0.0	0.0	177.7	0.0	0.0	0.0	0.8	0.0	0.0	146.1	0.0	0.0

	A	B	CG	CH	CI	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	CU	CV	CW	CX	CY	CZ	DA	DB	DC
1	Year/Month		Pumping	Delta											Conveyance Summary				In-Delta Storage					Aqueduct	
2																									
3	1	2	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99		101	102	103	104		106	107
4	Water Year	Month	Pumping + Storage (+) or Contribution (-) from Upstream Facilities	Available for Export to In-Delta Storage and New South Facilities	Delta Surplus Adjustment (Check against Col. 85)	Physical Unused Capacity at Banks	Delta Inflow	Adjusted Delta Inflow	Base Pumping Tracy	Base Pumping Banks	Base Pumping Tracy and Banks	Maximum Export Inflow Ratio	Maximum Pumping Through New Conveyance	Maximum Allowed Limited by Ratio	New Pumping Delivered Through Isolated Facility	Original Pumping Delivered Through Isolated Facility	Maximum New Pumping Through Delta Allowed by Ratio		Diversion to In-Delta Storage	Supply to Delta Outflow	Supply to Water Demands	In-Delta End of Month Storage		Capacity below Dos Amigos	Capacity below Coastal Aqueduct
5						(DWRSIM)	(DWRSIM)				(DWRSIM)	(DWRSIM)	(DWRSIM)											(DWRSIM)	(DWRSIM)
6																									
7																NOT USED						0			
8	1922	OCT	-29.5	29.5	-29.5	348.5	893	922.5	270.0	285.0	555	0.65	25	44.6					29.5	0.0	0.0	29.5		529.0	218.0
9		NOV	0.0	0.0	0.0	297.9	895	895.0	308.0	262.0	570	0.65	11	11.8					0.0	0.0	0.0	29.5		481.0	214.0
10		DEC	0.0	164.0	0.0	32.5	1323	1323.0	259.0	601.0	860	0.65	0	0.0					0.0	0.0	0.0	29.5		424.0	222.0
11		JAN	0.0	191.0	0.0	23.5	1337	1337.0	259.0	610.0	869	0.65	0	0.1					0.1	29.5	0.0	0.1		574.0	284.0
12		FEB	113.0	1346.0	113.0	260.7	2572	2459.0	236.0	311.0	547	0.35	201	260.7					260.7	0.0	0.0	260.7		389.0	120.0
13		MAR	189.0	999.0	189.0	321.5	2447	2258.0	238.0	312.0	550	0.35	225	240.3					139.3	0.0	0.0	400.0		360.0	109.0
14		APR	145.0	336.0	145.0	362.9	1856	1711.0	250.0	250.0	500	0.35	0	0.0					0.0	0.0	2.5	397.5		340.0	112.0
15		MAY	415.0	1640.0	415.0	266.5	3440	3025.0	283.0	367.0	650	0.35	0	0.0					0.0	0.0	3.1	394.4		328.0	116.0
16		JUN	0.0	109.0	0.0	15.9	2680	2680.0	274.0	597.0	871	0.35	0	15.9					5.6	0.0	0.0	400.0		120.0	33.0
17		JUL	-49.5	49.5	-49.5	484.5	1153	1202.5	219.0	149.0	368	0.65	381	413.6					0.0	0.0	0.0	400.0		137.0	40.0
18		AUG	0.0	0.0	0.0	470.5	905	905.0	283.0	163.0	446	0.65	142	142.3					0.0	0.0	0.0	400.0		180.0	40.0
19		SEP	-236.1	252.1	-236.1	280.9	1931	1167.1	273.0	332.0	605	0.65	0	153.6					0.0	0.0	0.0	400.0		353.0	71.0
20	1923	OCT	-504.7	601.7	-504.7	107.5	1229	1733.7	272.0	526.0	798	0.65	0	107.5					0.0	0.0	0.0	400.0		487.0	180.0
21		NOV	-186.3	317.3	-186.3	36.9	1280	1466.3	256.0	576.0	832	0.65	0	36.9					1.5	0.0	1.5	400.0		469.0	211.0
22		DEC	410.0	1228.0	410.0	75.5	2682	2272.0	314.0	503.0	817	0.65	24	75.5					1.8	0.0	1.8	400.0		260.0	99.0
23		JAN	202.7	1308.9	202.1	320.5	2440	2237.9	332.0	240.0	572	0.65	264	320.5					0.0	0.0	0.0	400.0		442.0	83.0
24		FEB	0.0	0.0	0.0	351.7	1778	1778.0	237.0	220.0	457	0.35	165	165.3					0.0	0.0	0.0	400.0		482.0	212.0
25		MAR	0.0	196.0	0.0	417.5	1234	1234.0	216.0	216.0	432	0.35	0	0.0					0.0	0.0	54.7	345.3		459.0	184.0
26		APR	180.2	568.9	180.2	375.9	1869	1688.9	237.0	237.0	474	0.35	0	0.0					0.0	0.0	82.5	262.8		377.0	116.0
27		MAY	0.0	165.0	0.0	436.5	1336	1336.0	197.0	197.0	394	0.35	0	0.0					0.0	0.0	62.8	200.0		383.0	133.0
28		JUN	0.0	0.0	0.0	408.9	1167	1315.8	204.0	204.0	408	0.35	0	52.5					0.0	59.3	0.0	140.8		237.0	66.0
29		JUL	0.0	0.0	0.0	1.5	1595	1595.0	283.0	632.0	915	0.65	1	1.5					0.0	0.0	0.0	140.8		212.0	47.0
30		AUG	0.0	0.0	0.0	265.5	1101	1101.0	283.0	368.0	651	0.65	65	64.7					0.0	0.0	0.0	140.8		243.0	41.0
31		SEP	0.0	0.0	0.0	357.9	814	814.0	265.0	255.0	520	0.65	10	9.1					0.0	0.0	0.0	140.8		386.0	91.0
32	1924	OCT	0.0	0.0	0.0	356.5	885	885.0	266.0	277.0	543	0.65	33	32.3					0.0	0.0	0.0	140.8		528.0	209.0
33		NOV	0.0	0.0	0.0	390.9	759	759.0	202.0	222.0	424	0.65	69	69.4					0.0	0.0	0.0	140.8		498.0	217.0
34		DEC	0.0	0.0	0.0	374.5	818	818.0	214.0	259.0	473	0.65	58	58.7					0.0	0.0	0.0	140.8		458.0	222.0
35		JAN	0.0	82.0	0.0	232.5	1016	1095.0	259.0	401.0	660	0.65	0	51.7					0.0	140.8	0.0	0.0		685.0	372.0
36		FEB	0.0	211.0	0.0	304.7	1115	1194.0	234.0	267.0	501	0.45	0	36.3					21.4	0.0	0.0	21.4		634.0	320.0
37		MAR	0.0	0.0	0.0	509.5	886	886.0	84.0	124.0	208	0.35	102	102.1					0.0	21.4	0.0	0.0		690.0	343.0
38		APR	0.0	0.0	0.0	530.9	618	642.8	82.0	82.0	164	0.35	0	0.0					0.0	0.0	0.0	0.0		652.0	321.0
39		MAY	0.0	0.0	0.0	615.5	633	633.0	12.0	18.0	30	0.35	139	139.0					0.0	0.0	0.0	0.0		686.0	347.0
40		JUN	0.0	0.0	0.0	595.9	685	685.0	13.0	17.0	30	0.35	209	209.8					0.0	0.0	0.0	0.0		634.0	319.0
41		JUL	0.0	0.0	0.0	619.5	534	534.0	6.0	14.0	20	0.65	327	327.1					0.0	0.0	0.0	0.0		638.0	312.0
42		AUG	0.0	0.0	0.0	627.5	491	491.0	112.0	6.0	118	0.65	202	201.2					0.0	0.0	0.0	0.0		643.0	312.0
43		SEP	0.0	2.0	0.0	560.9	571	571.0	222.0	52.0	274	0.65	97	97.2					2.0	0.0	0.0	2.0		668.0	334.0
44	1925	OCT	0.0	0.0	0.0	517.5	626	626.0	121.0	116.0	237	0.65	170	169.9					0.0	0.0	0.0	2.0		726.0	377.0
45		NOV	0.0	2.0	0.0	421.9	534	534.0	79.0	191.0	270	0.65	78	77.1					2.0	0.0	0.0	4.0		687.0	353.0
46		DEC	0.0	77.0	0.0	333.5	860	860.0	259.0	300.0	559	0.65	0	0.0					0.0	0.0	0.0	4.0		710.0	369.0
47		JAN	0.0	0.0	0.0	440.5	751	751.0	221.0	193.0	414	0.65	74	74.2					0.0	4.0	0.0	0.0		731.0	383.0
48		FEB	277.5	2078.5	277.5	7.6	3523	3245.5	172.0	564.0	736	0.35	86	7.6					7.6	0.0	0.0	7.6		640.0	328.0
49		MAR	16.2	287.9	16.2	364.5	1389	1372.9	201.0	269.0	470	0.35	0	10.5					10.5	0.0	0.0	18.1		538.0	250.0
50		APR	201.2	472.8	201.2	406.9	1752	1550.8	206.0	206.0	412	0.35	0	0.0					0.0	0.0	0.0	18.1		479.0	222.0
51		MAY	3.0	52.0	3.0	478.5	1089	1143.0	155.0	155.0	310	0.35	0	0.0					0.0	0.0	0.0	18.1		476.0	233.0
52		JUN	0.0	0.0	0.0	469.9	1110	1258.8	208.0	143.0	351	0.35	38	89.6					0.0	18.1	0.0	0.0		430.0	184.0
53		JUL	0.0	0.0	0.0	317.5	1197	1197.0	411.0	188.0	599	0.65	179	179.1					0.0	0.0	0.0	0.0		304.0	152.0
54		AUG	0.0	0.0	0.0	595.5	738	738.0	283.0	38.0	321	0.65	159	158.7					0.0	0.0	0.0	0.0		344.0	157.0
55		SEP	0.0	0.0	0.0	501.9	689	689.0	269.0	111.0	380	0.65	67	67.9					0.0	0.0	0.0	0.0		530.0	227.0
56	1926	OCT	0.0	0.0	0.0	457.5	780	780.0	260.0	176.0	436	0.65	70	71.0					0.0	0.0	0.0	0.0		515.0	297.0

	A	B	DE	DF	DG	DH	DI	DJ	DK	DL	DM	DN	DO	DP	DQ	DR	DS	DT	DU
1	Year/Month		New South of Delta Storage													Demands/Supply Summary			
2			Water Supply					Total	Environmental					Total					
3	1	2	109	110	111	112	113	114	115	116	117	118	119	120		122	123	124	125
4	Water Year	Month	Supply to Water Demand	Carryover Storage Supply	Pumping to Storage	EOM Storage	Water Supply Evap.	Evaporation	Environ. Evap	Supply to Environ.	Carryover Storage	Pumping to Storage	EOM Storage	Total EOM Storage		Remaining Demand Potential	Unused Delta Pumping Capacity	Limited Delta Supply	Remaining Conveyance Capacity
5																			
6																			
7				0		0					0		0						
8	1922	OCT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1.7	15.1	0.0	218.0
9		NOV	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1.5	11.8	0.0	214.0
10		DEC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1.8	0.0	164.0	222.0
11		JAN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1.1	0.0	191.0	284.0
12		FEB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		1.1	0.0	1085.4	120.0
13		MAR	0.0	49.6	49.6	49.6	0.0	0.0	0.0	0.0	49.6	49.6	49.6	99.2		0.0	49.6	810.1	91.2
14		APR	0.0	49.2	0.0	49.2	0.4	0.9	0.4	0.0	49.2	0.0	49.2	98.3		0.0	0.0	336.0	111.3
15		MAY	0.0	48.5	0.0	48.5	0.7	1.3	0.7	0.0	48.5	0.0	48.5	97.0		0.0	0.0	1640.0	117.2
16		JUN	0.0	50.9	3.1	50.9	0.8	1.5	0.8	0.0	50.9	3.1	50.9	101.7		0.0	3.1	100.3	31.2
17		JUL	0.0	74.8	24.8	74.8	0.8	1.7	0.8	0.0	74.8	24.8	74.8	149.6		0.0	384.6	24.8	32.9
18		AUG	0.0	73.9	0.0	73.9	0.9	1.9	0.9	0.0	73.9	0.0	73.9	147.7		0.0	138.3	0.0	39.0
19		SEP	0.0	132.5	59.5	132.5	0.8	1.7	0.8	0.0	132.5	59.5	132.5	265.0		0.0	91.9	192.6	48.8
20	1923	OCT	0.0	66.3	52.9	184.3	1.0	2.0	1.0	0.0	66.3	52.9	184.3	368.7		0.0	52.9	548.8	160.3
21		NOV	0.0	83.2	17.7	201.3	0.8	1.5	0.8	0.0	83.2	17.7	201.3	402.5		0.0	17.7	298.1	203.4
22		DEC	0.0	119.6	36.8	237.7	0.4	0.8	0.4	0.0	119.6	36.8	237.7	475.4		0.0	36.8	1189.4	86.0
23		JAN	0.0	180.8	61.5	298.8	0.4	0.7	0.4	0.0	180.8	61.5	298.8	597.7		0.0	258.4	1247.4	183.0
24		FEB	0.0	180.3	0.0	298.4	0.5	1.0	0.5	0.0	180.3	0.0	298.4	596.7		0.0	164.7	0.0	212.0
25		MAR	0.0	179.3	0.0	297.4	0.9	1.9	0.9	0.0	179.3	0.0	297.4	594.8		0.0	0.0	196.0	164.0
26		APR	0.0	177.5	0.0	295.6	1.8	3.6	1.8	0.0	177.5	0.0	295.6	591.2		0.0	0.0	568.9	116.0
27		MAY	39.3	135.5	0.0	253.6	2.8	5.5	2.8	0.0	174.8	0.0	292.8	546.4		0.0	0.0	165.0	133.0
28		JUN	59.5	73.3	0.0	191.4	2.7	5.9	3.1	0.0	171.6	0.0	289.7	481.1		25.1	0.0	0.0	66.0
29		JUL	41.0	29.7	0.0	147.8	2.5	6.4	3.9	0.0	167.8	0.0	285.9	433.7		106.2	1.5	0.0	41.0
30		AUG	28.1	0.0	0.0	118.1	1.7	4.9	3.2	0.0	164.5	0.0	282.6	400.7		83.2	44.3	0.0	41.0
31		SEP	0.0	0.0	0.0	116.9	1.2	4.0	2.8	0.0	161.7	0.0	279.8	396.7		55.2	0.0	0.0	91.0
32	1924	OCT	0.0	58.5	0.0	116.1	0.8	2.7	1.9	0.0	139.9	0.0	277.9	394.1		18.9	0.0	0.0	209.0
33		NOV	0.0	58.0	0.0	115.7	0.4	1.5	1.1	0.0	138.8	0.0	276.9	392.6		0.0	27.8	0.0	217.0
34		DEC	0.0	57.8	0.0	115.5	0.2	0.8	0.6	0.0	138.3	0.0	276.3	391.8		0.0	4.9	0.0	222.0
35		JAN	57.6	0.0	0.0	57.7	0.2	0.7	0.5	137.8	0.0	0.0	138.0	195.7		82.6	0.0	82.0	276.9
36		FEB	0.0	0.0	0.0	57.6	0.1	0.4	0.3	0.0	0.0	0.0	137.7	195.3		181.7	0.0	189.6	307.1
37		MAR	0.0	0.0	0.0	57.3	0.2	0.8	0.6	0.0	0.0	0.0	137.2	194.5		344.7	102.1	0.0	343.0
38		APR	0.0	0.0	0.0	56.9	0.4	1.5	1.1	0.0	0.0	0.0	136.1	193.0		449.9	0.0	0.0	321.0
39		MAY	0.0	0.0	0.0	56.2	0.7	2.3	1.6	0.0	0.0	0.0	134.5	190.7		535.6	139.0	0.0	347.0
40		JUN	0.0	0.0	0.0	55.4	0.8	2.7	1.9	0.0	0.0	0.0	132.6	188.0		689.9	209.8	0.0	319.0
41		JUL	0.0	0.0	0.0	54.5	0.9	2.9	2.1	0.0	0.0	0.0	130.5	185.1		728.5	327.1	0.0	312.0
42		AUG	0.0	0.0	0.0	53.8	0.7	2.5	1.8	0.0	0.0	0.0	128.8	182.6		681.3	201.2	0.0	312.0
43		SEP	0.0	0.0	0.0	53.2	0.6	1.9	1.4	0.0	0.0	0.0	127.4	180.6		418.9	95.2	0.0	334.0
44	1925	OCT	0.0	26.6	0.0	52.9	0.4	1.3	0.9	0.0	63.7	0.0	126.5	179.3		334.1	169.9	0.0	377.0
45		NOV	26.4	0.0	0.0	26.2	0.2	0.7	0.5	0.0	63.2	0.0	126.0	152.2		268.4	75.1	0.0	337.0
46		DEC	0.0	0.0	0.0	26.2	0.1	0.3	0.3	0.0	62.9	0.0	125.7	151.9		331.7	0.0	77.0	369.0
47		JAN	0.0	0.0	0.0	26.1	0.0	0.3	0.2	62.7	0.0	0.0	62.8	88.9		166.0	74.2	0.0	383.0
48		FEB	0.0	0.0	0.0	26.1	0.1	0.2	0.2	0.0	0.0	0.0	62.6	88.7		171.2	0.0	2070.9	328.0
49		MAR	0.0	0.0	0.0	25.9	0.1	0.4	0.3	0.0	0.0	0.0	62.3	88.2		137.5	0.0	277.4	250.0
50		APR	0.0	0.0	0.0	25.7	0.3	0.9	0.6	0.0	0.0	0.0	61.7	87.4		167.0	0.0	472.8	222.0
51		MAY	0.0	0.0	0.0	25.3	0.3	1.1	0.8	0.0	0.0	0.0	60.9	86.2		194.5	0.0	52.0	233.0
52		JUN	0.0	0.0	0.0	25.0	0.4	1.3	0.9	0.0	0.0	0.0	60.0	84.9		154.6	0.0	0.0	118.7
53		JUL	0.0	0.0	0.0	24.5	0.4	1.4	1.0	0.0	0.0	0.0	58.9	83.5		107.5	31.4	0.0	45.4
54		AUG	0.0	0.0	0.0	24.2	0.4	1.2	0.9	0.0	0.0	0.0	58.1	82.2		245.3	158.7	0.0	157.0
55		SEP	0.0	0.0	0.0	23.8	0.3	1.1	0.8	0.0	0.0	0.0	57.3	81.1		169.7	67.9	0.0	227.0
56	1926	OCT	0.0	11.9	0.0	23.6	0.2	0.7	0.5	0.0	28.7	0.0	56.8	80.4		135.4	71.0	0.0	297.0

	A	B	DW	DX	DY	DZ	EA	EB	EC	ED	EE	EF	EG	EH	EI	EJ	EK	EL	EM	EN
1	Year/Month		South of Delta Conjunctive Use					Summary												
2																				
3	1	2	127	128	129	130		132	133	134	135	136	137	138	139	140	141	142	143	144
4	Water Year	Month	Maximum Recharge	Recharge to Basin	Groundwater EOM Storage (TAF)	Extraction from Basin for Water Supply		Remaining Demands	Total Deliveries to Unmet Demands	Total Use of Excess Pumping Capacity	Original Excess Pumping Capacity	Remaining Excess Pumping Capacity	Remaining Delta Surplus	Remaining Capacity below Coastal Aqueduct	Interruptable Supply	Transfer Potential	Final Inflow	Final Pumping	Final Export Inflow Ratio	Is Ratio Violated?
5																				
6																				
7					0															
8	1922	OCT	0.0	0.0	0.0	0.0		1.7	0.0	29.5	44.6	15.1	0.0	218.0	0.0	15.1	922.5	584.5	0.63	no
9		NOV	0.0	0.0	0.0	0.0		1.5	0.0	0.0	11.8	11.8	0.0	214.0	0.0	11.8	895.0	570.0	0.64	no
10		DEC	0.0	0.0	0.0	0.0		1.8	0.0	0.0	0.0	0.0	164.0	222.0	0.0	0.0	1323.0	860.0	0.65	no
11		JAN	0.0	0.0	0.0	0.0		1.1	0.0	0.1	0.1	0.0	191.0	284.0	0.0	0.0	1337.0	869.1	0.65	no
12		FEB	0.0	0.0	0.0	0.0		1.1	0.0	260.7	260.7	0.0	1085.4	120.0	0.0	0.0	2459.0	807.7	0.33	no
13		MAR	30.8	0.0	0.0	0.0		0.0	1.8	190.7	240.3	49.6	810.1	91.2	49.6	49.6	2258.0	790.3	0.35	no
14		APR	0.0	0.0	0.0	0.0		0.0	2.5	0.0	0.0	0.0	336.0	111.3	0.0	0.0	1711.0	500.0	0.29	no
15		MAY	0.0	0.0	0.0	0.0		0.0	3.1	0.0	0.0	0.0	1640.0	117.2	0.0	0.0	3025.0	650.0	0.21	no
16		JUN	3.1	0.0	0.0	0.0		0.0	4.0	12.7	15.9	3.1	100.3	31.2	3.1	3.1	2680.0	886.9	0.33	no
17		JUL	24.8	0.0	0.0	0.0		0.0	4.3	29.0	413.6	384.6	24.8	32.9	24.8	32.9	1202.5	421.8	0.35	no
18		AUG	0.0	0.0	0.0	0.0		0.0	3.9	3.9	142.3	138.3	0.0	39.0	0.0	39.0	905.0	449.9	0.5	no
19		SEP	30.8	0.0	0.0	0.0		0.0	2.2	61.7	153.6	91.9	192.6	48.8	82.0	48.8	1167.1	748.7	0.64	no
20	1923	OCT	30.8	0.0	0.0	0.0		0.0	1.7	54.6	107.5	52.9	548.8	160.3	52.9	52.9	1733.7	905.5	0.52	no
21		NOV	17.7	0.0	0.0	0.0		0.0	1.5	19.2	36.9	17.7	298.1	203.4	17.7	17.7	1466.3	868.9	0.59	no
22		DEC	30.8	0.0	0.0	0.0		0.0	1.8	38.6	75.5	36.8	1189.4	86.0	36.8	36.8	2272.0	892.5	0.39	no
23		JAN	30.8	0.0	0.0	0.0		0.0	0.5	62.0	320.5	258.4	1247.4	183.0	82.0	183.0	2237.9	716.0	0.32	no
24		FEB	0.0	0.0	0.0	0.0		0.0	0.6	0.6	165.3	164.7	0.0	212.0	0.0	164.7	1778.0	457.6	0.26	no
25		MAR	0.0	0.0	0.0	0.0		0.0	54.7	0.0	0.0	0.0	196.0	164.0	0.0	0.0	1234.0	432.0	0.35	no
26		APR	0.0	0.0	0.0	0.0		0.0	82.5	0.0	0.0	0.0	568.9	116.0	0.0	0.0	1688.9	474.0	0.28	no
27		MAY	0.0	0.0	0.0	0.0		0.0	102.0	0.0	0.0	0.0	165.0	133.0	0.0	0.0	1336.0	394.0	0.29	no
28		JUN	0.0	0.0	0.0	0.0		25.1	112.0	52.5	52.5	0.0	0.0	66.0	0.0	0.0	1315.8	460.5	0.35	no
29		JUL	0.0	0.0	0.0	0.0		106.2	41.0	0.0	1.5	1.5	0.0	41.0	0.0	1.5	1595.0	915.0	0.57	no
30		AUG	0.0	0.0	0.0	0.0		83.2	48.5	20.4	64.7	44.3	0.0	41.0	0.0	41.0	1101.0	671.4	0.61	no
31		SEP	0.0	0.0	0.0	0.0		55.2	9.1	9.1	9.1	0.0	0.0	91.0	0.0	0.0	814.0	529.1	0.65	no
32	1924	OCT	0.0	0.0	0.0	0.0		18.9	32.3	32.3	32.3	0.0	0.0	209.0	0.0	0.0	885.0	575.3	0.65	no
33		NOV	0.0	0.0	0.0	0.0		0.0	41.5	41.5	69.4	27.8	0.0	217.0	0.0	27.8	759.0	465.5	0.61	no
34		DEC	0.0	0.0	0.0	0.0		0.0	53.8	53.8	58.7	4.9	0.0	222.0	0.0	4.9	818.0	526.8	0.64	no
35		JAN	0.0	0.0	0.0	0.0		82.6	109.3	51.7	51.7	0.0	82.0	276.9	0.0	0.0	1095.0	711.7	0.65	no
36		FEB	0.0	0.0	0.0	0.0		181.7	14.8	36.3	36.3	0.0	189.6	307.1	0.0	0.0	1194.0	537.3	0.45	no
37		MAR	0.0	0.0	0.0	0.0		344.7	0.0	0.0	102.1	102.1	0.0	343.0	0.0	102.1	886.0	208.0	0.23	no
38		APR	0.0	0.0	0.0	0.0		449.9	0.0	0.0	0.0	0.0	0.0	321.0	0.0	0.0	642.8	164.0	0.26	no
39		MAY	0.0	0.0	0.0	0.0		535.6	0.0	0.0	139.0	139.0	0.0	347.0	0.0	139.0	633.0	30.0	0.05	no
40		JUN	0.0	0.0	0.0	0.0		689.9	0.0	0.0	209.8	209.8	0.0	319.0	0.0	209.8	685.0	30.0	0.04	no
41		JUL	0.0	0.0	0.0	0.0		728.5	0.0	0.0	327.1	327.1	0.0	312.0	0.0	312.0	534.0	20.0	0.04	no
42		AUG	0.0	0.0	0.0	0.0		681.3	0.0	0.0	201.2	201.2	0.0	312.0	0.0	201.2	491.0	118.0	0.24	no
43		SEP	0.0	0.0	0.0	0.0		418.9	0.0	2.0	97.2	95.2	0.0	334.0	0.0	95.2	571.0	276.0	0.48	no
44	1925	OCT	0.0	0.0	0.0	0.0		334.1	0.0	0.0	169.9	169.9	0.0	377.0	0.0	169.9	626.0	237.0	0.38	no
45		NOV	0.0	0.0	0.0	0.0		268.4	26.4	2.0	77.1	75.1	0.0	337.0	0.0	75.1	534.0	272.0	0.51	no
46		DEC	0.0	0.0	0.0	0.0		331.7	0.0	0.0	0.0	0.0	77.0	369.0	0.0	0.0	860.0	559.0	0.65	no
47		JAN	0.0	0.0	0.0	0.0		166.0	0.0	0.0	74.2	74.2	0.0	383.0	0.0	74.2	751.0	414.0	0.55	no
48		FEB	0.0	0.0	0.0	0.0		171.2	0.0	7.6	7.6	0.0	2070.9	328.0	0.0	0.0	3245.5	743.7	0.23	no
49		MAR	0.0	0.0	0.0	0.0		137.5	0.0	10.5	10.5	0.0	277.4	250.0	0.0	0.0	1372.9	480.5	0.35	no
50		APR	0.0	0.0	0.0	0.0		167.0	0.0	0.0	0.0	0.0	472.8	222.0	0.0	0.0	1550.8	412.0	0.27	no
51		MAY	0.0	0.0	0.0	0.0		194.5	0.0	0.0	0.0	0.0	52.0	233.0	0.0	0.0	1143.0	310.0	0.27	no
52		JUN	0.0	0.0	0.0	0.0		154.6	89.6	89.6	89.6	0.0	0.0	118.7	0.0	0.0	1258.8	440.6	0.35	no
53		JUL	0.0	0.0	0.0	0.0		107.5	147.7	147.7	179.1	31.4	0.0	45.4	0.0	31.4	1197.0	746.7	0.62	no
54		AUG	0.0	0.0	0.0	0.0		245.3	0.0	0.0	158.7	158.7	0.0	157.0	0.0	157.0	738.0	321.0	0.43	no
55		SEP	0.0	0.0	0.0	0.0		169.7	0.0	0.0	67.9	67.9	0.0	227.0	0.0	67.9	689.0	380.0	0.55	no
56	1926	OCT	0.0	0.0	0.0	0.0		135.4	0.0	0.0	71.0	71.0	0.0	297.0	0.0	71.0	780.0	436.0	0.56	no

Columnar Explanation

Columnar Explanation

The following is a columnar description of FC_OPS2.XLS.

Year/Month/Conversion Factor

1. Water Year. Begins with water year 1922 and ends with water year 1992. (Note: A water year runs from October through September.)

2. Month. Seventy one years, or, 852 months of data.

3. Conversion Factor. Factor for converting input data in CFS to 1000 AF/Mo.

Sacramento River Supply

4. DWRSIM Sacramento River total flow at Navigation Control Point -- (Node 61, or, Wilkens Slough)

5. DWRSIM Sacramento River minimum flow at Navigation Control Point -- (Node 61, or, Wilkens Slough)

6. Sacramento River diversion potential indicator. This indicator is a switch to determine if there is divertable water in the Sacramento River. The indicator is set to zero (0) every October and is switched to one (1) whenever 1) the River flow in the previous month is greater than or equal to the threshold set in Criteria!M12 , or 2) the sum of the flow in the previous two months is greater than or equal to the two month threshold flow set in Criteria!N12.

7. Divertable flow Sacramento River at Navigation Control Point. When divertable indicator is on (Column 5 equals one (1)), this is equal to Column 3 minus Column 4. If Column 5 is zero, but Column 3 is greater than the single month minimum threshold flow (Criteria!M12), then pump up to the difference. (Column 3 minus Criteria!M12)

8. DWRSIM Delta surplus. Flow in excess of minimum Delta outflow and X2 requirement as determined by DWRSIM.

Spills and Target Demands

9. Storable Sacramento River flow available for offstream and groundwater storage. Equal to the minimum of 1) divertable flow at the NCP (Column 4), 2) Delta surplus (Column 7), or, 3) the excess pumping at Banks and Tracy Pumping Plants allowed under the Bay-Delta export/inflow ratio.) In the event that DWR reverts back to the use of the

neural network method of determining added salinity repulsion flows, this storable supply would be further tested against the excess flow at Freeport (Column 5 minus Column 6).

10. DWRSIM total Delta outflow (CFS). This item comes directly from DWRSIM output.

11. Target minimum Delta outflow (CFS). Targets are set in Criteria!$G32:G43.

12. Added target Delta outflow. Target flow less Delta outflow in 1000 acre-feet (TAF).

13. DWRSIM State Water Project (SWP) annual shortage (January through December). (TAF/YR.) and Other Target Demands. The SWP component comes directly from DWRSIM output and is input in Criteria!$Q5:75. Other demands in addition to unmet SWP and CVP demands can also be input as an annual value in Criteria!$S5:75. Other demands are distributed on the same pattern as SWP unmet demands and are included on this column. The "other demand" can be modified to represent SWP interruptable supply which is currently an option in DWRSIM. In this case, the other demand would not be distributed on the same pattern as SWP deliveries but would be limited by the amount of interruptable supply SWP contractors can take in any one month which has been estimated to be about 82,000 AF/mo.

14. Monthly SWP unmet Demands. SWP and other annual shortage distributed on the DWRSIM SWP monthly delivery pattern. (Criteria!$K19:30.)

15. DWRSIM Central Valley Project (CVP) annual shortage (March through February). (TAF/YR.) This item comes directly from DWRSIM output and are input in Criteria!$R5:75.

16. Monthly CVP unmet demands. CVP annual shortage distributed on the DWRSIM CVP monthly delivery pattern. (Criteria!$N19:30.)

CVP/SWP Flood Control Reoperation

Shasta Lake reoperations.

17. Shasta Lake end of month storages from DWRSIM output.

18. Change in Modeled Storage. This is the change in DWRSIM Shasta Lake modeled storage; previous month to current month. This is used in Shasta Lake reoperations in order to preserve the integrity of the existing DWRSIM run.

19 Spills from Shasta Lake. Computed by DWR staff from DWRSIM output.

20. Storable Shasta Lake Spill. This is the total spill from Shasta Lake checked against, 1) minimum flow requirements at the NCP checked against pulse flow requirement, 2) Delta surplus less Oroville spill, and 3) the excess Delta inflow limited by the export inflow ratio.

21. Maximum transfer potential from Shasta Lake This is the maximum transfer potential. It is the lesser of 1) the amount of storage in excess of the transfer target storage, and 2) the diversion capacity to the offstream storage.

22. Shasta transfer to offstream storage. This is the maximum transfer amount from Shasta. If the total transfer potential between Oroville and Shasta exceeds the space in the offstream storage, the transfer for each is prorated between each.

23. Shasta adjusted storage. This is the adjusted Shasta storage after transfer and/or after withdrawal from offstream storage to meet baseline CVP pumping. The baseline change in storage is factored in here. It is limited on the upper bound by the baseline Shasta storage and at the lower bound by the minimum target storage.

24. New Shasta spill. This is the new Shasta Lake spill based on reoperations. This number can exceed the original spill if targets are set on the low end.

25. Storable spill in Shasta. This is the amount of baseline spill that can be used to recover previous drawdown. It also is shown as a credit to offstream storage and in the event that Shasta Lake fully refills, the water becomes available to meet new demands from offstream storage.

26. Non-recoverable spill from Shasta. This is the spill that cannot be recovered or pumped. The amount is monitored and is factored in to the amount that must be left in the offstream storage to meet subsequent CVP baseline exports.

27. Cumulative Shasta storage difference. This is the cumulative difference in baseline compared to reoperated Shasta storage levels. This is the running total of debit due Shasta in the offstream storage reservoir.

28. Spill check. This the reoperated Shasta spill computed using a different procedure which is a check on column 24.

<u>Adjustments to Sacramento River flows:</u>

30. The adjusted flow at the NCP. Baseline flow less stored Shasta spills plus Shasta spills in excess of baseline spills.

31. DWRSIM minimum flows at the NCP.

32. Adjusted divertable flow indicator. Uses adjusted flows at the NCP to determine if there is adequate pulse flow to allow diversions.

33. Maximum adjusted divertable flow at the NCP.

34. Maximum adjusted storable flows at the NCP. This is the usual check against excess flow at the NCP, Delta surplus, and excess Delta inflow tested against the export/inflow ratio.

Oroville Lake reoperations.

36. Oroville Lake end of month storages from DWRSIM output.

37. Change in Modeled Storage. This is the change in DWRSIM Oroville Lake modeled storage; previous month to current month. This is used in Oroville Lake reoperations in order to preserve the integrity of the existing DWRSIM run.

38. Spills from Oroville Lake. Computed by DWR staff from DWRSIM output.

39. Storable Oroville Lake Spill. This is the total spill from Oroville Lake checked against, 1) Delta surplus less Shasta spill, and 3) the excess Delta inflow limited by the export inflow ratio.

40. Maximum transfer potential from Oroville Lake This is the maximum transfer potential. It is the lesser of 1) the amount of storage in excess of the transfer target storage, and 2) the diversion capacity to the offstream storage.

41. Oroville transfer to offstream storage. This is the maximum transfer amount from Oroville. If the total transfer potential between Oroville and Shasta exceeds the space in the offstream storage, the transfer for each is prorated between each.

42. Oroville adjusted storage. This is the adjusted Oroville storage after transfer and/or after withdrawal from offstream storage to meet baseline CVP pumping. The baseline change in storage is factored in here. It is limited on the upper bound by the baseline Oroville storage and at the lower bound by the minimum target storage.

43. New Oroville spill. This is the new Oroville Lake spill based on reoperations. This number can exceed the original spill if targets are set on the low end.

44. Storable spill in Oroville. This is the amount of baseline spill that can be used to recover previous drawdown. It also is shown as a credit to offstream storage and in the event that Oroville Lake fully refills, the water becomes available to meet new demands from offstream storage.

45. Non-recoverable spill from Oroville. This is the spill that cannot be recovered or pumped. The amount is monitored and is factored in to the amount that must be left in the offstream storage to meet subsequent CVP baseline exports.

46. Cumulative Oroville storage difference. This is the cumulative difference in baseline compared to reoperated Oroville storage levels. This is the running total of debit due Oroville in the offstream storage reservoir.

47. Spill check. This the reoperated Oroville spill computed using a different procedure which is a check on column 24.

Summary of data.

48. Total transfer to offstream storage. This is the total transfer to offstream storage from Shasta and Oroville. Sum of columns 22 and 41.

49. Total required carryover for offstream storage for CVP/SWP operations. This is the total carryover storage required to be maintained in the offstream storage to protect the integrity of the baseline DWRSIM operation. It is the total difference in storage caused by the reoperations of Shasta and Oroville 1) credited with stored baseline spills (Columns 25 and 44), 2) debited for spills caused by the lowering of lake levels (Column 26 and 45),and, 3) releases from offstream storage to meet baseline pumping (Columns 50 and 51).

50. Release from offstream storage to meet CVP baseline pumping at Tracy PP. This is triggered by the extraction target storage levels set for Shasta, Criteria!$C73:79. The release is the lesser of 1) the amount of adjusted Oroville storage below the target, 2) the cumulative deficit for CVP (Column 46), 3) the CVP share of offstream storage outlet capacity (prorated based on SWP/CVP export pumping ratio (Columns 91 and 92), or, 4) the base CVP pumping at Tracy PP (Column 92).

51. Release from offstream storage to meet SWP baseline pumping at Banks PP. This is triggered by the extraction target storage levels set for Oroville, Criteria!$D73:79. The release is the lesser of 1) the amount of adjusted Oroville storage below the target, 2) the cumulative deficit for SWP, 3) the SWP share of offstream storage outlet capacity (prorated based on SWP/CVP export pumping ratio), or, 4) the base SWP pumping at Banks PP.

52. Adjusted Delta surplus. Baseline surplus adjusted by change in spills at Oroville and Shasta.

53. Baseline Delta inflow from DWRSIM.

54. Delta inflow adjusted by change in spills caused by reoperations.

North Groundwater Operations.

(Columns 55 through 64 contain the original CH2M Hill logic for operations or north of Delta groundwater operations described in the THRDELT7.XLS columnar explanation for columns 16 through 25. The groundwater option was turned off for preliminary analyses done for this report. This section is still valid if ones wishes to test a north of Delta groundwater operation.)

55. Maximum potential recharge to the new northern groundwater storage due to non-project operations. This was derived in collaboration with John Fielden, DWR, and Bookman Edmunston staff. This is incidental recharge to the prospective north groundwater aquifers estimated to result from adjacent irrigation practices and was determined to have little or no impact on river flows. This potential is limited by the amount of de-watered storage in the new conjunctive use facility ranging from zero recharge at 41% empty to 2.15 % of de-watered storage at 100 % empty. The values are input into Criteria!$I10:K15.

56. Maximum potential recharge to the new northern groundwater storage from Sacramento River water supply sources. Equal to the minimum of storable Sacramento River water supply (Column 9) or the assumed recharge capacity of the new facility. (Recharge capacities are input in CFS in Criteria!$C9.

57. Total actual recharge to north groundwater storage for environmental purposes. (The north groundwater storage can be used for either environmental and/or water supply purposes. The ratio is varied in Criteria!$C14 and Criteria!$C15.) This column is the environmental portion only and is the minimum of 1) the environmental factor times total recharge potential (Column 55 plus Column 56), or 2) the environmental storage component from the previous month plus any potential environmental demand in the current month.

58. The end-of month storage of the environmental component of north groundwater storage. This is the environmental portion of the north groundwater storage. The storage is limited to the environmental factor (Criteria!$C15) times the maximum storage (Criteria!$C11).

59. The north groundwater storage extraction amount for supplemental Delta outflow. This storage is the first source of water used to meet environmental target demands. This is equal to the minimum of 1) the previous month's environmental storage (Column 58), 2) the added target Delta outflow (Column 12), or, 3) the environmental factor times the assumed extraction capacity of the new facility (Criteria!$C10).

60. Total actual recharge to north groundwater storage for water supply purposes. This column is the minimum of 1) the water supply factor (Criteria!$C14) times total recharge potential (Column 55 plus Column 56), or 2) the water supply storage component from the previous month plus any potential water supply demand met in the current month.

61. The end-of month storage of the water supply component of north groundwater storage. This is the water supply portion of the north groundwater. The storage is limited to the water supply factor (Criteria!$C15) times the maximum storage (Criteria!$C11).

62. The north groundwater storage extraction amount for supplemental water supply. Unmet water supply demands are met first from this source. This is equal to the minimum of 1) the previous month's water supply storage (Column 61), 2) the added target supplemental water supply (Columns 14 plus 16), 3) the water supply factor times the assumed extraction capacity of the new facility (Criteria!$C10), 4) the excess export capacity at south Delta pumps (Column 96), or, 5) the excess conveyance capacity in the California Aqueduct below the Coastal Aqueduct turnout minus Column 107 (SWP unmet share only. Unmet CVP share is assumed delivered at or above the vicinity of Dos Amigos PP.).

63. The summary total recharge from the Sacramento River water supplies. The recharge from non-project sources is allowed to occur first. If the non-project recharge is sufficient to fill the new storage first, the Sacramento River water is not used for recharge. (Note: This will only occur with assumed very small aquifer, e.g. less than 20,000 AF.)

64. The summary total recharge from non-project sources. This is the actual recharge from sources other than from the river.

Integration with north offstream storage.

Columns 66 through 83 depicts one way the flood control transfer can be interwoven into existing spreadsheet THRDELT7.XLS model, or incorporated into the version of the spreadsheet model CALFED is currently using. It is presently linked with an environmentally and water supply benefits option for offstream storage.

Accounting of CVP/SWP Reoperations.

Columns 66 through 72 contain the accounting computations for the CVP/SWP reoperations of north offstream storage. The reoperation is controlled by setting Criteria!$B$2 equal to "YES". If Criteria!$B$2 is off, the spreadsheet will compute the operations of the new CALFED facilities as before. The basic operation of the north offstream storage is similar to the processes used previously. The CVP/SWP water is held in offstream storage while new water is put into storage if space is available. Water for new demands are released only to the extent that the total offstream storage exceeds the CVP/SWP cumulative account balance.

66. Water transfer from CVP/SWP. This is the total water transferred from Shasta and Oroville to the north offstream storage. It is the sum of Columns 22 and 41.

67. Release for CVP/SWP. This is the total release from north offstream storage to preserve the integrity of the base DWRSIM run. It is the sum of Columns 50 and 51.

68. Offstream storage required for CVP/SWP operations. This is the same as Column 49.

69. Maximum potential offstream storage available for CVP/SWP operations. This is column 68 limited by the size of the north offstream storage Criteria!$C$23. Whenever the cumulative storage is greater than the assumed capacity of the offstream storage, it is recorded as a shortage to the baseline DWRSIM operations.

70. Shortages to CVP/SWP. See column 69.

71. Offstream CVP/SWP storage evaporation. This is the proportionate share of evaporation from the CVP/SWP offstream storage. The evaporation is measured as a loss to the new water development and is allocated between the water supply and environmental supply shares of usable storage (Columns 75 and 82).

72. Potential water banked for new uses. This is the running total of water transferred from Shasta and Oroville that becomes available for new uses. This is water that is stored in Shasta and/or Oroville that was spilled in the DWRSIM run. When this occurs, the allocated share of offstream (Column 68) storage is reduced and is now available for new uses.

<u>North of Delta Offstream Storage.</u>

Columns 73 through 145 are essentially the same as THRDELT7.XLS with the addition of added columns for individual CVP pumping at Tracy PP (Column 90) and for the SWP at Banks PP (Column 91) in the Delta section. Analyses were done with only the south and north Delta offstream storage turned on. The in-Delta storage and south of Delta groundwater banking can be evaluated using FC_OPS2.XLS but only to the relative accuracy of the previous CH2M Hill spreadsheet. If there is sufficient interest in future applications of the flood control reoperations of Shasta and Oroville, the above logic could be incorporated into the current CALFED spreadsheet.

The north offstream storage can be used for either water supply and/or environmental purposes. The ratio is varied in Criteria!$C25 and Criteria!C26, respectively.

73. Total actual Sacramento River pumping to north offstream storage for environmental purposes. The equation for this computation is broken down as follows:

IF either the maximum storage (Criteria!C23), the conveyance to (Criteria!C21), or the environmental supply ratio (Criteria!C26) = zero, **THEN** pumping = 0 **ELSE...**

IF water supply ratio (Criteria!$C25) = 0, **THEN** pumping is equal to the minimum of....

> <u>Supply</u> -- Total storable Sacramento River water supply (Column 34) less the amount stored by north of Delta groundwater (Column 63),

Storage Capacity -- Maximum storage capacity (Criteria!C23) times environmental factor (Criteria!C26) less environmental carryover storage from the previous month (Column 73, previous row) + environmental demands met in the current month (Column 76) + total offstream storage evaporation in the current month (Column 77), or

Conveyance Capacity -- Total conveyance capacity to the new offstream storage facility Criteria!C21 less that portion used by CVP/SWP operations (Column 22).....**ELSE....**

IF the water supply portion of the offstream storage is full (previous month), **THEN** pumping is equal to the minimum of....

Supply -- Total storable Sacramento River water supply (Column 34) less the amount stored by north of Delta groundwater (Column 63),

Storage Capacity -- Maximum storage capacity (Criteria!C23) times environmental factor (Criteria!C26) less environmental carryover storage from the previous month (Column 73, previous row) + environmental demands met in the current month (Column 76) + environmental share of offstream storage evaporation in the current month (Column 77 times previous environmental storage/previous total storage), or

Conveyance Capacity -- Total conveyance capacity to the new offstream storage facility less that portion used by CVP/SWP operations (Column 22).

IF, neither the water supply factor is = 0, nor the water supply portion of the offstream storage is full, and the previous combined storage (water supply plus environmental supply) is not full, **THEN**....

Supply -- Total storable Sacramento River water supply (Column 34) less the amount stored by north of Delta groundwater (Column 63) times the environmental supply factor (Criteria!$C25),

Storage Capacity -- Maximum storage capacity (Criteria!C23) times environmental supply factor (Criteria!C26) less water supply carryover storage from the previous month (Column 73, previous row) + environmental supply demands met in the current month (Column 76) + environmental supply share of offstream storage evaporation in the current month (Column 77 times previous environmental supply storage/previous total storage), or

Conveyance Capacity -- Total conveyance capacity to the new offstream storage facility less that portion used by CVP/SWP operations (Column 22) times the environmental supply factor (Criteria!C26).

74. The total end-of month storage of the environmental component of north offstream storage. Equal to the previous end-of-month storage (Column 74) plus environmental pumping (Column 73) plus environmental factor (Criteria!C26) times CVP/SWP transfer (Column 66) minus releases for environmental purposes (Column 76) minus the environmental supply proportionate share of evaporation (Column 77) minus the environmental factor (Criteria!C26) times the sum of CVP/SWP withdrawal (Column 67) and CVP/SWP evaporation (Column 71). This is limited to the environmental (Criteria!C26) factor times the maximum storage (Criteria!C23).

75. Available environmental carryover storage. Total environmental storage (Column 74) limited by the environmental factor (Criteria!$C26) times the storage required for CVP/SWP operations (Column 69).

76. The north offstream storage release for supplemental Delta outflow. This is equal to the minimum of 1) the previous month's environmental carryover storage (Column 75), the added target Delta outflow (Column 12) minus the supplemental outflow met from groundwater (Column 59) , or, 3) the environmental factor (Criteria$C26) times the

withdrawal rate of the new conveyance facility (Criteria!C22) less any withdrawal conveyance currently being used by CVP/SWP operations (Column 67).

77. Environmental supply evaporation. Environmental share of evaporation. Total evaporation (Column 78) prorated with previous end of month water supply storage (Column 82).

78. Total evaporation from north offstream storage. Area-capacity-elevation curves were provided by DWR. Area and storage for Colusa and Sites Reservoirs were combined to allows the spreadsheets to accommodate up to a 6 MAF facility. The area-capacity data were extrapolated beyond 6 MAF based on the upper trends of the area-capacity curves for Sites/Colusa to accommodate storages up to 10 MAF. Evaporation rates were derived from pan data at East Park Reservoir. Evaporation is computed from the combined area of the combined storages of the environmental and water supply offstream storage and allocated proportionately to each portion of the reservoir in the computation of end-of-month storage; Columns 27 and 31.

79. Water supply evaporation. Water supply share of evaporation. Total evaporation (Column 78) prorated with previous end of month environmental storage (Column 75).

80. Total Sacramento River pumping to north offstream storage for water supply purposes. The equation for this computation is broken down as follows:

IF either the maximum storage (Criteria!C23), the conveyance to (Criteria!C21), or the water supply ratio (Criteria!$C25) = zero, **THEN** pumping = **0 ELSE...**

IF environmental supply ratio (Criteria!$C25) = **0, THEN** pumping is equal to the minimum of....

> Supply -- Total storable Sacramento River water supply (Column 34) less the amount stored by north of Delta groundwater (Column 63),
>
> Storage Capacity -- Maximum storage capacity (Criteria!C23) times water factor (Criteria!$C25) less water carryover storage from the previous month (Column 81, previous row) + water demands met in the current month (Column 83) + total offstream storage evaporation in the current month (Column 79), or
>
> Conveyance Capacity -- Total conveyance capacity to the new offstream storage facility less that portion used by CVP/SWP operations (Column 22).....**ELSE....**

IF the environmental supply portion of the offstream storage is full (previous month), **THEN** pumping is equal to the minimum of....

> Supply -- Total storable Sacramento River water supply (Column 34) less the amount stored by north of Delta groundwater (Column 63),
>
> Storage Capacity -- Maximum storage capacity (Criteria!C23) times water factor (Criteria!$C25) less water carryover storage from the previous month (Column 81, previous row) + water demands met in the current month (Column 83) + water supply share of offstream storage evaporation in the current month (Column 79 times previous water storage/previous total storage), or

Conveyance Capacity -- Total conveyance capacity to the new offstream storage facility less that portion used by CVP/SWP operations (Column 22).

IF, neither the water supply factor is = 0, nor the water supply portion of the offstream storage is full, and the previous combined storage (water supply plus environmental supply) not full, **THEN....**

Supply -- Total storable Sacramento River water supply (Column 34) less the amount stored by north of Delta groundwater (Column 63) times the water supply factor (Criteria!$C25),

Storage Capacity -- Maximum storage capacity (Criteria!C23) times water supply factor (Criteria!C26) less water supply carryover storage from the previous month (Column 73, previous row) + water supply demands met in the current month (Column 76) + water supply share of offstream storage evaporation in the current month (Column 77 times previous water supply storage/previous total storage), or

Conveyance Capacity -- Total conveyance capacity to the new offstream storage facility less that portion used by CVP/SWP operations (Column 22) times the water supply factor (Criteria!$C25).

81. The total end-of month storage of the water supply component of north offstream storage. Equal to the previous end-of-month storage plus water supply pumping (Column 80) plus water supply factor (Criteria!$C25) times CVP/SWP transfer (Column 66) minus releases for water supply purposes (Column 83) minus the water supply proportionate share of evaporation (Column 77) minus the water supply factor (CRIteria!$C25) times the sum of CVP/SWP withdrawal (Column 67) and CVP/SWP evaporation (Column 71). This is limited to the water supply factor (Criteria!C26) times the maximum storage (Criteria!C23).

82. Available water supply carryover storage. Total water supply storage (Column 81) limited by the water supply factor (Criteria!$C25) times the storage required for CVP/SWP operations (Column 69).

83. The north offstream storage release for water supply. This is equal to the minimum of 1) the previous month's water supply carryover storage (Column 82), the unmet demands (Columns 14 plus 16) minus the unmet met from groundwater (Column 62) , or, 3) the water supply factor (Criteria!$C25) times the withdrawal rate of the new conveyance facility (Criteria!C22) less any withdrawal conveyance currently being used by CVP/SWP operations (Column 67).

In-Delta Operations

85. Actual pumping to and/or from new upstream facilities. This a summary of the flow adjustments to Delta inflow. A positive number indicates a reduction in flow; a negative number indicates an increase in flow. Positive impacts include the water recharged to new groundwater facilities (Column 63), water pumped into north storage (Columns 73 and 80), DWRSIM spills stored in Shasta and Oroville (Columns 25 and 44). Negative impacts

include spills created by Shasta/Oroville reoperations in excess of DWRSIM (Columns 26 and 45). Increased spills are able to be picked up at the Delta pumps if conditions permit.

86. Total water available for export. This is equal to the Delta surplus (Column 52) minus the minimum of 1) the sum of maximum north of Delta groundwater storage (Criteria!$C10) minus previous end of month groundwater storage (Columns 58 and 61) or the groundwater recharge rate (Criteria!$C8), and, the maximum of north of delta offstream storage (Criteria!$C23) minus previous end of month offstream storage (Columns 74 and 81), or, 2) the adjusted storable Sacramento River flow (Column 34).

(**Note**: This computation is based on the assumption that if a storable Sacramento River supply exists, it will be pumped up to the maximum of either space or conveyance to each of the two upstream facilities and reduce Delta surpluses accordingly. The spreadsheet models rely on the development of "new" water supplies; thus any **releases** from new upstream facilities made for water enhancement are not included as added Delta surpluses. Releases made from new upstream facilities to meet water supply or water demands **are** shown as added DWRSIM base study Delta inflow for export/inflow ratio adjustments.

This computation is made, as such, to avoid circular reference computational problems in Excel. While not an exact reflection of the actual operations of upstream facilities, it is valid in nearly all cases and errs only on the conservative side and by less than one percent.

87. Delta surplus adjustment. This is a check against Column 37. If the adjustment made to available export water (Column 38) occurs when either the environmental and/or water shares of the upstream storages are full in the previous months, some water will be "left on the table". If Column 39 differs from Column 37, this is the reason.

88. DWRSIM unused capacity at Banks and Tracy Pumping Plants. For the existing facilities scenarios, this column is taken straight out of DWRSIM run 472. For the through-Delta and isolated facilities scenarios, this is the difference between physical capacity at the two pumping plants minus Tracy and Banks total pumping in the DWRSIM 472 simulation.

89. DWRSIM total Delta inflow. This is from DWRSIM output and is the total Delta inflow excluding precipitation on the Delta.

90. Adjusted Delta inflow. DWRSIM Delta inflow adjusted for upstream operations. The following procedure is used to avoid circular calculation in EXCEL. **Equals** inflow **(Column 36) less** the **minimum of** 1) Sacramento River water available for upstream use **(Column 8)**, or 2) the **sum** of a) the **minimum of** the **space** remaining in the groundwater aquifer (previous end-of-month storage **(Columns 19 and 22) less** maximum storage **(Criteria**, cell **C10))**, **or**, the **conveyance** capacity to it **(Criteria**, cell **C8)** and b) the **space** remaining in the north offstream storage (previous end-of-month storage (Columns 28 and 34) less maximum storage (Criteria, cell C23)), **or**, the **conveyance** capacity to it (Criteria, cell C21). This adjustment works for all months except when either the water supply or the environmental portion of the respective facilities is full when the other portion is not full. In this very infrequent case the adjustment errs on the conservative side. The error is of the same magnitude as the Delta surplus adjustment described in Column 39.

91. DWRSIM base pumping at Tracy Pumping Plant.

92. DWRSIM base pumping Banks Pumping Plant.

93. DWRSIM combined base pumping at Tracy and Banks Pumping Plants.

94. DWRSIM maximum allowable export/inflow ratio under existing conditions.

95. DWRSIM maximum pumping through south Delta pumps. (Same as Column 35.)

96. Maximum pumping limited by the export/inflow ratio. The existing facilities and through-Delta scenarios are tested for allowable pumping under the ratio. For the existing facility the values are the same or smaller than the DWRSIM output; having been tested and reduced, if necessary, by upstream operations. For the through-Delta facility scenarios, the new added capacity at Banks PP is tested by the ratio. For the isolated facility scenarios, the export/inflow ratio applies to water that still must be exported through the Delta under a wide range of isolated facility sizes.

97. Amount of new pumping allowed through the isolated facility. (This Column and Columns 98 and 99 are **not used** in FC_OPS2.XLS.)

98. Amount of existing export that must be delivered through the isolated facility.

99. Amount of new export that can be further pumped through the Delta.

<u>In-Delta Storage</u>

101. Diversion to in-Delta storage. Diversions to in-Delta storage are limited to the minimum of...

1. In-Delta storage space (Maximum storage, Citeria!$C34, less previous month storage Column 104),

2. The water available for export (Column 86),

3. Through Delta conveyance capacity limited by export/ inflow ratio with allowance for delivery of releases made from upstream facilities for water supply purposes, or

4. Maximum conveyance capacity (Criteria!$C32) to the in-Delta storage

102. Supply to Delta outflow from in-Delta storage. Supply to the target added Delta outflow not met by new upstream facilities.

103. Supply to water supply from in-Delta storage. In-Delta storage is set up to first meet Delta outflow. Withdrawals can be made for water supply and are limited to:

1. The target unmet demand (Columns 14 and 16) less the amount already met from north groundwater (Column 62), and the north offstream storage (Column 83).

2. The total amount of storage in the preceding month in excess of the water supply target (Criteria!$C42:53) for the preceding month, or..

3. The excess capacity in the California Aqueduct below Dos Amigos for the unmet CVP demands, and the excess capacity below South Coastal Aqueduct for the unmet SWP demand.

104. In-Delta end of month storage levels.

California Aqueduct Capacity

106. Remaining San Luis Canal Capacity below Dos Amigos Pumping Plant. This is the total CVP and SWP remaining capacity in the San Luis Canal. These values are taken directly from DWRSIM output. Remaining capacity is reduced by 1) deliveries to unmet CVP and SWP demands,

107. Remaining California Aqueduct Capacity below the Coastal Aqueduct turnout. These values are from DWRSIM and can limit the ability to meet demands south of Kettleman City.

South of Delta offstream storage.

109. South of Delta offstream storage supply to water demands. Releases from south offstream storage to meet unmet CVP, SWP, and other demands. Equal to the lesser of

1. The target unmet demand (Columns 14 and 16) less the amount already met from north groundwater (Column 62), the north offstream storage (Column 83), and in-Delta storage (Column 103),

2. The carryover water supply storage (Column 110),

3. The excess capacity in the California Aqueduct below Dos Amigos for the unmet CVP demands, and the excess capacity below South Coastal Aqueduct for the unmet SWP demand.

110. Water supply carryover storage supply. This is the amount of total storage (Column 59) available for water supply use limited by the drawdown factor (Criteria!$F20).

111. Water pumped to south of Delta offstream storage for water supply. Pumping of Delta surplus to south water supply portion of offstream storage. Limited by lesser of;

1. The water supply factor (Criteria!$F25) times:
   - the total available for export (Column 86) less the diversion to in-Delta storage (Column 101), or,
   - the excess capacity in the Aqueduct below Dos Amigos (Column 106) less the water supply already being exported and using some of that space (Columns 62, 83, and 103)
   - the water supply portion of the conveyance capacity to the offstream storage (Criteria!$F21*Criteria!$F26)...or
2. The space in the water supply portion of south of Delta offstream storage (maximum storage Criteria!$F24 times Criteria!$F25 less previous months storage, (Column 112).

112. Total end of month offstream storage for water supply.

113. Water supply portion of evaporation. Water supply share of total evaporation (Column 114) prorated by previous end of month storage.

114. Total evaporation from south of Delta offstream storage. The evaporation rates and area-capacity-elevation curves were provided by Mark Cowin, DWR. They are the same as data used for Los Banos Grandes investigation studies. The evaporation rates are input in the Criteria!$N70:81. The area-capacity-elevation data is input into Criteria!$Z6:AB46.

115. Environmental supply portion of evaporation. Environmental supply share of total evaporation (Column 114) prorated by previous end of month storage.

116. Environmental supply from south of Delta offstream storage. The south of Delta offstream environmental storage is used to offset base CVP and SWP pumping (Column 93. It is assumed that pumping reductions would be allocated to supplement Delta outflow. Equal to the lesser of:

1. The target outflow(Column 12) less the amount already met from north groundwater (Column 59), the north offstream storage (Column 76), and, in-Delta storage (Column 102),

2. The amount of carryover storage remaining in environmental storage (Column 117),

3. The amount of total environmental storage remaining (Column 119), or...

4. The total CVP/SWP pumping (Column 93).

117. Environmental supply carryover storage supply. This is the amount of total storage (Column 119) available for environmental supply use limited by the drawdown factor (Criteria!$F$19). The carryover limit is reset each October first.

118. Water pumped to south of Delta offstream storage for environmental supply. Pumping of Delta surplus to south environmental supply portion of offstream storage. Limited by lesser of;

1. The environmental supply factor (Criteria!$F26) times:

   - the total available for export (Column 86) less the diversion to in-Delta storage (Column 101), or,

   - the excess capacity in the Aqueduct below Dos Amigos (Column 106) less the water supply already being exported and using some of that space (Columns 62, 83, and 103)

   - the water supply portion of the conveyance capacity to the offstream storage (Criteria!$F21)...or

2. The space in the environmental supply portion of south of Delta offstream storage (maximum storage Criteria!$F24 times Criteria!$F26 less previous months storage, (Column 119).

119. Total end of month offstream storage for environmental supply.

120. Summary. Total south of Delta offstream storage. The sum of Columns 112 and 119.

Demand/Conveyance summary before operations of south of Delta groundwater banking operation.

122. Remaining unmet demands.

123. Remaining conveyance capacity -- south Delta pumps to Coastal Aqueduct turnout.

124. Remaining Delta surplus.

125. Remaining California Aqueduct capacity at Coastal Aqueduct turnout (Below Kettleman City).

South of Delta groundwater banking.

127. Maximum recharge supply available for south of Delta groundwater storage. The lesser of:

1. Remaining capacity at Delta pumps (Column 123),
2. Remaining Delta surplus (Column 124,
3. Recharge rate (Criteria!$F9), or ....
4. Remaining capacity in the Aqueduct below Kettleman City (Column 125).

128. Actual recharge to the basin. Minimum of Column 127 or available space in south groundwater aquifer.

129. South of Delta groundwater bank end of month storage.

130. Extraction for water supply from south of Delta groundwater storage. Equal to the lesser of:

1. The target unmet demand (Columns 14 and 16) less the amount already met from north groundwater (Column 62), the north offstream storage (Column 83), in-Delta storage (Column 103), and south of delta offstream storage (Column 109).
2. Water in storage (previous months storage Column 129), or ...
3. The maximum extraction rate (Criteria!$F10)

Summary after all operations.

132. Remaining unmet SWP/CVP demands.

133. Total deliveries to unmet SWP/CVP demands.

134. Total use of excess pumping and conveyance capacity.

135. Original excess pumping and conveyance capacity.

136. Remaining excess pumping and conveyance capacity.

137. Remaining exportable Delta supply.

138. Remaining capacity in the California Aqueduct below the Coastal Aqueduct turnout.

139. Unmet demands that are met through conveyance only. This column is used to measure the accomplishments of improved conveyance only. With new storage zeroed out, or limited to small capacities, this column provides information on new demands that can be met direct without regulation.

140. Remaining transfer potential. This is the minimum of remaining capacity at the south Delta pumps or the Aqueduct below the Coastal Aqueduct turnout; vicinity of Kettleman City after operations of all new CALFED facilities. If transfers are desired above this point, deliveries would be limited by Aqueduct capacity at that point.

141. Final Delta Inflow.

142. Final south Delta export pumping.

143. Final Export/Inflow ratio. This is a final check.

144. Is ratio violated? This is a final test of the model. Yes/No

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