Expert Report of Antonio M. Buelna
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South-Central California Area Office
Fresno, California

1. Introduction and Summary of Opinions

I have been identified as an expert by the U.S. Department of Justice to provide testimony in *NRDC v. Rodgers*. I have been asked to express my opinion on the effects to the Central Valley Project (CVP) operations if the Friant Division of the CVP was to be operated or managed in the manner proposed in the expert reports submitted by Dr. Kenneth W. Kirby and Dr. Mathias Kondolf.

Based on my analysis, Reclamation would be unable to supply as much water to the Friant water users as we would otherwise based on the proposed releases for restoration purposes. In addition, Reclamation would be unable to deliver the flows greater than 1200 cfs into Mendota Pool due to the existing conditions of the San Joaquin River between the bifurcation structure and Mendota Pool.

2. Professional Qualifications

I graduated from the California State University Fresno with a Bachelor of Science degree in Civil Engineering. I am a Registered Professional Engineer in the State of California. I began my career with Reclamation in 1978. In December 1990, I became the Chief of the Operations Division in the South-Central California Area Office (SCCAO). As Chief of the Operations Division, I am responsible for the physical operation and maintenance of Friant Dam, the Friant-Kern and Madera Canals of the CVP, Bradbury Dam, and Cachuma Project. I am directly responsible for management of water service for the Friant-Kern and Madera Canals according to the Friant Operational Guidelines. I am responsible for the optimization of the Friant Division CVP water supply, directing the flood control operations, developing the water operations forecasts, developing the water supply allocations, and directing the daily water operations of the Friant Division, CVP.

I was deposed in January 2004 during the ***Central Green Co. vs. US. CT. No. CV-F-96-5541*** within the preceding four years.

3. Data and Other Information Considered by the Witness in Forming Opinions

Information used in preparation of this report:

- Dr. Kenneth Kirby and Dr. Mathias Kondolf Expert Reports
- Reclamation's Central Valley Project Operations Data: 1974 to 2005 (see Attachment A)
- USGS Station 11251000, San Joaquin River below Friant Dam (see Attachment A)

And, the documents in the administrative record submitted June 15, 2005, "Federal Defendants' Notice of Lodging of Initial Disclosures" was also considered. The dates, document title, and Bates Numbers are as follows:

DATE	TO	FROM	SUBJECT	BATES NUMBER
6/14/1909	Miller & Lux, et al. with San Joaquin Light & Power Company		Contract with Miller & Lux, et al. with San Joaquin Light & Power Company	00001
1/19/1916	Bureau of Reclamation – Sacramento	State of California State Water Rights Board	Application to Appropriate Unappropriated Water - Application No. 234	00002
7/30/1927	Bureau of Reclamation – Sacramento	State of California State Water Rights Board	Application to Appropriate Unappropriated Water - Application No. 5638	00013
12/1/1947	Regional Supervisor of Operations and Maintenance	Chief, Irrigation Operations Division	Memorandum - Revision of Exchange Contract of Orig. Exchange Contract between the Federal Government & San Joaquin and Kings River Canal and Irrigation Co., Columbia Canal Co., San Luis Canal Co. and Firebaugh Canal Co. executed on July 27, 1939	00029
12/1955 Rev. 8/1980	Department of the Army, Sacramento District, Corps of Engineers, Sacramento, CA	Unknown	Report on Reservoir Regulation for Flood Control Friant Dam and Millerton Lake San Joaquin River, CA	00030
6/1/1957	Southern California Edison Company	United States Department of the Interior, Bureau of Reclamation	Operating Contract Relating to Southern California Edison Company's Mammoth Pool and Existing Projects on the San Joaquin River	00031
6/21/1957	Central California Irrigation District, Columbia Canal Co., Firebaugh Canal Co., San Luis Canal Co.	Southern California Edison Company	Agreement. To acquire rights and interests in and to the use of the waters of the San Joaquin River and its tributaries	00032
12/30/1960	State Water Rights Board, State of California	Unknown	Order Allowing change in Place of Use. Application 234, Permit 11885	00033
12/30/1960	State Water Rights Board, State of California	Unknown	Order Allowing change in Place of Use. Application 1465, Permit 11886	00034
10/11/1989	Friant Power Authority Fish Water Release Power Project	Bureau of Reclamation - Fresno	Transmittal of Contract No. 0-07-20-L X0308 Agreement for the Construction Operation and Maintenance of the Friant Fish Water Release Power Project Friant Dam Friant United Central Valley Project	00049

In forming the opinions set forth herein and in preparing this expert report, I relied on my 17 years of best practices and experience operating, maintaining and supervising the CVP Friant Division and my coordination with numerous local entities that have requirements that must be addressed: Southern California Edison (SCE), Pacific Gas & Electric (PG&E), California Department of Water Resources (DWR), Friant Water Users Authority, Corps Of Engineers, California Department of Fish and Game, San Joaquin River Exchange Contractors Water

Authority, Lower San Joaquin Levee District, San Joaquin River Association, National Weather Service, River Forecast Center, Madera – Chowchilla Water and Power Authority, Kings River Water Association, riparian landowners, and others.

Description of the CVP Friant Division - Friant Dam and Millerton Lake operations
The SCCAO of the Mid-Pacific Region operates the Friant Division of the CVP. The Friant Division is defined as: Friant Dam, Friant-Kern Canal, and Madera Canal. Millerton Lake created behind the Friant Dam has a total capacity of 520,500 acre-feet (AF) between the streambed and the top of the active conservation level. It covers approximately 4,900 acres and has a shoreline of 47 miles. Millerton Lake also serves as a recreational area providing camping, fishing, picnicking, and swimming. This recreational area is managed by the California State Department of Parks and Recreation.

Operating Parameters that Effect the Operations of Friant Division:

- There are nine dams located upstream of Friant Dam, which are operated and maintained by SCE. The Mammoth Pool Agreement, which is a contract between SCE and Reclamation, provides a target maximum allowable total storage for SCE projects at the end of the water year, conditioned on, among other things, the April through July runoff.

- PG&E operates two dams upstream from Friant Dam. The Miller-Lux Agreement, which is a contract between PG&E and Reclamation, provides a target maximum allowable total storage for Crane Valley reservoir at the end of the water year.

- As a result of *Rank vs. Krug* litigation, Reclamation has a requirement to provide a minimum of 5 cfs flow at the Gravelly Ford gaging station (~38 river miles downstream of Friant Dam) annually. In order to provide for the minimum flow at Gravelly Ford, Reclamation releases an average to approximately 117,000 AF per year from Friant Dam.

- The Corps of Engineers (Corps) Flood Operations Regulations have an operating criteria that requires Reclamation to coordinate with the Corps during flood release conditions.

- Friant Operating Permit #11885 requires Reclamation to not store water supply in Millerton Lake between August 1 through November 1 (+/- 15 days).

- The 'Agreement for the Construction Operation and Maintenance of the Friant Fish Water Release Power Project Friant Dam Friant United Central Valley Project' requires Reclamation to provide a continuous flow of ~35 cfs water to the California Department of Fish and Game's fish hatchery.

Reclamation utilizes Friant Dam to store and regulate the San Joaquin River, meet downstream riparian releases requirements at Gravelly Ford (above Mendota Pool), provide flood control and conservation storage for the San Joaquin Valley, and meet diversion requirements for the Madera and Friant-Kern Canals.

The last hundred years the San Joaquin River annual runoff volume has varied from 361,000 AF in 1977 to 4,642,000 AF in 1983. The San Joaquin River runoff uncertainty, together with the relatively small storage capacity of Friant, makes it very difficult to define a fixed water allocation (quantity) to be diverted into the Madera, Friant-Kern Canals and the San Joaquin River at the beginning of the water year. It is important to coordinate with the above-mentioned entities on a regular basis during the water year in order to optimize the uses of the San Joaquin River runoff. To assist in this complex management system, on behalf of the State of California, the DWR prepares a San Joaquin River runoff forecast on 1 February and updates the water supply runoff forecast on a weekly basis until the runoff stabilizes, usually in the early summer.

The water delivery and release schedules I ultimately direct for the Friant Division depend on the quantity of water available, the time it becomes available, flood control requirements, release schedules from storage reservoirs above Millerton Lake, and water user requirements. After evaluating the DWR runoff forecast, I determine the Friant Division water delivery and release schedules. On or about 15 February, a declaration of Class 1 and Class 2 allocations for Friant Division is publicly released. At a declaration of 100% Class 1, the Friant Division contractors that have a contractual right to Class 1 water can receive a combined total amount up to 800,000 AF per year. At a declaration of 100% Class 2, the Friant Division contractors that have a contractual right to Class 2 water can receive a combined total amount up to approximately 1,400,000 AF per year. The declaration of Class 1 and Class 2 is adjusted throughout the water year as needed based on the various inflow predictions for the San Joaquin River basin released by DWR and the Corps of Engineers requirements for flood management.

Class 1 Water is defined as: The supply of water stored in or flowing through Millerton Lake which, subject to the contingencies described in the water service contract, will be available for delivery from Millerton Lake and the Friant-Kern and Madera Canals as a dependable water supply during each Contract Year.

Class 2 Water is defined as: The supply of water which can be made available subject to the contingencies described in the water service contract for delivery from Millerton Lake and the Friant-Kern and Madera Canals in addition to the supply of Class 1 water. Because of its uncertainty as to availability and time of occurrence, such water will be undependable in character and will be furnished only if, as, and when it can be made available as determined by the Contracting Officer.

The table below shows various allocations (%) and their associated volumes (ac-ft).

Allocation	Class 1 (ac-ft)	Class 2 (ac-ft)
100%	800,000	1,401,475
90%	720,000	1,261,328
80%	640,000	1,121,180
70%	560,000	981,033
60%	480,000	840,885
50%	400,000	700,738
40%	320,000	560,590
30%	240,000	420,443
20%	160,000	280,295
10%	80,000	140,148
5%	40,000	70,074

4. Discussion

I will discuss how the additional proposed restoration flows in the San Joaquin River from Friant Dam (Millerton Lake) as described by the NRDC experts might effect the water supply allocations in the future based on the spreadsheet analysis (Table 1). This spreadsheet analysis predicts the impact to the water supply of Friant Dam based on NRDC's proposed restoration releases as defined in Kondolf's report.

This analysis excludes the re-operation effect that the restoration flows would have on the required flood control releases. It also assumes that the restoration flows for the defined water year class apply October through September. In keeping with SWRCB treatment of water year classification, you could assume they apply May through January and would be based on forecasted water year class February, March, and April. There is no treatment of how forecasted water year class would affect the required flows.

In Attachment A, Table 1, entitled, "Predicted Impact to Water Supply based on NRDC's Proposed Restoration Releases", analyzes the historic 'San Joaquin River Releases' versus the 'NRDC's Proposed Riparian and Restoration Releases'. The results of my analysis were based upon the information reflected in the following columns of Table 1:

Column 1: The water years used in this analysis range from 1957 through 2005. The water year period extends from October 1 through September 30.

Column 2: The annual San Joaquin River Runoff ranges from 361 thousand acre- feet (TAF) to 4642 thousand AF (TAF). The annual San Joaquin River Runoff extends from 1 October through 30 September.

Column 3: The majority of the annual runoff derives from snowmelt between the months of April – July.

Column 4:	Reclamation historic records – The percentage of Class 1 water available (which is based on a percent of the contractual amount)
Column 5:	Reclamation historic records – The percentage of Class 2 water available (which is based on a percent of the contractual amount)
Column 6:	Reclamation historic records - Water allocation based on Class 1 contractual amount.
Column 7:	Reclamation historic records - Water allocation based on Class 2 contractual amount.
Column 8:	The Water Year type 'Classification' is based on the hydrograph from the Expert Report of Kenneth W. Kirby, Ph. D., page 27, footnote 24.
Column 9:	The 'NRDC Riparian Releases' is based on the Expert Report of Kenneth W. Kirby, Ph.D., page 27.
Column 10:	The 'NRDC Restoration Releases' is based on the Expert Report of Kenneth W. Kirby, Ph.D., page 27.
Column 11:	'Total Restoration and Riparian Releases' are the combined values of proposed releases.
Column 12:	The 'Historic San Joaquin River Releases' used are from two data sources. The releases between 1957 through 1974 were provided from the USGS Station 11251000 - San Joaquin River below Friant Dam location. The releases between 1975 and 2005 were provided from Reclamation's, Mid-Pacific Region, Central Valley Operations office.
Column 13:	Impact to Water Supply – Water used for restoration releases were considered to impact water supply allocation.
Column 14:	Water Supply Impact - Since the riparian needs on the San Joaquin River change from month to month depending on irrigation patterns, Reclamation analyzed the impact on a monthly basis. If Reclamation's historic San Joaquin River release was less than Riparian Release, then Reclamation considered Restoration Release as the impact value. If Reclamation's historic San Joaquin River release was greater then Riparian Release, then Reclamation considered the monthly analysis impact value (refer to Table 4).
Column 15 &16:	Total Water Allocation Class 1 and Class 2 Reduced - Reclamation calculated a new water allocation by subtracting the impact value calculated in Column 14, from the original available water supply which produced reduced water supply allocation.

Column 17 & 18: The new water allocation for Class 1 and Class 2 by percentages.

Column 19 & 20: The difference between the original allocation and the reduced allocation by percentages.

Table 2: Historical San Joaquin River Releases – Values between 1957 through 1974 were provided from the USGS Station 11251000 - San Joaquin River below Friant Dam. The values between 1975 through 2005 were obtained from the U.S. Bureau of Reclamation, Mid-Pacific Region, Central Valley Operations Office.

Table 3: NRDC Restoration and Riparian Release - based on the Expert Report of Kenneth W. Kirby, Ph.D., page 27.

Table 4: Impact to Water Supply - The difference between the historical San Joaquin River releases and NRDC's Restoration/Riparian releases (refer to Table 2 and Table 3).

From this information noted above, I determined the monthly impact to the water supply. Over the period of record, the proposed restoration releases could result in the average annual impact to the water supply of approximately 223,000 AF per year based upon Reclamation's historical water allocation records.

An incremental change in the annual releases from Friant Dam (Millerton Lake) directly effects the water supply allocation in the Friant Division area

Our analysis shows there are impacts to the Friant Division water supply when we apply the restoration hydrograph proposed by the NRDC experts. The proposed hydrograph was analyzed by comparing the NRDC hydrograph to the historic annual water supply allocation data from 1957 to 2005. The water supply allocation impacts vary from year to year and are greatest in water years classified as 'critically dry' and least in years classified as 'wet'. These water year type classifications are the same as defined in Kirby's expert report.

The analysis shows that the minimum impact to the water supply would have resulted in a loss of 18,000 acre-ft (AF) and would have occurred in water year 1983, while the maximum impact would have occurred in water year 1997 and resulted in a loss of 433,000 AF to the Friant water users. Both of these years were classified as 'wet' years. The average annual loss to the water supply over the period of record (1957-2005) would have been approximately 223,000 AF. This quantity of water represents approximately 28% of the annual Class 1 water supply to the Friant Division.

The existing main stem San Joaquin River channel does not have the carrying capacity to convey the flows recommended by the NRDC experts.

As an example, in 2005, when releases from Friant Dam exceeded the 1,500 cfs channel capacity between the bifurcation structure and Mendota Pool, the Lower San Joaquin Levee District contacted me to convey privately owned lands were experiencing seepage. To address this problem, the released flows above 1,200 cfs were diverted into the bifurcation structure upstream of Mendota Pool. Although the channel capacity in the reach of San Joaquin River between bifurcation structure and Mendota Pool is rated to carry at 2,500 cfs, the actual existing conditions of the channel preclude the flows being conveyed into Mendota Pool without flooding of neighboring privately owned lands. It is my opinion that the existing San Joaquin River channel between the bifurcation structure and Mendota Pool cannot be used to convey flows above 1,200 cfs without flooding the riparian landowners along this reach of the San Joaquin River without modification to the existing levees.

5. Conclusion

My analysis of Table 1 reflects:

A. Over the period of record, the proposed restoration releases could result in the average annual loss to the water supply of approximately 223,000 AF per year based upon Reclamation's historical water allocation records.

B. Using an "average annual loss" does not tell the whole story. For example:

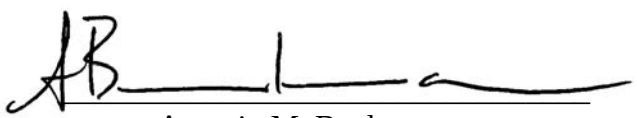
- In 1997 the runoff was 2,818,000 AF and classified as a wet year, the Friant waters users would have experienced the maximum impact to their water supply in the volume of 433,000 AF.

- In 1983 the runoff was 4,642,000 AF and classified as a wet year, the Friant water users would have experienced the least impact to their water supply in the volume of 18,000 AF.

Based on these observations, I conclude that Reclamation would be unable to supply as much water to the Friant water users as we would otherwise if the proposed restoration releases are made.

Although my analysis reflects a 223,000 AF loss per year, the loss of an average of 329,000 AF annually is noted on page 9 of Kirby's report. Regardless of the discrepancy in these numbers, I do not believe the Friant Division can replace these losses as implied by Kirby. Based on my 17 years of Friant Division experience and working with the water users as Chief of Operations, a reduction of Class 1 and/or Class 2 (Table 5, pages 31 of Kirby Report) would directly affect the Friant Division Municipal contractors and the Friant Division Agricultural contractors.

Dated: September 19, 2005



Antonio M. Buelna

ATTACHMENT A

TABLE 1

Predicted Impact to Water Supply based on NRDC's Proposed Restoration Releases

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Water Year	Annual SJR Runoff taf	Apr-Jul SJR Runoff taf	Historic Water Allocation		Historic Water Allocation taf		Classification for Hydrograph	NRDC Riparian Release taf	NRDC Restoration Releases taf	Total Restoration and Riparian Release taf	Historic SJR Release taf	Impact to Water Allocation	Water Supply Impact taf	Total Water Amount of Allocation Reduced (taf)		New Water Allocation		Difference in Water Allocation by %	
				Class 1	Class 2	Class 1	Class 2								Class 1	Class 2	Class 1	Class 2	Class 1	Class 2
1	1957	1327	1024	100%	0%	800	0	Normal Dry	116.7	257.0	373.7	149	Yes	245	555	0	69%	0%	31%	0%
2	1958	2631	2068	100%	0%	800	0	Normal Wet	116.7	371.4	488.2	1180	Yes	122	678	0	85%	0%	15%	0%
3	1959	949	606	100%	0%	800	0	Dry	116.7	184.0	300.8	80	Yes	184	616	0	77%	0%	23%	0%
4	1960	829	608	100%	0%	800	0	Dry	116.7	184.0	300.8	96	Yes	184	616	0	77%	0%	23%	0%
5	1961	648	452	75%	0%	600	0	Critical Dry	116.7	70.8	187.5	100	Yes	71	529	0	66%	0%	9%	0%
6	1962	1924	1486	100%	62%	800	869	Normal Wet	116.7	371.4	488.2	75	Yes	371	800	497	100%	35%	0%	27%
7	1963	1945	1413	100%	80%	800	1121	Normal Wet	116.7	371.4	488.2	83	Yes	371	800	750	100%	53%	0%	27%
8	1964	922	643	100%	12%	800	168	Dry	116.7	184.0	300.8	70	Yes	184	784	0	98%	0%	2%	12%
9	1965	2272	1421	100%	100%	800	1401	Normal Wet	116.7	371.4	488.2	63	Yes	371	800	1030	100%	73%	0%	27%
10	1966	1299	837	100%	23%	800	322	Normal Dry	116.7	257.0	373.7	62	Yes	257	800	65	100%	5%	0%	18%
11	1967	3232	2327	100%	100%	800	1401	Wet	116.7	564.7	681.4	1269	Yes	163	800	1238	100%	88%	0%	12%
12	1968	862	552	92%	0%	736	0	Dry	116.7	184.0	300.8	58	Yes	184	552	0	69%	0%	23%	0%
13	1969	4040	2898	100%	100%	800	1401	Wet	116.7	564.7	681.4	2208	Yes	98	800	1303	100%	93%	0%	7%
14	1970	1446	907	100%	29%	800	406	Normal Dry	116.7	257.0	373.7	87	Yes	257	800	149	100%	11%	0%	18%
15	1971	1417	970	100%	35%	800	491	Normal Dry	116.7	257.0	373.7	48	Yes	257	800	234	100%	17%	0%	18%
16	1972	1039	653	100%	4%	800	56	Normal Dry	116.7	257.0	373.7	68	Yes	257	599	0	75%	0%	25%	4%
17	1973	2047	1546	100%	77%	800	1079	Normal Wet	116.7	371.4	488.2	285	Yes	257	800	822	100%	59%	0%	18%
18	1974	2190	1507	100%	82%	800	1149	Normal Wet	116.7	371.4	488.2	136	Yes	363	800	786	100%	56%	0%	26%
19	1975	1796	1412	100%	60%	800	841	Normal Wet	116.7	371.4	488.2	48	Yes	371	800	469	100%	33%	0%	27%
20	1976	629	350	75%	0%	600	0	Critical Dry	116.7	70.8	187.5	81	Yes	71	529	0	66%	0%	9%	0%
21	1977	361	262	25%	0%	200	0	Critical Dry	116.7	70.8	187.5	93	Yes	71	129	0	16%	0%	9%	0%
22	1978	3402	2332	100%	100%	800	1401	Wet	116.7	564.7	681.4	1338	Yes	124	800	1277	100%	91%	0%	9%
23	1979	1830	1295	100%	63%	800	883	Normal Wet	116.7	371.4	488.2	96	Yes	371	800	512	100%	36%	0%	27%
24	1980	2973	1910	100%	100%	800	1401	Wet	116.7	564.7	681.4	944	Yes	272	800	1130	100%	81%	0%	19%
25	1981	1068	783	100%	22%	800	308	Normal Dry	116.7	257.0	373.7	65	Yes	257	800	51	100%	4%	0%	18%
26	1982	3316	2296	100%	100%	800	1401	Wet	116.7	564.7	681.4	791	Yes	216	800	1186	100%	85%	0%	15%
27	1983	4642	2860	100%	100%	800	1401	Wet	116.7	564.7	681.4	3150	Yes	18	800	1384	100%	99%	0%	1%
28	1984	2043	1115	100%	50%	800	701	Normal Wet	116.7	371.4	488.2	601	Yes	322	800	379	100%	27%	0%	23%
29	1985	1136	792	100%	14%	800	196	Normal Dry	116.7	257.0	373.7	67	Yes	257	739	0	92%	0%	8%	14%
30	1986	3032	1802	100%	100%	800	1401	Wet	116.7	564.7	681.4	997	Yes	316	800	1085	100%	77%	0%	23%
31	1987	757	554	91%	0%	728	0	Dry	116.7	184.0	300.8	70	Yes	184	544	0	68%	0%	23%	0%
32	1988	862	563	78%	0%	624	0	Dry	116.7	184.0	300.8	84	Yes	184	440	0	55%	0%	23%	0%
33	1989	939	668	98%	0%	784	0	Dry	116.7	184.0	300.8	92	Yes	184	600	0	75%	0%	23%	0%
34	1990	743	514	68%	0%	544	0	Dry	116.7	184.0	300.8	108	Yes	184	360	0	45%	0%	23%	0%
35	1991	1027	831	100%	0%	800	0	Normal Dry	116.7	257.0	373.7	111	Yes	257	543	0	68%	0%	32%	0%
36	1992	808	568	83%	0%	664	0	Dry	116.7	184.0	300.8	130	Yes	172	492	0	61%	0%	22%	0%
37	1993	2672	1946	100%	90%	800	1261	Normal Wet	116.7	371.4	488.2	327	Yes	250	800	1011	100%	72%	0%	18%
38	1994	824	600	80%	0%	640	0	Dry	116.7	184.0	300.8	129	Yes	174	466	0	58%	0%	22%	0%
39	1995	3876	2616	100%	100%	800	1401	Wet	116.7	564.7	681.4	1592	Yes	75	800	1326	100%	95%	0%	5%
40	1996	2201	1518	100%	58%	800	813	Normal Wet	116.7	371.4	488.2	390	Yes	225	800	588	100%	42%	0%	16%
41	1997	2818	1293	100%	60%	800	841	Wet	116.7	564.7	681.4	1165	Yes	433	800	408	100%	29%	0%	31%
42	1998	3161	2307	100%	10%	800	140	Wet	116.7	564.7	681.4	1603	Yes	47	800	93	100%	7%	0%	3%
43	1999	1527	1071	100%	20%	800	280	Normal Dry	116.7	257.0	373.7	242	Yes	168	800	112	100%	8%	0%	12%
44	2000	1735	1251	100%	17%	800	238	Normal Wet	116.7	371.4	488.2	170	Yes	323	715	0	89%	0%	11%	17%
45	2001	1065	795	100%	5%	800	70	Normal Dry	116.7	257.0	373.7	137	Yes	235	635	0	79%	0%	21%	5%
46	2002	1171	846	100%	8%	800	112	Normal Dry	116.7	257.0	373.7	117	Yes	257	655	0	82%	0%	18%	8%
47	2003	1450	1058	100%	8%	800	112	Normal Dry	116.7	257.0	373.7	129	Yes	244	668	0	84%	0%	16%	8%
48	2004	1131	736	100%	18%	800	252	Normal Dry	116.7	257.0	373.7	132	Yes	240	800	12	100%	1%	0%	17%
49	2005	2825	2081	100%	0%	800	0	Wet	116.7	564.7	681.4	684	Yes	242	558	0	70%	0%	30%	0%

TABLE 1

Predicted Impact to Water Supply based on NRDC's Proposed Restoration Releases

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Water Year	Annual SJR Runoff taf	Apr-Jul SJR Runoff taf	Historic Water Allocation		Historic Water Allocation taf		Classification for Hydrograph	NRDC Riparian Release taf	NRDC Restoration Releases taf	Total Restoration and Riparian Release taf	Historic SJR Release taf	Impact to Water Allocation	Water Supply Impact taf	Total Water Amount of Allocation Reduced (taf)		New Water Allocation		Difference in Water Allocation by %	
			Class 1	Class 2	Class 1	Class 2								Class 1	Class 2	Class 1	Class 2	Class 1	Class 2
Total	88838	60941			37320	25325		5720	16062	21782	21797		10943	33804	17898				
Average	1813	1244	95%	37%	762	517		117	328	445	445		223	690	365	86%	26%	9%	11%
Min	361	262	25%	0%	200	0		117	71	187	48		18	129	0	16%	0%	0%	0%
Max	4642	2898	100%	100%	800	1401		117	565	681	3150		433	800	1384	100%	99%	32%	31%

Note:

1 Water Year - From October 1 thru September 30

2 Annual San Joaquin River Runoff from October 1 thru September 30

3 San Joaquin River Basin April-July Natural River Runoff

4 Reclamation Historic Records - Class 1 Water Allocation (%)

5 Reclamation Historic Records - Class 2 Water Allocation (%)

6 Reclamation Historic Water Allocation based on Class 1 Contractual amount (taf)

7 Reclamation Historic Water Allocation based on Class 2 Contractual amount (taf)

8 Classification is bases on the Hydrograph from Expert Report of Kenneth W. Kirby , Ph.D (Exhibit page 27, foot note 24)

9 NRDC Riparian Release is based on Expert Report of Kenneth W. Kirby , Ph.D (Exhibit page 27)

10 NRDC Restoration Release is based on Expert Report of Kenneth W. Kirby , Ph.D (Exhibit page 27)

11 Total Restoration and Riparian Release (Col 9+ Col 10)

12 Historic San Joaquin River Releases: A.) 1957-1974 date obtained from USGS station 11251000, San Joaquin River below Friant. B.) 1975 - 2005 based on US Bureau of Reclamation, Mid-Pacific Region, Central Valley Operations (CVO) Records

13 Impact to Water Allocation

14 Water Supply Impact based on NRDC Restoration Releases (Col 10) or monthly analysis table 4

15 Total Water Allocation Class 1 reduced: If (Col 14 greater then Col 7, then 800 taf - (Col 14 - Col 7), Col 6)

16 Total Water Allocation Class 2 reduced: If (Col 7 = 0, then 0, if(Col 14 < Col 7, then Col 7 - Col 14, 0))

17 New Water Allocation for Class 1 by percentage: Col 15 /800 taf (Class 1 Total Contractual amount)

18 New Water Allocation for Class 2 by percentage: Col 16 /1400 taf (Class 2 Total Contractual amount)

19 Difference between original allocation (%) vs reduced allocation (%) for Class 1 (Col 4 - Col 17)

20 Difference between original allocation (%) vs reduced allocation (%) for Class 2 (Col 5 - Col 18)

A.) Thousand Acre Feet (taf)

B.) Values are rounded to the nearest thousandth

Table Range

Classification		Range (taf)		Difference	Years
Wet	Annual SJR Runoff	4642	2761	1881	20
Normal Wet	Annual SJR Runoff	2672	1604	1068	30
Normal Dry	Annual SJR Runoff	1527	1027	500	30
Dry	Annual SJR Runoff	949	692	257	15
Critical Dry	Annual SJR Runoff	648	361	287	5

TABLE 2

Historic San Joaquin River Release

	Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total	Water Year type
1	1957	45	17	19	8	3	4	7	7	11	11	10	8	149	Normal Dry
2	1958	6	5	5	5	6	87	416	389	226	21	9	7	1180	Normal Wet
3	1959	5	4	3	3	3	4	7	8	10	12	12	8	79	Dry
4	1960	7	6	3	2	3	7	8	9	12	14	13	10	96	Dry
5	1961	8	4	11	9	3	7	9	10	10	11	10	7	100	Critical Dry
6	1962	6	5	4	4	7	4	5	6	9	10	9	6	75	Normal Wet
7	1963	6	5	4	4	3	4	3	5	26	9	9	5	83	Normal Wet
8	1964	5	3	3	3	4	5	6	7	8	10	10	7	70	Dry
9	1965	6	4	4	3	3	4	3	6	7	10	9	6	63	Normal Wet
10	1966	4	3	3	2	2	4	5	8	8	9	9	7	62	Normal Dry
11	1967	6	4	3	10	59	3	240	500	355	76	8	7	1269	Wet
12	1968	4	3	2	2	2	2	4	5	7	9	9	7	58	Dry
13	1969	5	3	2	79	394	474	262	467	460	52	6	4	2208	Wet
14	1970	3	2	3	13	30	5	4	5	5	6	6	4	87	Normal Dry
15	1971	4	3	2	2	3	3	3	3	6	7	7	6	48	Normal Dry
16	1972	4	2	2	2	3	5	7	6	8	10	9	7	68	Normal Dry
17	1973	6	3	4	3	59	23	119	9	37	9	8	6	285	Normal Wet
18	1974	5	3	2	33	10	4	26	10	21	9	8	6	136	Normal Wet
19	1975	4	2	2	2	2	2	3	6	6	7	7	5	48	Normal Wet
20	1976	5	4	3	4	3	7	7	11	10	10	10	8	82	Critical Dry
21	1977	6	5	6	4	5	7	9	8	10	12	12	9	93	Critical Dry
22	1978	8	7	5	2	98	290	419	332	156	8	6	6	1338	Wet
23	1979	6	3	4	17	15	6	6	11	7	7	7	6	96	Normal Wet
24	1980	6	5	4	122	199	237	103	138	23	89	10	8	944	Wet
25	1981	5	4	2	3	3	3	5	6	8	11	8	7	65	Normal Dry
26	1982	6	6	3	3	2	9	409	231	89	22	6	5	790	Wet
27	1983	4	92	228	223	281	437	466	380	527	311	81	119	3150	Wet
28	1984	73	76	133	241	22	5	13	6	8	9	8	7	601	Normal Wet
29	1985	6	3	2	2	2	3	7	8	9	10	9	8	67	Normal Dry
30	1986	7	4	3	3	201	416	288	17	32	10	8	7	997	Wet
31	1987	4	5	2	2	3	2	8	8	9	10	9	8	70	Dry
32	1988	7	4	4	3	4	7	6	8	9	12	11	9	84	Dry
33	1989	8	6	3	2	4	6	8	9	10	13	13	9	92	Dry
34	1990	8	7	6	3	5	7	10	12	12	14	14	11	107	Dry
35	1991	10	8	7	7	8	5	7	11	12	14	13	11	111	Normal Dry
36	1992	10	8	7	5	5	7	9	13	16	17	18	15	130	Dry
37	1993	13	8	7	3	2	26	72	57	64	42	18	15	327	Normal Wet
38	1994	10	7	6	7	7	10	10	11	13	17	16	15	128	Dry
39	1995	11	8	7	3	21	228	341	452	157	324	29	12	1592	Wet
40	1996	10	8	5	5	35	97	68	100	20	15	14	12	390	Normal Wet
41	1997	11	7	63	545	353	80	14	17	17	19	21	18	1165	Wet
42	1998	16	12	11	6	174	146	273	252	393	270	25	26	1603	Wet
43	1999	24	24	35	17	28	5	6	9	25	35	20	14	242	Normal Dry
44	2000	10	6	5	5	3	54	8	8	28	14	15	14	170	Normal Wet
45	2001	13	11	11	8	5	5	7	9	16	14	16	20	137	Normal Dry
46	2002	12	8	7	6	5	8	9	11	11	14	13	12	117	Normal Dry
47	2003	11	7	7	6	6	7	9	10	23	15	14	14	129	Normal Dry
48	2004	12	8	7	7	7	9	12	13	13	14	15	14	132	Normal Dry
49	2005	11	8	8	6	7	15	88	290	178	41	17	15	683	Wet
	Average	10	9	14	30	43	57	78	80	64	35	13	12		

Note: Data from 1957 thru 1974 obtained from USGS

Data from 1975 thru 2005 obtained from US Bureau, Central Valley Operation Historical Data

Units in Thousand Acre feet (taf)

TABLE 3

NRDC Restoration and Riparian Releases

	Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total	Water Year type
1	1957	23.0	26.0	22.0	22.0	19.0	62.0	85.0	23.0	22.0	23.0	23.0	22.0	372.00	Normal Dry
2	1958	22.0	26.0	22.0	22.0	19.0	62.0	193.0	25.0	24.0	25.0	25.0	24.0	489.00	Normal Wet
3	1959	22.0	26.0	22.0	22.0	19.0	62.0	21.0	22.0	21.0	22.0	22.0	21.0	302.00	Dry
4	1960	22.0	26.0	22.0	22.0	19.0	62.0	21.0	22.0	21.0	22.0	22.0	21.0	302.00	Dry
5	1961	10.0	11.0	7.0	7.0	6.0	62.0	12.0	13.0	13.0	16.0	16.0	15.0	188.00	Critical Dry
6	1962	22.0	26.0	22.0	22.0	19.0	62.0	193.0	25.0	24.0	25.0	25.0	24.0	489.00	Normal Wet
7	1963	22.0	26.0	22.0	22.0	19.0	62.0	193.0	25.0	24.0	25.0	25.0	24.0	489.00	Normal Wet
8	1964	22.0	26.0	22.0	22.0	19.0	62.0	21.0	22.0	21.0	22.0	22.0	21.0	302.00	Dry
9	1965	22.0	26.0	22.0	22.0	19.0	62.0	193.0	25.0	24.0	25.0	25.0	24.0	489.00	Normal Wet
10	1966	23.0	26.0	22.0	22.0	19.0	62.0	85.0	23.0	22.0	23.0	23.0	22.0	372.00	Normal Dry
11	1967	22.0	26.0	22.0	22.0	19.0	62.0	193.0	123.0	119.0	25.0	25.0	24.0	682.00	Wet
12	1968	22.0	26.0	22.0	22.0	19.0	62.0	21.0	22.0	21.0	22.0	22.0	21.0	302.00	Dry
13	1969	22.0	26.0	22.0	22.0	19.0	62.0	193.0	123.0	119.0	25.0	25.0	24.0	682.00	Wet
14	1970	23.0	26.0	22.0	22.0	19.0	62.0	85.0	23.0	22.0	23.0	23.0	22.0	372.00	Normal Dry
15	1971	23.0	26.0	22.0	22.0	19.0	62.0	85.0	23.0	22.0	23.0	23.0	22.0	372.00	Normal Dry
16	1972	23.0	26.0	22.0	22.0	19.0	62.0	85.0	23.0	22.0	23.0	23.0	22.0	372.00	Normal Dry
17	1973	22.0	26.0	22.0	22.0	19.0	62.0	193.0	25.0	24.0	25.0	25.0	24.0	489.00	Normal Wet
18	1974	22.0	26.0	22.0	22.0	19.0	62.0	193.0	25.0	24.0	25.0	25.0	24.0	489.00	Normal Wet
19	1975	22.0	26.0	22.0	22.0	19.0	62.0	193.0	25.0	24.0	25.0	25.0	24.0	489.00	Normal Wet
20	1976	10.0	11.0	7.0	7.0	6.0	62.0	12.0	13.0	13.0	16.0	16.0	15.0	188.00	Critical Dry
21	1977	10.0	11.0	7.0	7.0	6.0	62.0	12.0	13.0	13.0	16.0	16.0	15.0	188.00	Critical Dry
22	1978	22.0	26.0	22.0	22.0	19.0	62.0	193.0	123.0	119.0	25.0	25.0	24.0	682.00	Wet
23	1979	22.0	26.0	22.0	22.0	19.0	62.0	193.0	25.0	24.0	25.0	25.0	24.0	489.00	Normal Wet
24	1980	22.0	26.0	22.0	22.0	19.0	62.0	193.0	123.0	119.0	25.0	25.0	24.0	682.00	Wet
25	1981	23.0	26.0	22.0	22.0	19.0	62.0	85.0	23.0	22.0	23.0	23.0	22.0	372.00	Normal Dry
26	1982	22.0	26.0	22.0	22.0	19.0	62.0	193.0	123.0	119.0	25.0	25.0	24.0	682.00	Wet
27	1983	22.0	26.0	22.0	22.0	19.0	62.0	193.0	123.0	119.0	25.0	25.0	24.0	682.00	Wet
28	1984	22.0	26.0	22.0	22.0	19.0	62.0	193.0	25.0	24.0	25.0	25.0	24.0	489.00	Normal Wet
29	1985	23.0	26.0	22.0	22.0	19.0	62.0	85.0	23.0	22.0	23.0	23.0	22.0	372.00	Normal Dry
30	1986	22.0	26.0	22.0	22.0	19.0	62.0	193.0	123.0	119.0	25.0	25.0	24.0	682.00	Wet
31	1987	22.0	26.0	22.0	22.0	19.0	62.0	21.0	22.0	21.0	22.0	22.0	21.0	302.00	Dry
32	1988	22.0	26.0	22.0	22.0	19.0	62.0	21.0	22.0	21.0	22.0	22.0	21.0	302.00	Dry
33	1989	22.0	26.0	22.0	22.0	19.0	62.0	21.0	22.0	21.0	22.0	22.0	21.0	302.00	Dry
34	1990	22.0	26.0	22.0	22.0	19.0	62.0	21.0	22.0	21.0	22.0	22.0	21.0	302.00	Dry
35	1991	23.0	26.0	22.0	22.0	19.0	62.0	85.0	23.0	22.0	23.0	23.0	22.0	372.00	Normal Dry
36	1992	22.0	26.0	22.0	22.0	19.0	62.0	21.0	22.0	21.0	22.0	22.0	21.0	302.00	Dry
37	1993	22.0	26.0	22.0	22.0	19.0	62.0	193.0	25.0	24.0	25.0	25.0	24.0	489.00	Normal Wet
38	1994	22.0	26.0	22.0	22.0	19.0	62.0	21.0	22.0	21.0	22.0	22.0	21.0	302.00	Dry
39	1995	22.0	26.0	22.0	22.0	19.0	62.0	193.0	123.0	119.0	25.0	25.0	24.0	682.00	Wet
40	1996	22.0	26.0	22.0	22.0	19.0	62.0	193.0	25.0	24.0	25.0	25.0	24.0	489.00	Normal Wet
41	1997	22.0	26.0	22.0	22.0	19.0	62.0	193.0	123.0	119.0	25.0	25.0	24.0	682.00	Wet
42	1998	22.0	26.0	22.0	22.0	19.0	62.0	193.0	123.0	119.0	25.0	25.0	24.0	682.00	Wet
43	1999	23.0	26.0	22.0	22.0	19.0	62.0	85.0	23.0	22.0	23.0	23.0	22.0	372.00	Normal Dry
44	2000	22.0	26.0	22.0	22.0	19.0	62.0	193.0	25.0	24.0	25.0	25.0	24.0	489.00	Normal Wet
45	2001	23.0	26.0	22.0	22.0	19.0	62.0	85.0	23.0	22.0	23.0	23.0	22.0	372.00	Normal Dry
46	2002	23.0	26.0	22.0	22.0	19.0	62.0	85.0	23.0	22.0	23.0	23.0	22.0	372.00	Normal Dry
47	2003	23.0	26.0	22.0	22.0	19.0	62.0	85.0	23.0	22.0	23.0	23.0	22.0	372.00	Normal Dry
48	2004	23.0	26.0	22.0	22.0	19.0	62.0	85.0	23.0	22.0	23.0	23.0	22.0	372.00	Normal Dry
49	2005	22.0	26.0	22.0	22.0	19.0	62.0	193.0	123.0	119.0	25.0	25.0	24.0	682.00	Wet
	Average	22	25	21	21	18	62	118	45	44	23	23	22		

Note: Units in Thousand Acre feet (taf)

TABLE 4

Impact to Water Supply

	Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total	Water Year type
1	1957	0.0	9.0	3.5	13.8	15.8	58.4	77.7	16.1	10.8	12.1	13.4	14.4	244.88	Normal Dry
2	1958	16.3	21.5	16.9	16.9	13.2	0.0	0.0	0.0	0.0	4.3	15.8	17.1	121.95	Normal Wet
3	1959	16.7	21.5	19.0	18.9	15.9	58.1	13.5	14.3	11.3	10.1	10.1	13.0	222.53	Dry
4	1960	15.1	19.8	18.6	20.1	15.8	54.6	13.0	12.6	8.9	8.3	8.8	10.6	206.33	Dry
5	1961	2.1	6.9	0.0	0.0	2.6	55.0	3.0	3.1	3.2	4.9	5.9	8.0	94.59	Critical Dry
6	1962	16.3	21.3	18.2	18.4	11.6	58.1	187.9	18.7	15.0	15.0	15.9	17.5	413.88	Normal Wet
7	1963	16.5	21.3	18.0	18.3	16.2	57.5	189.7	19.9	0.0	16.0	16.3	18.5	408.30	Normal Wet
8	1964	17.4	22.5	18.9	18.8	15.3	57.5	15.3	14.7	13.4	12.1	11.8	13.9	231.60	Dry
9	1965	15.8	22.0	18.2	19.0	16.4	58.3	189.7	19.2	16.9	15.4	16.3	18.4	425.69	Normal Wet
10	1966	18.8	22.8	19.1	20.2	17.1	58.3	80.0	15.5	14.5	14.3	13.8	15.4	309.61	Normal Dry
11	1967	16.4	22.0	19.5	12.3	0.0	58.8	0.0	0.0	0.0	0.0	17.1	17.3	163.39	Wet
12	1968	17.8	22.9	19.8	19.6	16.6	60.0	16.6	17.1	13.7	12.9	13.1	14.2	244.31	Dry
13	1969	17.3	22.6	19.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.9	20.0	98.49	Wet
14	1970	20.1	23.6	19.0	8.8	0.0	56.7	81.4	17.7	17.3	16.8	17.4	17.7	296.49	Normal Dry
15	1971	19.3	22.8	20.0	19.7	16.4	59.3	82.4	20.3	15.6	15.8	15.8	16.1	323.57	Normal Dry
16	1972	18.6	23.8	19.8	19.7	16.2	56.8	77.9	16.5	13.7	12.6	13.8	14.6	303.89	Normal Dry
17	1973	15.9	22.6	18.5	19.2	0.0	39.2	74.2	16.0	0.0	16.3	17.0	18.1	256.87	Normal Wet
18	1974	17.2	23.0	19.8	0.0	9.3	57.9	167.0	15.0	2.5	16.0	17.2	18.4	363.37	Normal Wet
19	1975	17.6	23.8	20.0	19.9	17.0	60.1	190.2	18.9	17.8	18.0	18.2	19.3	440.66	Normal Wet
20	1976	4.7	6.9	3.9	3.2	3.0	55.4	4.9	2.5	2.7	5.5	6.2	7.1	106.09	Critical Dry
21	1977	3.9	6.1	1.1	2.7	1.4	55.1	2.9	5.1	2.6	4.2	4.1	6.1	95.29	Critical Dry
22	1978	14.2	19.3	16.9	19.6	0.0	0.0	0.0	0.0	0.0	16.8	19.0	18.5	124.30	Wet
23	1979	15.9	22.7	18.4	5.2	3.7	55.8	187.0	13.6	16.6	17.7	18.4	18.0	393.00	Normal Wet
24	1980	16.2	21.2	18.0	0.0	0.0	0.0	89.8	0.0	96.1	0.0	14.5	15.8	271.70	Wet
25	1981	18.2	21.7	19.8	18.9	16.4	59.5	80.1	16.8	14.3	12.0	14.5	14.5	306.84	Normal Dry
26	1982	15.8	20.5	18.6	19.3	17.0	53.4	0.0	0.0	30.4	2.6	18.9	19.4	215.87	Wet
27	1983	17.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.84	Wet
28	1984	0.0	0.0	0.0	0.0	0.0	57.0	180.3	18.8	16.3	15.8	16.6	17.1	321.89	Normal Wet
29	1985	17.4	22.9	20.2	20.1	17.3	59.2	78.4	15.0	12.9	13.1	14.3	14.2	305.00	Normal Dry
30	1986	15.4	21.9	18.7	18.5	0.0	0.0	0.0	105.8	87.2	15.4	16.6	16.6	316.25	Wet
31	1987	17.8	21.5	19.6	19.8	16.5	59.9	13.1	14.0	12.4	11.8	12.8	13.2	232.26	Dry
32	1988	14.9	22.0	18.3	18.9	15.4	55.3	15.0	14.0	11.6	10.4	10.7	11.9	218.36	Dry
33	1989	13.7	19.9	18.5	19.8	14.9	56.3	13.3	13.0	10.7	9.4	9.4	11.5	210.40	Dry
34	1990	14.1	19.5	15.7	18.7	14.5	54.9	11.1	10.4	9.1	8.0	8.3	10.2	194.52	Dry
35	1991	13.5	18.1	15.2	15.3	11.0	57.2	77.6	12.4	10.1	9.4	10.1	11.4	261.34	Normal Dry
36	1992	12.0	18.4	15.3	16.7	14.5	55.3	11.8	8.9	4.5	5.2	4.2	5.6	172.42	Dry
37	1993	9.1	18.2	14.7	19.0	17.0	35.5	120.8	0.0	0.0	0.0	6.9	8.7	250.04	Normal Wet
38	1994	11.7	18.5	15.6	15.2	12.4	52.5	11.0	11.5	8.0	5.4	5.6	6.2	173.52	Dry
39	1995	10.9	17.6	15.2	19.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.2	75.02	Wet
40	1996	11.7	17.6	16.6	17.3	0.0	0.0	124.8	0.0	3.7	10.4	11.1	11.7	224.93	Normal Wet
41	1997	11.3	19.3	0.0	0.0	0.0	0.0	179.1	105.6	101.7	6.4	4.4	5.7	433.38	Wet
42	1998	6.3	13.8	11.2	15.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.18	Wet
43	1999	0.0	1.6	0.0	4.9	0.0	56.9	79.1	13.8	0.0	0.0	3.4	8.2	167.93	Normal Dry
44	2000	12.4	20.0	16.8	16.7	16.1	8.1	185.0	17.2	0.0	10.9	10.1	9.5	322.88	Normal Wet
45	2001	10.5	15.0	11.1	13.7	13.6	56.5	77.8	13.6	6.0	9.1	6.7	1.9	235.50	Normal Dry
46	2002	10.9	18.2	14.7	16.3	13.7	54.4	75.5	12.2	10.8	8.8	10.2	9.6	255.27	Normal Dry
47	2003	12.3	18.6	15.3	15.6	13.3	55.0	76.3	13.1	0.0	7.6	9.1	7.9	244.07	Normal Dry
48	2004	10.6	18.0	14.9	15.1	12.3	52.6	73.3	9.8	8.6	8.9	7.9	8.4	240.38	Normal Dry
49	2005	11.4	18.0	14.5	15.9	12.2	46.7	105.4	0.0	0.0	0.0	8.3	9.4	241.67	Wet
	Average	13	18	15	14	10	43	68	14	13	9	11	13		

Note: Units in Thousand Acre feet (taf)