

APPENDIX B

METHODOLOGY AND ASSUMPTIONS USED TO ASSESS 2030 DEMAND

This Appendix B describes the methodology and assumptions used by the Water Forum for assessing water demands to the year 2030.

As a technical reference, this appendix provides water demand information that includes all purveyors in Sacramento County, Placer County, and El Dorado County. However, it is important to note that the El Dorado Irrigation District and Georgetown Divide Public Utility District have remaining issues that could not be resolved in time for inclusion in the Water Forum Agreement.

SACRAMENTO COUNTY WATER DEMAND PROJECTIONS

METHOD AND DATA

To estimate current water demands and projections of future water demands for Sacramento County, Boyle Engineering Corp. used a forecasting method known as the land-use method, which is a standard model in the water industry. The objective of this method is to forecast future water demands based on how land is expected to be used and how much water is required by projected land use types. The model is:

$$\text{Water Demand} = (\text{Land use acreage}) \times (\text{Water Demand Factor}) \times (\text{Weather Normalization Factor}) \times (\text{Conservation Factors})$$

The resulting water demands are based on three things: (1) the number of acres in Sacramento County in land use types; (2) the amount of water which is used on an acre for a given land use type; and, (3) adjustments for weather and for water conservation. Each of these factors will be briefly explained in the following paragraphs.

The Water Forum based its water demand projections on those presented in a report entitled *The Estimate of Annual Water Demand within the Sacramento Metropolitan Area*, by Boyle Engineering Corp. (May 1995). Some of these projections were adjusted by recent demand data for specific water purveyors.

LAND USE ACREAGE (acres by land use type):

Estimates of current water demand and projections of future water demands were developed based on the distribution of current land uses and a projection of future land uses. Current land use types were determined from the current Assessor's parcel information. Future land uses were based on the Sacramento County General Plan, adopted December 15, 1993, which incorporated

the latest General Plans for the cities of Folsom, Galt and Sacramento. The General Plan process uses State of California county population forecasts to determine the future need for certain types of land use. For example, when population growth is anticipated the need for future housing may necessitate the conversion of agricultural to urban land uses.

The goal was to forecast the future amount of acres in each land type. The types of land use analyzed include such categories as single family homes, multi-family, commercial, industrial, rural estates and parks. Another significant land use is agriculture/irrigated agriculture. The water forecast to be used per acre is dependent on these land use characteristics.

The amount of acres by land use type for Sacramento County was forecast for two future time periods known as "buildout" and "ultimate buildout" (buildout refers to the completion of development anticipated in the General Plans). Estimates for the "buildout" of the General Plans represent the distribution of land uses projected at the end of the current planning periods of the cities of Folsom, Galt and Sacramento and the Sacramento County General Plans. Estimates of "ultimate buildout" project land uses beyond the 20-year planning horizon of the General Plans. The latter takes into consideration the identification of future growth centers in Sacramento County and the likely conversion of agricultural land to urban land uses. The population estimates for Sacramento County (see Figure 1) correspond roughly to both the buildout and ultimate buildout time periods.

WATER DEMAND FACTOR (acre-feet per acre):

Each land use type, urban and agricultural, is estimated to use a different amount of water depending on the type of land use. For example, for urban land, an acre of multi-family units may have a higher water use than an acre of single family units. Likewise, agricultural and park/recreation acres that are irrigated use more water than those that are not. The demand factors used for the 1990 base year were adjusted for "buildout" and "ultimate buildout" with normalization and conservation factors. Current demand factors were utilized in developing projections of future urban demands, i.e., similar water use was assumed. This information is contained in the previously mentioned Boyle Engineering Report entitled *The Estimate of Annual Water Demand within the Sacramento Metropolitan Area*. Excerpts from that Report are attached which indicate the aggregated demand factors for the water purveyors and other specified areas contained in the Report (see Tables 1 and 2). A copy of that Report is available for review in the Sacramento City-County Office of Metropolitan Water Planning.

For agricultural land, the types of crops grown are key determinants of its water requirement. The water demand factors were derived from the CA Department of Water Resources studies and historical usage data from Sacramento County water purveyors. Current demand factors were utilized in development in projections of future agricultural demands (i.e., current patterns of crop distribution are assumed for the buildout and ultimate buildout periods).

WEATHER NORMALIZATION FACTOR (percentage change in overall water demands):

To adjust for weather differences from year to year, a normalization procedure was applied. A normalization factor of 10% above the determined total water demand projection at ultimate buildout was applied to estimate the range of water demands that may be experienced. This range

reflects maximum demand water years and minimum demand water year, which equate to normal and wet/drought precipitation years, respectively. The percentages were based on a Boyle Engineering analysis of water demands for the City of Sacramento in 1990, both a drought year and the base year for the study.

WATER CONSERVATION FACTOR (percentage reduction in overall water demands): The Boyle report estimated the anticipated reduction in urban water demands due to specific water conservation measures. These were primarily limited to those considered to be the most cost-effective BMPs which could be implemented in Sacramento County in 1990. However, the Water Forum Agreement contains an expanded list of conservation measures, which includes residential water metering. The overall reduction in urban water demands of 25.6% is based on the ultimate implementation of all water conservation measures known as Best Management Practices (BMPs) by the year 2030 (see Table 3). The BMPs, developed by the California Urban Water Conservation Council and the CA Department of Water Resources, are used by the water purveyors statewide. Agricultural water conservation is expected to account for reductions in water use of 5% due to an improvement in irrigation efficiencies. Specifics on the agricultural water conservation program will be negotiated by the Water Forum Successor Effort.

EQUATION OF LAND USE DEMAND PROJECTIONS TO YEAR 2030

A. 1ST STEP - Conversion of land use projections to population.

A methodology was developed in order to equate these land use based buildout and ultimate buildout water projections to population equivalents at specific years. Sacramento area population projections were based on California Department of Finance (DOF) decennial period projections prepared in 1990. Based upon this methodology, the buildout of the policy area of the Sacramento County, and cities of Sacramento, Folsom and Galt General Plans equated to the population projected for the year 2024 (see Figure 1 and Table 1). The ultimate buildout equated to a population considerably beyond the year 2030 based upon DOF projections (see Figure 1 and Table 2).

B. 2ND STEP - Conversion from population estimates to year 2030.

The estimate of total, urban and agricultural demand projections for the year 2030 was developed by utilizing population projections at the buildout of the general plans, projections by DOF at the year 2030, and at ultimate buildout. Water demand projections for the year 2030 were determined by interpolating between the demand projections for the buildout of the policy area (for the Sacramento County and cities of Sacramento, Folsom and Galt General Plans) and ultimate buildout. California Department of Finance population projections were used as the basis of the interpolation. Thus the year 2030 projections become population based, not land use based.

SACRAMENTO COUNTY AREA-WIDE WATER DEMAND PROJECTIONS

FIGURE 1
(All demand values are in units of acre-feet per year.)

Planning Period	Population	Urban Demand	Agricultural Demand	Total Demand
1990 Base Year	1,046,000	394,600	361,600	756,200
Buildout of the General Plans (partial BMP implementation)	1,939,000	667,500	289,400	957,000
Ultimate Buildout (partial BMP implementation)	2,678,000	765,300	262,900	1,028,200
Year 2030 (partial BMP implementation)	2,092,000	687,800	283,900	971,700
Year 2030 (all Water Forum BMPs implemented)	2,092,000	571,100	283,900	855,000

USE OF THIS DATA IN NEGOTIATIONS

The total projected water demand of 855,000 acre-feet per year for the year 2030 is an aggregate projection for the Sacramento county-wide area. This projection was taken into consideration by both the Surface Water and the Groundwater Negotiating Teams as they developed their respective elements of the Agreement.

FOOTHILLS (PLACER AND EL DORADO COUNTIES) WATER DEMAND PROJECTIONS

A. PLACER COUNTY

The water demand projections for the west slope of the Placer County area were based upon population projections made by Placer County Water Agency. Besides the Placer County Water Agency, the west slope area includes other water purveyors such as: City of Roseville; a portion of the San Juan Water District; and the City of Lincoln. Their population assumptions were based upon a constant 3.2% annual growth rate for this area between 1990 and 2030.

In order to project the water demand for this area for the year 2030, the Placer County Water Agency used an estimated water demand figure of 0.3408 acre-feet per capita per year. In 1990 their demands were 54,200 acre-feet and in 2030 they are projected to be 175,228 acre-feet.

B. EL DORADO COUNTY

The 1990 water use in the western slope of El Dorado County, which includes the El Dorado Irrigation District and the Georgetown Divide Public Utility District, was 44,066 acre feet of which 30,000 acre-feet was diverted from the American River. The El Dorado Irrigation District provides service to about 70% of the population of the western slope of El Dorado County. The Georgetown Divide Public Utility District serves much of the remainder of the western slope population.

The El Dorado County Water Agency, in its 1993 County Water Resources Development and Management Plan, projected the 2030 demands for the areas served by the El Dorado Irrigation District and the Georgetown Divide Public Utility District to be 82,090 acre-feet. That plan projected that 67,100 acre-feet of water would be diverted from the American River.

TABLE 1

**SACRAMENTO COUNTY-WIDE
WATER DEMAND ANALYSIS SYSTEM
BUILDOUT AREA DEMANDS SUMMARY**
(Equated to the population projected to the year 2024)

Sacramento CCOMWP
Water Demand Analysis System
BUILDOUT AREA DEMANDS SUMMARY

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Group	Area Name	Area (acres)	Demand Factor (ac-ft/ac)	Total Demand (ac-ft)
Normalization Factor = 10.0% Conservation Factor = 8.0% Agricultural Efficiencies = 4.0%				
URBAN WATER DISTRICTS	Arcade WD	9,833.7	2.87	28,195.1
	Arden Cordova WS	7,080.2	2.66	18,845.0
	Carmichael WD	5,467.9	2.45	13,385.9
	Citizens Utilities CC	24,195.7	2.89	69,933.3
	Citrus Heights ID	8,029.4	2.50	20,083.3
	Del Paso Manor WD	613.9	3.13	1,919.6
	Elk Grove WW	8,240.4	2.43	20,000.5
	Fair Oaks WD	6,522.8	2.63	17,158.8
	Florin County WD	1,454.1	1.76	2,565.1
	City of Folsom	19,173.2	2.02	38,661.4
	Fruitridge Vista WD	1,913.1	2.86	5,477.0
	City of Galt	3,376.2	2.59	8,742.9
	Northridge WD	9,240.4	2.51	23,164.2
	Orange Vale WC	3,126.2	2.62	8,205.2
	Rancho Murieta CSD	3,544.8	2.44	8,643.4
	Rio Linda WD	11,359.3	1.78	20,178.1
	Sacramento County WMD	9,553.9	2.40	22,911.8
San Juan Suburban WD	2,740.1	2.08	5,700.7	
Tokay Park WC	57.1	2.56	146.0	
TOTAL GROUP	135,522.4	2.46	333,917.1	
AGRICULTURAL DISTRICT	Clay WD	7,067.4	2.19	15,479.2
	Galt ID	33,264.5	2.10	69,724.8
	Natomas Central MWC	19,938.3	2.56	51,063.5
	Omochumne-Hartnell WD	29,504.4	1.50	44,124.9
	TOTAL GROUP	89,774.6	2.01	180,392.3
UNORGANIZED AREAS	Zone 40 Expansion	26,027.4	1.73	45,027.1
	Sunrise A	18,985.7	1.53	29,099.4
	Sunrise B	11,521.5	1.95	22,460.1
	Southwest	33,585.5	2.39	80,220.5
	OFSCU	15,427.7	1.36	20,966.6
	Eastern Foothills	112,819.9	0.05	5,120.1
	TOTAL GROUP	218,367.7	0.93	202,893.7
OTHER AREAS	American River Parkway	4,616.4	0.02	72.4
	Folsom Lake and Prison	2,580.6	0.68	1,753.3
	McClellan AFB	2,601.9	0.71	1,850.8
	North Ridge CC	149.8	3.24	485.3
	Miscellaneous A	223.4	0.39	86.7
	Miscellaneous B	109.9	3.25	356.9
	Rancho Seco	2,131.1	21.28	45,341.7
	Sacramento Metro Air	5,430.9	1.17	6,349.9
TOTAL GROUP	17,844.0	3.15	56,297.0	
CITY	City	63,113.8	2.91	183,509.1
	TOTAL GROUP	63,113.8	2.91	183,509.1
TOTAL COUNTY		524,622.5	1.82	957,009.2

Note: Total Demand includes Non-Agriculture System Losses
Boyle Engineering Corporation (ctydem2)

NOTE: These demand estimates in the above table were developed before the Water Forum negotiated a full implementation of BMPs as a part of the *Water Forum Agreement*.

TABLE 2

**SACRAMENTO COUNTY-WIDE
WATER DEMAND ANALYSIS SYSTEM
ULTIMATE BUILDOUT AREA DEMANDS SUMMARY**
(Equated to the population projected considerably beyond year 2030)

Sacramento CCOMWP
Water Demand Analysis System
ULTIMATE BUILDOUT AREA DEMANDS SUMMARY

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Group	Area Name	Area (acres)	Demand Factor (ac-ft/ac)	Total Demand (ac-ft)
Normalization Factor = 10.0% Conservation Factor = 11.9% Agricultural Efficiencies = 5.0%				
URBAN WATER DISTRICTS	Arcade WD	9,833.8	2.82	27,718.7
	Arden Cordova WS	7,080.2	2.74	19,382.8
	Carmichael WD	5,467.9	2.35	12,840.2
	Citizens Utilities CC	24,195.9	3.10	75,085.1
	Citrus Heights ID	8,029.4	2.49	19,988.8
	Del Paso Manor WD	613.9	3.00	1,841.2
	Elk Grove WW	8,240.3	2.59	21,317.6
	Fair Oaks WD	6,522.8	2.53	16,515.2
	Florin County WD	1,454.0	1.87	2,724.6
	City of Folsom	19,173.2	2.10	40,196.3
	Fruitridge Vista WD	1,913.1	2.93	5,611.4
	City of Galt	3,376.2	2.53	8,537.2
	Northridge WD	9,240.3	2.42	22,362.6
	Orange Vale WC	3,126.2	2.52	7,885.2
	Rancho Murietta CSD	3,544.8	2.35	8,332.5
	Rio Linda WD	11,359.5	2.56	29,026.4
	Sacramento County WMD	9,554.0	2.42	23,110.4
	San Juan Suburban WD	2,739.9	2.62	7,185.6
	Tokay Park WC	57.1	2.46	140.2
	TOTAL GROUP	135,522.5	2.58	349,882.1
AGRICULTURAL DISTRICT	Clay WD	7,067.4	2.17	15,329.3
	Galt ID	33,264.5	2.07	68,990.6
	Natomas Central MWC	19,938.1	2.58	51,423.4
	Orochumne-Hartnell WD	29,504.5	1.63	48,058.7
	TOTAL GROUP	89,774.5	2.05	183,802.0
UNORGANIZED AREAS	Zone 40 Expansion	26,027.3	2.19	57,129.5
	Sunrise A	18,985.7	2.48	47,110.4
	Sunrise B	11,521.6	2.48	28,605.9
	Southwest	33,585.1	2.36	79,359.8
	OFSCU	15,427.8	1.35	20,771.8
	Eastern Foothills	112,819.8	0.19	21,658.8
	TOTAL GROUP	218,367.3	1.17	254,636.3
OTHER AREAS	American River Parkway	4,616.4	0.02	69.8
	Folsom Lake and Prison	2,580.6	0.73	1,879.5
	McClellan AFB	2,601.9	0.69	1,791.5
	North Ridge CC	149.8	3.11	466.3
	Miscellaneous A	223.4	2.28	509.8
	Miscellaneous B	109.9	3.12	343.0
	Rancho Seco	2,131.1	20.44	43,562.5
	Sacramento Metro Air	5,430.9	1.25	6,808.5
	TOTAL GROUP	17,844.0	3.11	55,430.8
CITY	City	63,113.8	2.92	184,480.9
	TOTAL GROUP	63,113.8	2.92	184,480.9
TOTAL COUNTY		524,622.1	1.96	1,028,152.1

Note: Total Demand includes Non-Agriculture System Losses
Boyle Engineering Corporation (ctydem2)

NOTE: These demand estimates in the above table were developed before the Water Forum negotiated a full implementation of BMPs as a part of the *Water Forum Agreement*.

TABLE 3

DEMAND/CONSERVATION TEAM

IMPLEMENTATION OF SELECTED BMPs BY 2030

<u>BMP #</u>	<u>BMP NAME</u>	<u>% CONSERVATION</u>
1.	Single family & multi-family water audits	0.1%
2.	Indoor plumbing retrofit	0.4%
3.	Distrib. Sys. Water Audits/Leak Detection	4.5%
4. & 11.	Residential Metering of New Construction & Commodity Pricing	2.2%
4. & 11.	Residential Metering of Existing Unmetered Connections & Commodity Pricing	6.7%
5.	Large Landscape Water Audits	0.4%
6.	Landscape Req'ts-Comm/Inds/Public/MF	0.2%
12.	Water Efficient Landscaping/AB 325	7.4%
16.	Ultra Low Flush Toilet Replacement	3.7%
	TOTAL	25.6%

