

Section III: Description of Quantity of Water Uses

Water year 2011-2012 is chosen as the representative year for this plan (Table 23), because SWP allocation in 2012 was 65% (which is close to long term expected SWP reliability). For planning purposes, data starts in November 2011 and ends October 2012 (to include a full year of historic data). This “water year” will be the basis to reference the water supplies and water uses that define the water budget in the sections that follow.

Table 23. Representative Year	
	Description
Representative year(s) based upon	2011-2012
First month of representative year	November 2011
Last month of representative year	October 2012

A. Agriculture Water Use

Table 24 illustrates the annual agricultural water use in the District. The District relies only on surface water sources.

Table 24. Annual Agricultural Water Use (AF)						
Source	Rep. Year 2012					
		2013	2014	2015		
Agricultural Water Supplier Delivered						
Surface Water	88,617	94,829	80,307	82,000		
Groundwater	0	0	0			
Other (define)	0	0	0			
Subtotal	88,617	94,829	80,307			
Other Water Supplies Used						
Surface Water	0	0	0			
Groundwater	0	0	0			
Other (define)	0	0	0			
Subtotal	0	0	0			
Total	88,617	94,829	80,307			

Table 25 illustrates the estimated crop water needs in the District for the representative year 2012. Table 26 complement and summarize the crop water use in the District.

Table 25. Agricultural Crop Water Needs for 2012

Crop	Area (acres)	Crop Evapotranspiration Etc (in) (Representative Year 2012)												Total Crop Etc (in)
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Other row crops	75				1.40	1.65	4.98	8.49	8.02	5.23	1.06			30.83
Almonds	7,335		2.39	3.22	4.08	6.60	6.45	6.51	6.55	3.95	1.93			41.67
Carrots	0	1.98	2.65	4.30	5.78	1.81				1.21	0.82	1.59	1.18	0.00
Figs	520			3.02	3.50	6.55	6.97	7.09	6.26	4.58	1.81			39.77
Grapes	640			2.57	1.84	4.24	6.11	6.25	4.86	2.78				28.65
Pistachios	13,685				1.73	2.72	6.28	8.42	7.68	5.33	2.36			34.53
Pomegranates	9,660	2.11	3.08	4.76	4.75	5.60	5.86	5.79	5.27	3.76	2.54	1.56	1.05	46.12
Safflower	0		2.40	3.24	5.56	9.00	7.68	0.69						0.00
Totals	31,915													

Salinity of Irrigation Water EC_{iw} = 0.5 dS/m = mmhos/cm

Crop	Area (acres)	Total Crop Etc (ac-ft/ac)	Threshold Salinity EC _e (mmhos/cm)	Leaching Fraction LF	Leaching Reqmnt LR (ac-ft/ac)	Effective Precip'n Pe (ac-ft/ac)	Total Crop Water Needs (ac-ft/ac)	Total Crop Water Needs (ac-ft)
Other row crops	75	2.57	1.0	0.11	0.29	0.25	2.61	196
Almonds	7,335	3.47	1.5	0.07	0.25	0.25	3.47	25,483
Carrots	0	0.00	2.5	0.04	0.00	0.25	0.00	0
Figs	520	3.31	2.7	0.04	0.13	0.25	3.20	1,662
Grapes	640	2.39	1.5	0.07	0.17	0.25	2.31	1,479
Pistachios	13,685	2.88	2.7	0.04	0.11	0.25	2.74	37,518
Pomegranates	9,660	3.84	2.7	0.04	0.15	0.25	3.75	36,179
Safflower	0	0.00	4.8	0.02	0.00	0.25	0.00	0
Totals	31,915						Totals:	102,516

Assumptions:

- Representative crop for other row crops: Cotton
- Pomegranates are comparable to citrus (3)
- Figs are considered miscellaneous deciduous or subtropical trees (1)
- Crop ET and reference ET obtained from (1), Zone 15 for Dry Year 1999. Kc values were derived and applied to reference ET to obtain crop ET for year 2012
- All crops are assumed surface irrigated. Needs to be adjusted for sprinkler, drip/micro, and subsurface drip irrigation as needed (1)
- Leaching requirement developed from (4) to maintain 100% yield potential
- Reference Evapotranspiration and Rainfall data collected by CIMIS #146 Belridge.
- All rainfall during the crop growing season is considered effective except for first and last months where 50% is considered effective.
- Crop response to soil salinity:
 - Almonds: Sensitive (S) (2)
 - Figs: Moderately Tolerant (MT) (2)
 - Pistachios: Moderately Sensitive to Moderately Tolerant (MS-MT) (2)
 - Pomegranates: Moderately Sensitive (MS) (2); Moderately Tolerant (MT) (4,6)
- Threshold salinity EC_e: Almonds: 1.0 (2) to 1.5 (6) mmhos/cm; Grapes: 1.5 mmhos/cm (6); Pistachios: 1.5 mmhos/cm (Assumed); Pomegranates: 2.7 mmhos/cm (Assumed); Figs: 2.7 mmhos/cm (Assumed)
- EC_e threshold: average root zone salinity at which yield starts to decline (i.e., electrical conductivity of the saturation extract of the soil) mmhos/cm = dS/m

References:

1. Irrigation Training and Research Center (ITRC), California Polytechnic State University, 2003. California Crop and Soil Evapotranspiration, Report 03-001.
2. Agricultural and Natural Resources (ANR), University of California. Irrigation Water Salinity and Crop Production, Publication 8066.
3. Division of Agricultural Sciences, University of California, 1980. Growing Pomegranates in California, Leaflet 2480.
4. Food and Agriculture Organization (FAO), Irrigation and Drainage Paper No. 29. Water Quality for Agriculture.
5. Maas, E.V. and S.R. Grattan. 1999. Crop Yields as Affected by Salinity, p.55-108. In R.W. Skaggs and J. van Schilfhaarde (ed.) Agricultural Drainage. Agronomy Monograph 38. ASA, CSSA. Madison, WI.
6. Food and Agriculture Organization (FAO), Irrigation and Drainage Paper No. 56. Crop Evapotranspiration.

Table 26. Agricultural Crop Data for 2012								
Crop	Total Acreage	Irrigation Method	Planting Month	Harvest Month	ET crop (AF/Ac)	Cultural Practices (AF/Ac)	Leaching Requirement (AF/Ac)	Total Crop Water Needs (AF)*
Other Row Crops	75	Furrow	S	S	2.57	0	0.29	214
Almonds	7,335	Micro	P	P	3.47	0	0.25	27,289
Carrots	0				0	0	0	0
Figs	520	Micro	P	P	3.31	0	0.13	1,790
Grapes	640	Micro	P	P	2.39	0	0.17	1,637
Pistachios	13,685	Micro	P	P	2.88	0	0.11	40,888
Pomegranates	9,660	Micro	P	P	3.84	0	0.15	38,557
Safflower	0				0	0	0	0
Total	31,915							110,375
<p>Notes: This table does not account for effective precipitation and constitutes the difference with Table 25. Effective Precipitation is an input in Table 48. Representative crop for "Other Row Crops" is Cotton S = Seasonal crop P = Permanent crop</p>								

Table 26-13. Agricultural Crop Data for 2013								
Crop	Total Acreage	Irrigation Method	Planting Month	Harvest Month	ET crop (AF/Ac)	Cultural Practices (AF/Ac)	Leaching Requirement (AF/Ac)	Total Crop Water Needs (AF)*
Cotton	75	Furrow	S	S	2.68	0.00	0.30	223
Almonds	7,095	Micro	P	P	3.53	0.00	0.25	26,864
Figs	520	Micro	P	P	3.40	0.00	0.13	1,834
Grapes	560	Micro	P	P	2.42	0.00	0.17	1,454
Pistachios	13,765	Micro	P	P	3.00	0.00	0.13	43,049
Pomegranates	9,700	Micro	P	P	3.95	0.00	0.15	39,758
Total	31,715				108,010	0	5,173	113,183
<p>Notes: S = Seasonal crop P = Permanent crop</p>								

Table 26-14. Agricultural Crop Data for 2014								
Crop	Total Acreage	Irrigation Method	Planting Month	Harvest Month	ET crop (AF/Ac)	Cultural Practices (AF/Ac)	Leaching Requirement (AF/Ac)	Total Crop Water Needs (AF)*
Other Row Crops	75	Furrow	S	S	2.74	0.00	0.30	229
Almonds	7,095	Micro	P	P	3.69	0.00	0.26	28,062
Figs	520	Micro	P	P	3.55	0.00	0.14	1,918
Grapes	560	Micro	P	P	2.54	0.00	0.18	1,523
Pistachios	13,765	Micro	P	P	3.09	0.00	0.13	44,332
Pomegranates	8,420	Micro	P	P	4.12	0.00	0.16	35,984
Total	30,435				106,876	0	5,172	112,048
Notes: S = Seasonal crop P = Permanent crop								

Table 26-15. Agricultural Crop Data for 2015								
Crop	Total Acreage	Irrigation Method	Planting Month	Harvest Month	ET crop (AF/Ac)	Cultural Practices (AF/Ac)	Leaching Requirement (AF/Ac)	Total Crop Water Needs (AF)*
Almonds	7,095	Micro	P	P				
Figs	520	Micro	P	P				
Grapes	560	Micro	P	P				
Pistachios	13,765	Micro	P	P				
Pomegranates	5,960	Micro	P	P				
Total	27,900							
Notes: S = Seasonal crop P = Permanent crop								

Table 27. Irrigated Acres						
	Rep. Year 2012					
		2013	2014	2015		
Total Irrigated Acres	31,915	31,715	30,435	27,900		

Table 28. Multiple Crop Information						
Cropping System	Rep. Year 2012					
		2013	2014	2015		
Single-Cropped Acres	31,915	31,715	30,435	27,900		
Inter-cropping	0	0	0	0		
Double Cropping	0	0	0	0		

B. Environmental Water Use

A small amount of water is occasionally delivered to maintain mitigation ponds associated with the District’s evaporation ponds for agricultural subsurface drainage water. The amount is insignificant to the District’s overall supplies (Table 29). Continued water management activities should eliminate the need for these deliveries in the future.

Table 29. Environmental Water Uses (AF)						
Environmental Resources	Rep. Year 2012					
		2013	2014	2015		
From Supplier						
Vernal pools	0	0	0			
Streams	0	0	0			
Lakes or reservoirs	0	0	0			
Riparian Vegetation	0	0	0			
Other	0	0	0			
Subtotal	0	0	0			
All Sources						
Vernal pools	0	0	0			
Streams	0	0	0			
Lakes or reservoirs	0	0	0			
Riparian Vegetation	0	0	0			
Other (Mitigation Ponds)	530	671	705			
Subtotal	530	671	705			
Overall Totals (From Supplier and From All Sources)						
Vernal pools	0	0	0			
Streams	0	0	0			
Lakes or reservoirs	0	0	0			
Wetlands Subtotal	0	0	0			
Riparian Vegetation	0	0	0			
Other	0	0	0			
Total	530	671	705			

C. Recreational Water Use

No recreational resources are supported by the District's water supplies (Table 30).

Table 30. Recreational Water Uses (AF)						
Recreational Facility	Rep. Year 2012					
		2013	2014	2015		
None	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0

D. Municipal and Industrial Use

A small portion of the District’s water supply is delivered to oil production customers and agricultural processors (Table 31) and is termed “industrial water”.

Table 31. Municipal/Industrial Water Uses (AF)						
Municipal/ Industrial Entity	Rep. Year 2012					
		2013	2014	2015		
Municipal Entity						
None	0	0	0			
Subtotal	0	0	0			
Industrial Entity						
Oil Producers	708	1,045	1,267	1,161		
Ag Processing	478	322	154	128		
Subtotal	1,186	1,367	1,421			
Total	1,186	1,367	1,421			

E. Groundwater Recharge Use

No groundwater recharge resources within the District are supported by the District’s water supplies. However, the District participates in the Pioneer and the Berrenda Mesa banking projects. In addition one landowner participates in the Kern Water Bank Authority (all outside of the District on the Kern River alluvial fan).

Table 32. Groundwater Recharge Water Uses (AF)						
Location/ Groundwater Basin	Method of Recharge	Rep Year 2012				
			2013	2014	2015	
Commitments/Dedicated						
None		0	0	0		
Subtotal		0	0	0		
Voluntary/Oppportunistic						
Kern Fan Banks*	Recharge basins	992	0	0		
Subtotal		992	0	0		
Total		992	0	0		
Notes: Amounts shown correlate to 2012 recovery. Recharge occurs opportunistically. A 10% factor is applied to recharge account for banking losses. * Recharge outside District boundary.						

F. Transfer and Exchange Use

The District relies on transfers and exchanges to supplement its annual water supply. In recent years, common landowner transfers into the District (noted in Table 34) account for most of the activity in this section.

G. Other Water Use

There are no other water uses in the District (Table 33).

Table 33. Other Water Uses (AF)						
Water Use	Rep. Year 2012	Planning Cycle				
		2013	2014	2015		
None	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0