Resource Management Strategy Documentation

Technical Documentation Memo
for select Resource Management Strategies'
quantitative ranges of water supply benefits

as presented in

California Water Plan Update 2009

This memo provides a summary of available documentation from DWR staff and Subject Matter Experts, to support and explain the numerical range presented for the eight future water supply projections that are in the Final CWP Update 2009.

The Strategy Summary Table is published in the CWP Update 2009 in
(1) page 18-19 of the Highlights document, and
(2) page 1-10 as Table 1-1 in CWP Volume 2.

CWP Update Volume 2 presents information for 27+ resource management strategies, and the eight with quantified water supply benefits are:

- Agricultural Water Use Efficiency (Net)
- Urban Water Use Efficiency (Applied)
- Conjunctive Management & Groundwater
- Desalination - Brackish & Seawater
- Precipitation Enhancement
- Recycled Municipal Water
- Surface Storage - CALFED
- Forest Management (Meadow Restoration)

There are additional strategies discussed in Volume 2 that are likely to generate additional water supply benefits where statewide quantification are not available. Chief among them is the strategy for Surface Storage - Regional/Local, which was not used due to the high degree of uncertainty about future projects and the lack of definitive feasibility studies available to estimate potential water supply.

In general, these projections of future year 2030 water supply capability should be viewed as rough estimates, based on the best available information with the expertise of available subject matter experts. The water supply benefits are not additive. Although presented individually, the resource management strategies are alternatives that can complement each other or compete for limited system capacity, funding, water supplies, or other components necessary for implementation. Assumptions, methods, data, and local conditions vary per strategy.

This limited use of simulation models illustrates the need for a common conceptual framework, data standards, and analytical approach to improve common understanding of water resources planning issues as described in Chapter 6 of Volume 1.

Available information is summarized in the identified chapters of CWP Update Volume 2 on Resource Management Strategies, and in most cases additional relevant reports are referenced in the chapter text.

Agricultural Water Use Efficiency (Net) : 0.1 to 1.0 MAF/year - Volume 2, Chapter 2. back to top

The text starting on page 2-13 of chapter 2 describes both CALFED and statewide potential water supply benefits and refers to specific estimates provided in Table 2-2, with a couple assumptions. In the Strategy Summary Table, the low and high ends of the range correspond to Table 2-2, Projection Level 1 and 500 (PL-1 and PL-500) using the irrecoverable flows only, equalling 34 TAF and 888 TAF respectively. This table is based on information obtained from Water Use Efficiency Comprehensive Evaluation and CALFED studies. An estimate of 94 TAF for lining the All American and Coachella Canals in the Imperial Valley is assumed (see page 2-14). DWR staff experts (and CALFED staff) did not have data for the North Coast hydrologic region and the Klamath River basin. Thus the total estimates were rounded up to 100 to 1,000 TAF. With the general assumption that some additional water supply benefits would be obtained from the Klamath Basin areas.

As an additional documentation note, the above Agricultural WUE has been discussed and calculated on a "net" use basis, but the Urban Water Use Efficiency estimates below were made on an "applied" water use basis. The estimation of net water savings is the reduction in the amount of water used that becomes available for other purposes, while maintaining or improving crop yield. Net water savings and applied water reduction is discussed in Box 2-1 and on page 2-5 in chapter 2.

Because urban water use does not have a similar high percentage of reuse, it is generally assumed that applied water is a more realistic measure of the amount of savings that can be achieved.

Urban Water Use Efficiency (Applied) : 1.2 to 3.1 MAF/year - Volume 2, Chapter 3. back to top

This water supply potential is discussed on pages 3-22 through 3-24 in CWP Update 2009, Volume 2, and the specific values for the Strategy Summary Table are stated on page 3-23. Most of this information was derived from CALFED urban conservation studies, as summarized in Table 3-1 and 3-2. For the low estimate of the range, the year 2030 level 1 projections total 1,153 TAF/year, which has been rounded to 1.2 MAF. For the high level estimate, the level 6 projections in Table 3-1 total 3,096 TAF/year, which has been rounded to 3.1 MAF.

This documentation in Volume 2 - Chapter 3 appears to provide adequate supporting information for the values presented in the CWP Strategy Summary Table.

Conjunctive Management & Groundwater Storage : 0.5 to 2.0 MAF/year - Volume 2, Chapter 8. back to top

Any projections that involve statewide future use of groundwater will (due to lack of specific data) involve significant estimates. The water supply projections of 0.5 to 2.0 MAF/year are specifically stated on page 8-21, along with a general discussion of potential benefits.

The footnote at the bottom of page 8-21 references six report sources that were used to develop this information.

DWR subject matter experts developed a supporting data table that lists these conjunctive management studies, the different hydrologic regions evaluated, and the resulting numerical estimates of (both minimum and maximum) increases in water supplies. From this table, the minimum potential totals 646 TAF, and the maximum water supply potential totals 2,332 TAF. Due to the large degree of uncertainty in future projections, the subject matter experts chose to be conservative and round these values downward to the nearest half million acre-feet. As such, 646 TAF was summarized as 0.5 maf for the lower range value, and 2,332 TAF was summarized as 2.0 maf for the high value of future water supply potential.

Ocean & Brackish Desalination : 0.3 to 0.4 MAF/year - Volume 2, Chapter 9. back to top

The statewide desalination projections are not specifically stated within the text of chapter 9. The text on pages 9-7 through 9-10 provides a discussion of planned and proposed desalination projects and refers to Table 9-1 on page 9-10.

In Table 9-1, the right-side column summarizes information for desalination plants in the "planned and projected stages" of development, and this data is a combination of a separate background data table, given below. The former (planned) are plants for which reconnaissance or feasibility level planning studies have been prepared or are in preparation at the time of CWP Update publication. The latter (projected) are plants that are only at a conceptual level of development or have been discussed. The low estimate of 220,500 AF/year was rounded upward to 0.3 MAF/year and based on the assumption that only those plants in the "planning stage" are constructed.

	Operation		**Design and Construction**		**Planned**		**Projected**	
	No.	*Capacity*	*No.*	*Capacity*	*No.*	*Capacity*	*No.*	*Capacity*
Groundwater	20	82200	4	30000	3	30900	0	26400
Seawater	6	1700	3	50800	9	189600	4	67400
TOTAL	**26**	**83900**	**7**	**80800**	**12**	**220500**	**4**	**93800**

From Table 9-1on pg. 9-10, the high estimate of 0.4 MAF/year can be obtained by adding the 81 TAF/year under construction with the combined 314 TAF/year total for planned and projected. The resulting value of 395 TAF was rounded up to obtain the 0.4 MAF/year value.

The supporting documentation and tables were compiled and summarized by DWR subject matter experts, and they can provide additional detailed information if needed.

Precipitation Enhancement: 0.3 to 0.4 MAF/year - Volume 2, Chapter 10. back to top

The water supply projections of 0.3 to 0.4 are specifically stated on page 10-9, following the discussion of existing programs starting on page 10-6. This estimate is a general projection based on the potential viability of California watersheds that are not currently cloud-seeded, compared with the estimated water yield from existing cloud seeding programs in 14 watersheds (shown in Figure 10-1). The staff analysis was conducted by DWR's chief hydrologist. This internal memo contains a table listing 10 watersheds with estimates of potential additional runoff that totaled 383 TAF/year. Due to the high degree of variability in the assumptions, this total value was summarized as the range of 300 to 400 TAF/year (or as 0.3 to 0.4 MAF/year).

Recycled Municipal Water: 1.8 to 2.3 MAF/year - Volume 2, Chapter 11. back to top

The water supply projections of 1.85 to 2.25 MAF/year are specifically stated on page 11-9 in CWP Volume 2, and shown in Figure 11-3. On page 11-10, a general discussion of potential benefits is given. The reference source for these values is clearly identified in the text and reference section as the Recycling Water Task Force 2003 report "Water Recycling 2030".

Water recycling potential is discussed on pages 12-14 of Water Recycling 2030 with a table and graph on page 12-14.

Surface Storage - CALFED: 0.1 to 1.1 MAF/year - Volume 2, Chapter 12. back to top

Estimates of the CALFED Surface Storage projects' water supply benefits are shown in the CALFED Surface Storage Initial Alternatives Benefit Summary, Table 12-1. The CALFED initial alternatives cost in millions is shown in Table 12-4 on page 12-12. The minimum water supply benefit assumes implementation of just one project; Shasta Lake, In-Delta Storage, or Los Vaqueros Expansion. Each of these projects has a number of scenarios that produced a water supply benefit of about **0.1 MAF**.

The maximum water supply benefit assumes implementation of all five projects, each with maximum water supply benefits. The maximum water supply benefit scenario from each project is:

- Shasta Lake Water Resources Investigation (SLWRI), 91 TAF
- North-of-the-Delta Offstream Storage (NODOS), 622 TAF
- In-Delta Storage Project (IDSP), 107 TAF
- Los Vaqueros Reservoir Expansion (LVE), 104 TAF
- Upper San Joaquin River Basin Storage Investigation (USJRBSI), 158 TAF

The total, maximum water supply benefit from all five projects is **1.1 MAF**.

A number of additional benefits that are not typically measured in terms of water supply are also shown Table 12-1 and discussed on page 12-9 and in Box 12-2, Analysis of CALFED Surface Storage Benefits. Additional information can be found at http://www.water.ca.gov/storage/.

Forest Management (Meadow Restoration): 0.1 - 0.5 MAF/year - Volume 2, Chapter 23. back to top

Almost all forest management in California can affect water quantity and quality. However, the potential water supply benefit has been quantified for the meadow restoration and groundwater storage component only. The meadow restoration discussion begins on page 23-11 of Chapter 23, Volume 2.

Like dams, meadow restoration does not create "new" water, but alters the temporal distribution of streamflow so that less water flows downstream during peak runoff periods in the winter and spring when water is not in high demand and more is released during the summer low-flow season when demand is great. Based on data on the proportion of eroded meadows and the depth of gullies in eroded meadows (Wood, 1975), specific yield of meadow alluvium (Wood, 1975; Loheide and Gorelick, 2007) and unpublished USDA Forest Service data on the extent of wet meadows, meadow restoration in the Sierra Nevada could increase the amount of groundwater stored in meadows by 50,000 to 500,000 AF annually (the volume of stored groundwater is computed as the product of total eroded meadow area, average depth of erosion, and estimated specific yield). The wide range in these estimates results from uncertainties in channel depths and specific yields of meadow alluvium.

The low end of the range, 50,000 AF/year was rounded up to 0.1 MAF/year, giving a range of 0.1-0.5 MAF/year. The studies were conducted by subject matter experts who can provide additional detailed information if needed.