

### Section III: Description of Quantity of Water Uses

Water year 2011-2012 is chosen as the representative year for this plan (Table 21), because SWP allocation 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.

<b>Table 21. Representative Year</b>	
	<b>Description</b>
<b>Representative year(s) based upon</b>	2011-2012
<b>First month of representative year</b>	November 2011
<b>Last month of representative year</b>	October 2012

#### A. Agriculture Water Use

BMWD provides only surface water (Table 22) for irrigation supplies of the many crops grown in the District as listed in Table 24.

<b>Table 22. Annual Agricultural Water Use (AF)</b>						
<b>Source</b>	<b>Representative Year 2012</b>					
		<b>2013</b>	<b>2014</b>	<b>2015</b>		
<b>Agricultural Water Supplier Delivered</b>						
<b>Surface Water*</b>	85,338	94,028	78,912	84,200		
<b>Groundwater</b>	0	0	0			
<b>Other (define)</b>	0	0	0			
<b>Other Water Supplies Used</b>						
<b>Surface Water</b>	0	0	0			
<b>Groundwater</b>	0	0	0			
<b>Other (define)</b>	0	0	0			

BMWD supplies irrigation water to many crops, as listed in Table 24. The primary products grown within the BMWD service area are from trees (mostly almonds, pistachios, carrots, and pomegranates). The evolution of irrigation and changing economic conditions has brought many crop changes to the District. Extensive

agricultural cropping patterns of thousands of acres planted to a single crop were replaced with intensive agriculture cropping patterns of numerous smaller parcels planted to a wide variety of high-value specialty crops. Nuts such as almonds and pistachios have been the fastest growing crop types in the District. As the land was converted, pressurized irrigation systems such as drip and micro sprinkler replaced flood irrigation as the predominant method of irrigation. Similarly, the on-farm irrigation efficiencies improved as the irrigation system conversions happened.

Table 23 illustrates the estimated crop water needs in the District for the representative year 2012. Table 24 complements and summarizes the crop water use in the District from 2012-2015.

**Table 23. 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	
Pistachios	13,720				1.73	2.72	6.28	8.42	7.68	5.33	2.36			34.53
Almonds	8,042		2.39	3.22	4.08	6.60	6.45	6.51	6.55	3.95	1.93			41.67
Carrots	2,244	1.98	2.65	4.30	5.78	1.81				1.21	0.82	1.59	1.18	21.32
Pomegranates	1,633	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	1,013		2.40	3.24	5.56	9.00	7.68	0.69						28.58
Cherries	291			2.83	3.70	6.93	7.24	7.37	6.75	4.61	1.93			41.36
Grapes	224			2.57	1.84	4.24	6.11	6.25	4.86	2.78				28.65
Vegetables	40	1.98	2.65	4.30	5.78	1.81				1.21	0.82	1.59	1.18	21.32
Citrus	17	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
<b>Totals</b>	<b>27,224</b>													

Salinity of Irrigation Water EC<sub>w</sub> = **0.5** dS/m = mmhos/cm

Crop	Area (acres)	Total Crop ETC (ac-ft/ac)	Threshold Salinity EC <sub>e</sub> (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)
Pistachios	13,720	2.88	2.5	0.04	0.12	0.25	2.75	37,740
Almonds	8,042	3.47	1.5	0.07	0.25	0.25	3.47	27,939
Carrots	2,244	1.78	1.0	0.11	0.20	0.25	1.73	3,878
Pomegranates	1,633	3.84	2.7	0.04	0.15	0.25	3.75	6,116
Safflower	1,013	2.38	5.7	0.02	0.04	0.25	2.18	2,206
Cherries	291	3.45	1.0	0.11	0.38	0.25	3.58	1,043
Grapes	224	2.39	1.5	0.07	0.17	0.25	2.31	518
Vegetables	40	1.78	1.5	0.07	0.13	0.25	1.66	66
Citrus	17	3.84	1.3	0.08	0.32	0.25	3.92	67
<b>Totals</b>	<b>27,224</b>						<b>Totals:</b>	<b>79,573</b>

**Assumptions:**

Representative crop for other row crops: Cotton  
 Pomegranates are comparable to citrus (3)  
 Persimmons are comparable to apples  
 Carrots are considered small vegetables  
 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:  
 Almond: Sensitive (S) (2)  
 Apple: Sensitive (S) (2)  
 Carrot: Sensitive (S) (2)  
 Cherry: Sensitive (S) (2)  
 Citrus - Lemon: Sensitive (S) (2)  
 Citrus - Orange: Sensitive (S) (2)  
 Fig: Moderately Tolerant (MT) (2)  
 Pistachio: Moderately Sensitive to Moderately Tolerant (MS-MT) (2)  
 Pomegranate: Moderately Sensitive (MS) (2); Moderately Tolerant (MT) (4,6)  
 Safflower: Moderately Tolerant (MT) (4,6)  
 Vegetables: Sensitive (S) to Moderately Tolerant (MT) (2)  
 Threshold salinity EC<sub>e</sub> and reference (I): Almond: 1.0 (2) to 1.5 (6) mmhos/cm; Apple: 1.5 mmhos/cm (Assumed); Carrot: 1.0 mmhos/cm (5); Cherry: 1.0 mmhos/cm (Assumed); Grape: 1.5 mmhos/cm (6); Pistachio: 1.5 mmhos/cm (Assumed); Pomegranate: 2.7 mmhos/cm (Assumed); Figs: 2.7 mmhos/cm (Assumed); Citrus-Lemon: 1.0 (2) to 1.5 (5) mmhos/cm; Citrus-Orange: 1.1 (2) to 1.3 (5) mmhos/cm; Safflower: 5.7 mmhos/cm (4); Vegetables: 1.5 mmhos/cm (Assumed).  
 ECe 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 Schilfegaarde (ed.) Agricultural Drainage. Agronomy Monograph 38. ASA, CSSA, SSSA. Madison, WI.
6. Food and Agriculture Organization (FAO), Irrigation and Drainage Paper No. 56. Crop Evapotranspiration.

<b>Table 24. Agricultural Crop Data for 2012</b>								
<b>Crop</b>	<b>Total Acreage</b>	<b>Irrigation Method</b>	<b>Planting Month</b>	<b>Harvest Month</b>	<b>ET crop (AF/Ac)</b>	<b>Cultural Practices (AF/Ac)</b>	<b>Leaching Requirement (AF/Ac)</b>	<b>Total Crop Water Needs (AF)</b>
Pistachios	13,720	Drip	NA	Sep-Oct	2.88	0	0.12	41,119
Almonds	8,042	Drip	NA	Aug-Sep	3.47	0	0.25	29,920
Carrots	2,244	Sprinkler	Summer/ Winter	Spring/ Fall	1.78	0	0.20	4,430
Pomegranates	1,633	Drip	NA	Sep-Oct	3.84	0	0.15	6,518
Safflower	1,013	Sprinkler	Winter	Spring/ Summer	2.38	0	0.04	2,456
Cherries	291	Drip	NA	Apr-May	3.45	0	0.38	1,115
Grapes	224	Drip	NA	Aug	2.39	0	0.17	573
Vegetables	40	Sprinkler	Varies	Varies	1.78	0	0.13	76
Citrus	17	Drip	NA	Dec	3.84	0	0.32	71
<b>Total</b>	<b>27,224</b>							<b>86,276</b>

<b>Table 24-13. Agricultural Crop Data for 2013</b>								
<b>Crop</b>	<b>Total Acreage</b>	<b>Irrigation Method</b>	<b>Planting Month</b>	<b>Harvest Month</b>	<b>ET crop (AF/Ac)</b>	<b>Cultural Practices (AF/Ac)</b>	<b>Leaching Requirement (AF/Ac)</b>	<b>Total Crop Water Needs (AF)</b>
Pistachios	13,961	Drip	NA	Sep-Oct	3.00	0.00	0.13	43,662
Almonds	9,152	Drip	NA	Aug-Sep	3.53	0.00	0.25	34,653
Carrots	1,680	Sprinkler	Summer/ Winter	Spring/ Fall	1.85	0.00	0.21	3,454
Pomegranates	165	Drip	NA	Sep-Oct	3.95	0.00	0.15	676
Cherries	291	Drip	NA	Apr-May	3.53	0.00	0.39	1,143
Grapes	224	Drip	NA	Aug	2.42	0.00	0.17	582
Vegetables	570	Sprinkler	Varies	Varies	1.85	0.00	0.13	1,130
Citrus	8	Drip	NA	Dec	3.95	0.00	0.33	34
<b>Total</b>	<b>26,051</b>				<b>80,675</b>	<b>0</b>	<b>4,658</b>	<b>85,333</b>

<b>Table 24-14. Agricultural Crop Data for 2014</b>								
<b>Crop</b>	<b>Total Acreage</b>	<b>Irrigation Method</b>	<b>Planting Month</b>	<b>Harvest Month</b>	<b>ET crop (AF/Ac)</b>	<b>Cultural Practices (AF/Ac)</b>	<b>Leaching Requirement (AF/Ac)</b>	<b>Total Crop Water Needs (AF)</b>
Pistachios	14,029	Drip	NA	Sep-Oct	3.09	0.00	0.13	45,182
Almonds	9,141	Drip	NA	Aug-Sep	3.69	0.00	0.26	36,154
Carrots	953	Sprinkler	Summer/ Winter	Spring/ Fall	1.92	0.00	0.21	2,028
Safflower	2	Sprinkler	Winter	Spring/ Summer	2.52	0.00	0.05	5
Cherries	58	Drip	NA	Apr-May	3.69	0.00	0.41	238
Grapes	83	Drip	NA	Aug	2.54	0.00	0.18	226
Vegetables	570	Sprinkler	Varies	Varies	1.92	0.00	0.14	1,170
<b>Total</b>	24,836				80.466	0	4,537	85,003

<b>Table 24-15. Agricultural Crop Data for 2015</b>								
<b>Crop</b>	<b>Total Acreage</b>	<b>Irrigation Method</b>	<b>Planting Month</b>	<b>Harvest Month</b>	<b>ET crop (AF/Ac)</b>	<b>Cultural Practices (AF/Ac)</b>	<b>Leaching Requirement (AF/Ac)</b>	<b>Total Crop Water Needs (AF)</b>
Pistachios	14,029	Drip	NA	Sep-Oct				
Almonds	9,461	Drip	NA	Aug-Sep				
Carrots	3	Sprinkler	Summer/ Winter	Spring/ Fall				
Safflower	2	Sprinkler	Winter	Spring/ Summer				
Cherries	58	Drip	NA	Apr-May				
Grapes	83	Drip	NA	Aug				
Vegetables	570	Sprinkler	Varies	Varies				
<b>Total</b>	24,204							

The District's service area encompasses 55,440 acres. As shown on Table 24, surface water was delivered to approximately 27,224 acres (Table 25). A majority of non-irrigated land (approximately 28,216 acres) could be attributed to landowners opting not to plant certain row-crops given low prices for crops versus cost to farm, limited water availability in 2012, and dry land farming. Other non-irrigated land (approximately 6,000 acres) in the service area is within non-farmable land (oilfields, mountain slopes).

<b>Table 25. Irrigated Acres</b>						
	Rep. Year 2012					
		2013	2014	2015		
<b>Total Irrigated Acres</b>	27,224	26,051	24,836	24,204		

<b>Table 26. Multiple Crop Information</b>						
Cropping System	Rep. Year 2012					
		2013	2014	2015		
<b>Single-Cropped Acres</b>	27,224	28,824	28,824	28,824		
<b>Inter-cropping</b>	Negligible	Negligible	Negligible	Negligible		
<b>Double Cropping</b>	Negligible	Negligible	Negligible	Negligible		

## B. Environmental Water Use

BMWD does not provide water to any environmental uses.

## C. Recreational Water Use

BMWD does not provide any water to recreational uses.

## D. Municipal and Industrial Use

A small portion of the District’s water supply is delivered to agricultural processors (Table 27) and is termed “industrial water”.

<b>Table 27. Municipal/Industrial Water Uses (AF)</b>						
Municipal/ Industrial Entity	Representative Year 2012					
		2013	2014	2015		
<b>Municipal Entity</b>						
None	0	0	0			
<b>Industrial Entity</b>						
Ag Processing	1,774	1,550	1,580	1,600		
<b>Total</b>	1,774	1,550	1,580			

### 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).

<b>Table 28. Groundwater Recharge Water Uses (AF)</b>							
Location/ Groundwater Basin	Method of Recharge	Rep Year 2012					
			2013	2014	2015		
<b>Commitments/Dedicated</b>							
None		0	0	0			
<b>Voluntary/Oppportunistic</b>							
Pioneer Project	Recharge basins	0	0	0			
Berrenda Mesa Project	Recharge basins	5,750	0	0			
Others	Recharge basins	0	0	0			
<b>Total</b>		5,750	0	0			

### 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 as net transfers in Table 29) account for most of the activity in this section.

### G. Other Water Use

There are no other water uses in the District.