Section II: Description of the Agricultural Water Supply and Service Area

A. Physical Characteristics

1. Size of service area

The District is located in western Kern County and encompasses 99,819 acres of land (

Appendix 3). The District currently owns and operates an irrigation distribution system that is shown in Appendix 4. Of the 99,819 acres in the District, 88,223 acres are farmable (District acreage less acres in Industrial Zone), although not all this acreage is currently being farmed. The net cropped acreage in 2020 was 34,461 acres. The overall District history and size is summarized in Table 2. BWSD has the infrastructure to deliver water to approximately 46,130 acres of land.

Table 2. Water Supplier History and Size	
District	**BWSD**
Date of Formation	21-Feb-62
Source of Water	**Applicable sources**
Local Surface Water	
Local Groundwater	Limited
Wholesaler	Kern County Water Agency (KCWA)
USBR	
SWP	Via California Aqueduct
Service Area Acreage	93,589 acres
Non-Service Area Acreage	6,230 acres

The District primarily supplies agricultural water to growers within its boundaries. The District supplies no municipal water. The industrial water supplied makes up less than one percent of the District's normal annual water deliveries. SWP water is the primary water supply for the District. All of the water delivered by the District is delivered to the District through the California Aqueduct (Figure 1).

As shown on Table 3, currently there are no plans to change the BWSD service area.

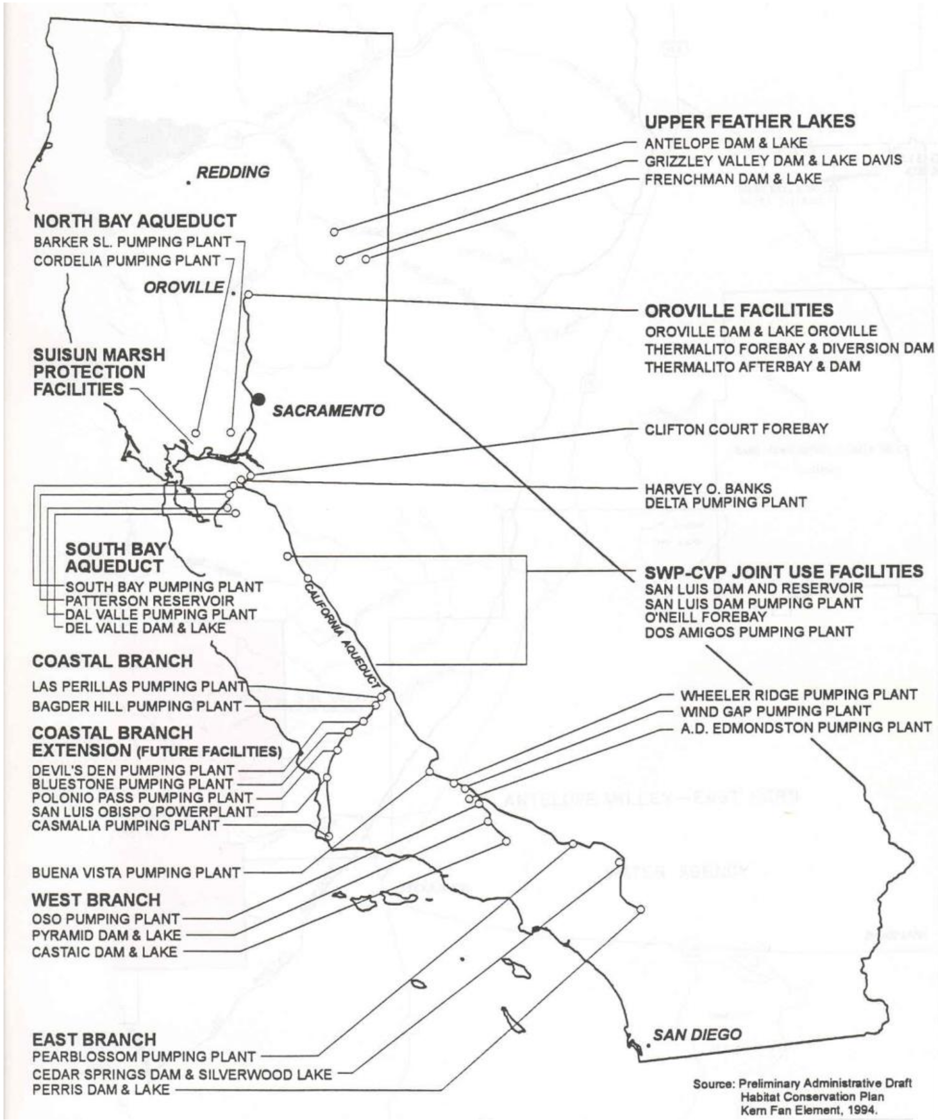

Figure 1. SWP Facilities

Table 3. Expected Changes to Service Area		
Change to Service Area	**Estimate of Magnitude**	**Effect on the Water Supplier**
Reduced Service Area Size	0	None anticipated
Increased Service Area Size	0	No expansion plans at this time
Other		
- Cropping Changes	0	None anticipated
- Reduced Irrigated Land	0	None anticipated

2. Location of the service area and water management facilities

As previously mentioned and shown, BWSD is located within the southern San Joaquin Valley about 40 miles northwest of the City of Bakersfield (

Appendix 3). BWSD is located in the northwestern corner of Kern County on the eastern edge of the Temblor Range. State Highway 46 is located at the very North end of the District and Highway 33 passes through the western portion of the District. Adjacent districts include the Berrenda Mesa Water District and Lost Hills Water District to the north, a part of West Kern Water District to the south, and Buena Vista Water Storage District to the east.

BWSD distributes SWP water via a network of facilities (Appendix 4): three (3) main canals, pipelines, pump stations, and control structures. BWSD's first project as a public entity was the construction of facilities to serve lands west of the Aqueduct (i.e. Units of

Construction 1 and 2). This project was completed in February 1968 in conjunction with initial deliveries on the CA Aqueduct by DWR. Construction of two additional penstocks (Unit of Construction 6-1) was completed in 1972. Although seven turnouts from the Aqueduct were planned, only three are actually operational. The remaining four turnouts (Bel 2, Bel 4, Bel 6, and Bel 7) were partially completed at the Aqueduct but, never activated. Bel 1A was constructed to replace Bel 1/BV 1 which was shared with neighboring Buena Vista Water Storage District. A long-term joint use agreement for Bel 1/BV 1 could not be reached between the two districts,

Privately owned irrigation facilities that served lands in Zone of Benefit 5 (Zone 5) via an unlined earthen ditch were purchased by the District in 1979. In 2001, the District secured a Proposition 204 loan from DWR to replace approximately 3.5 miles of the unlined canal in Zone of Benefit 5-2 with a large diameter pipeline. In 2004, the District lined all but about 1 mile of the remaining portion of the unlined canal with high-density polyethylene (HDPE) liner. The remaining 1 mile of unlined canal was abandoned in 2010. Table 4 provides a summary of existing irrigation facilities in BWSD. The District's two main canals located west of the Aqueduct were designed to follow the 415 ft and 500 ft contour elevations. As such, they are referred to as the 415 Canal and 500 Canal, respectively. Once pumped uphill approximately 115 feet from the Aqueduct, by Pump Station 1A, water flows into a regulating reservoir (415 Reservoir) at the head-works of the 415 Canal. From there water is delivered by gravity through the concrete lined 415 Canal to the North, the South and a portion is diverted to a second pump station (Pump Station 1B) to lift water to the second regulating reservoir (500 Reservoir). Through the concrete lined 500 Canal, water deliveries are gravity flow to the North only. Gravity pipeline laterals feed lands that are lower in elevation than the canals. Lands that are located higher in elevation than the 415 and 500 Canals are served by a mixture of landowner owned and District owned facilities. Since 2012, the District has installed automatic gate controls at canal check structures on both the 415 and 500 Canals. This equipment allows operators to (1) adjust water levels in the canals remotely via an internet connection (2) react more quickly to changes in water levels in the canals and (3) reduces the number of trips necessary to adjust the gates manually. All of which lead to more safe and efficient water management. Lateral pipelines are District owned, but landowners supply their own booster pumps (and pay the accompanying energy charges).

The District owns and operates two lined reservoirs (415 Reservoir and 500 Reservoir) and two unlined reservoirs at the terminus of the 415 Canal and 500 Canal (415 Terminal Reservoir and 500 Terminal Reservoir). The canals are operated so that little or no water spills into the unlined Terminal Reservoirs (Table 4). Occasionally, the Terminal Reservoirs are utilized; however, the little water that is lost can be recovered and pumped back into the canals, as necessary.

There are twenty-two (22) small lined and thirteen (13) small unlined pits used to capture filter back-flush and fifty-three (53) small lined reservoirs owned by District landowners (Table 5). Nearly all of the pits and reservoirs are lined. Filter back-flush operations occur up to four (4) times a day during the peak irrigation season (generally May through August) producing approximately 4,800 gallons of back-flush water per day at each filter station location. Over the course of a “typical” irrigation season approximately 216,000 gallons of back-flush water is produced from a single filter station nearly all of which is captured and recycled through the system.

The District’s two main reservoirs (415 Reservoir and 500 Reservoir) are used primarily for short-term regulation of the District’s two main pump stations (Pump Station 1A & 1B, respectively). Because of their relatively small storage capacities, long-term storage of surplus water is generally not applicable. To minimize pumping costs and energy bills during the summer peak energy period (noon to six) the combined storage of the 415 and 500 Reservoirs provides only one to two hours of curtailment pumping. In 2002, Provost & Pritchard Engineering Group (P&P) calculated the cost to expand the 415 and 500 Reservoirs to provide sufficient storage capacity to perform load-shifting operations during peak energy periods. The estimated cost to provide an additional 60 acre-ft of reservoir storage capacity was approximately $1.13 million with a simple payback of 8.8 years. All factors considered, the benefit-cost ratio for additional storage in the District does not appear economical under current conditions. However, should grants, low interest financing or other funding sources become available, BWSD will investigate additional storage facilities to expand load-shifting capability, regulation, and/or surplus water storage capabilities.

Table 4. Water Conveyance and Delivery System

System Used	Number of Miles
Unlined Canal	0
Lined Canal	38
Pipelines	50
Drains	0.0
Regulation Reservoirs	65 AF

The BWSD water delivery system was designed to deliver irrigation water to growers mainly by gravity or in some cases by pumping. All turnouts are designed to serve 160 acres at a flow rate of two and one-half cubic feet per second (2.5-cfs). Lateral turnouts will deliver water at a higher rate of up to 5-cfs during low total demand periods.

All lands that are currently farmed in the District employ micro-irrigation or sprinklers that do not necessitate tailwater return. The vast majority is micro-irrigation.

The District distribution system is shown on Appendix 4. An inventory of the District distribution system facilities currently in use is shown in (Table 7).

Table 5. Water Supplier Reservoirs

Number	2

BWSD 415 Reservoir and 500 Reservoir	65 AF
Berrenda Mesa Project and Pioneer Project – Groundwater Banks (Outside District)	0 AF
End of system reservoirs	0 AF
Total Capacity	65 AF

Table 6. Tailwater/Spill Recovery System

System	Yes/No
District Operated Spill Recovery	Yes
Grower Operated Tailwater Recovery	No
Grower Operated Back flush water Recovery	Yes

Table 7. Water Distribution System Inventory

Supply Points - Active California Aqueduct Turnouts				
Description	Pump or Gravity	Capacity	Meter Type	Aqueduct Milepost
Belridge 1A	Gravity	100	Venturi	209.71
Belridge 3	Gravity	90	Parshall Flume	214.11
Belridge 5	Gravity	610	Venturi	217.13

Miscellaneous Distribution System Components						
Service Area	Water Meters	Pump Stations			Reservoirs	Radio Telemetry Units
		Name	Number of Pumps	HP		

1	82	P.S.-1A	8	9750	415	1
2	21	P.S. 1A & 1B	14	13875	500	2
3	18	P.S. 1A	8	9750	415	1
4	Not in Use	N/A	0	N/A	N/A	N/A
5	31		0			1
6	35	P.S. 1A & 1B	14	13875	500	2
7	26	P.S. 1A & 1B	14	13875	500	2

The District's distribution system can be classified as a fixed duration-restricted arranged system with deliveries arranged in advance and a normal duration in 24-hour time intervals.

Growers within BWSD utilize sprinkler, micro irrigation and solid-set sprinklers system types. Furrow irrigation is no longer used in the District because of the topography and water cost. In the early years of the District, sprinkler and furrow irrigation were the predominate irrigation types used to irrigate crops. As technology advanced, micro irrigation systems were installed on some of the permanent crop acreage. By the 1980's, many of the permanent crops were converted from furrow or sprinkler systems to micro irrigation systems, either drip or fan-jet irrigation. All of the recent permanent crop plantings have been installed with micro irrigation systems. Sprinklers are used to a minimal extent when row crops are grown. Currently, pressurized micro irrigation systems (drip and fan-jet systems) account for 100% of the irrigated permanent crop acreage. The permanent crop acreage irrigated with micro irrigation has increased from 5,400 acres in 1990 to nearly 35,000 acres in 2020.

SWP Water is among the most expensive surface water supplies in the State. Water costs to landowners in BWSD are further impacted by the District's location and topography. About 80% of the lands currently taking delivery of SWP water in BWSD are located west of and at a higher elevation than the CA Aqueduct. When reduced water supplies are received, the costs increase dramatically. This alone is incentive enough for most growers to efficiently manage their water allocation. BWSD is a progressive district, and along with its water users, uses the best available technology for conveying water to crops.

BWSD participates in groundwater banking projects outside of the District boundaries just southwest of the City of Bakersfield.

Appendix 3 shows the location of the banking facilities with respect to the District boundary. The Pioneer Project and Berrenda Mesa Project are discussed in the groundwater recharge section.

3. Terrain and soils

Topography in BWSD is gentle, with foothills lying at the western edge. Elevations range from 250 feet above sea level in the east-southeast to 1,000 feet in the west. Typical slopes range from 25 to 30 feet per mile in the central portion of BWSD. Table 8 summarizes the topography impacts to the irrigation of the land.

BWSD is mostly underlain with Quaternary alluvium, which in turn is underlain with the Tulare Formation of Pliocene/Pleistocene age.

The United States Department of Agriculture, Natural Resource Conservation Service (NRCS) (formerly the Soil Conservation Service), issued a soil survey of the northwestern portion of Kern County in the fall of 1988. This detailed soil survey included the Belridge Water Storage District area. A general soils map of the District taken from the NRCS soil survey is included in Appendix 5.

Table 8 gives the general characteristics of the major soil types within the District and accompanies

Soils within BWSD can be characterized as deep clay, sandy loam and saline-alkali soils. The soils all formed in alluvium derived primarily from sedimentary and granite rock. Most soils found in the District are well drained and formed on low terraces, alluvial fans, and plains. Reports prepared during design and construction of district facilities indicate soils in the district contain high concentrations of sulfates and other salts and therefore classify the soils as moderately to very severely corrosive.

Soils that formed in and along the margins of creeks and washes; or soils considered moisture deficient; are often highly collapsible when saturated. Approximately 6 miles of the District's 35 miles of canals have been impacted by localized soil collapse resulting in elevation decrease of more than 2 feet in places. Damage to the concrete liner of the canals varies from small cracks to catastrophic liner failure depending upon the localized magnitude of collapse. Due to the variability and widespread extent of the collapse however, no one-soil series has been identified as the source. While the impact to operations has been relatively minor, significant funds and effort have been expended to raise canal banks and extend the concrete canal liner to compensate for the collapse and maintain a minimum freeboard and hydraulic flow-line.

Sandy loam soils found in BWSD include the Kimberlina, Milham, and Elk Hills series (Table 9). Clay soils found in BWSD include Twisselman, Lokern and Panoche series (Table 10). Saline-alkali soils found in BWSD include the Lokern clay, Yribaren loam and Panoche clay loam (Table 11). Soil erosion hazard within BWSD is considered slight to moderate. The Kimberlina sandy loam and Milham sandy loam are classified as prime farmland soils by the U.S. Department of Agriculture. Approximately 90 percent of the soils within BWSD are considered prime for agricultural activities and well drained.

The streambeds and channels of the three named seasonal streams that flow into BWSD from the west (Salt, Chico Martinez, and Santos) have been redirected or destroyed by past development and are nearly unrecognizable and/or non-existent. The limited runoff in these streams is sporadic, at best, and occurs only during extreme rain events. Surface water quality data from creeks in BWSD is limited and the limited data suggests that the surface waters have high concentrations of calcium-sulfate due to leaching from surrounding soils. Due to limited volumes and the poor water quality, these seasonal streams do not provide either irrigation water, nor are they utilized to transport irrigation water.

Table 8. Landscape Characteristics

Topography Characteristic				% of the District				Effect on Water Operations and Drainage
Sloping Land				100% of Irrigated land				Requires micro-irrigation or sprinkler irrigation for efficient application
Soil Unit	**Soil Name / Characteristic / Classification**	**Description**	**Total Area (acres)**	**Percent of District**	**Depth (in)**	**Clay (%)**	**Permeability (in/hr)**	**Effect on Water Operations and Drainage**
146	Elkhills sandy loam, 9-50% slopes, eroded	Deep, well-drained soil is primarily on uplifted, dissected old areas of valley fill. Formed in alluvium derived dominantly from sedimentary and granitic rock.	533.6	0.57	0-29	5-18	1.98 - 5.95	No irrigation operations impact
					29-49	5-18	1.98 - 5.95	
					49-65	5-18	1.98 - 5.95	
147	Elkhills gravelly sandy loam, 9-15% slopes	Deep, well-drained soil is in areas of uplifted, dissected old valley fill. Formed in alluvium derived dominantly from sedimentary and granitic rock.	57.1	0.06	0-29	5-18	1.98 - 5.95	No irrigation operations impact
					29-49	5-18	0.57 - 1.98	
					49-65	5-18	1.98 - 5.95	
174	Kimberlina fine sandy loam, 0-2% slopes	Deep, well-drained soil on alluvial fans and plains. Formed in alluvium derived dominantly from granitic and sedimentary rock.	19010.1	20.46	0-9	6-18	1.98 - 5.95	No irrigation operations impact
					9-45	10-18	1.98 - 5.95	
					45-71	10-25	0.57 - 1.98	
175	Kimberlina sandy loam, 2-5% slopes	Deep, well-drained soil on alluvial fans and plains. Formed in alluvium derived dominantly from granitic and sedimentary rock.	4257.9	4.58	0-9	6-18	1.98 - 5.95	No irrigation operations impact
					9-45	10-18	1.98 - 5.95	
					45-71	10-25	0.57 - 1.98	
176	Kimberlina sandy loam, 5-9% slopes	Deep, well-drained soil on alluvial fans and plains. Formed in alluvium derived dominantly from granitic and sedimentary rock.	1581.3	1.70	0-9	6-18	1.98 - 5.95	No irrigation operations impact
					9-45	10-18	1.98 - 5.95	
					45-71	10-25	0.57 - 1.98	
177	Kimberlina gravelly sandy loam, 2-5% slopes	Deep, well-drained soil on alluvial fans and plains. Formed in alluvium derived dominantly from granitic and sedimentary rock.	1888.1	2.03	0-25	6-18	1.98 - 5.95	No irrigation operations impact
					25-60	6-18	1.98 - 5.95	
178	Kimberlina gravelly sandy loam, 5-9% slopes	Deep, well-drained soil on alluvial fans and plains. Formed in alluvium derived dominantly from granitic and sedimentary rock.	1.3	0.00	0-25	6-18	1.98 - 5.95	No irrigation operations impact
					25-60	6-18	1.98 - 5.95	
185	Lewkalb, saline alkali-Milham-Kimberlina complex, 0-5% slopes	Deep, well-drained soil on low terraces, alluvial fans and plains. Formed in alluvium derived dominantly from sedimentary and granitic rock.	1841.5	1.98	0-23	6-18	1.98 - 5.95	No irrigation operations impact
					23-40	6-18	0.06 - 0.2	
					40-65	6-18	0.06 - 0.2	
187	Lokern clay, drained	Deep, somewhat poorly drained soil in basins. Formed in alluvium derived dominantly from mixed rock sources, dominantly granitic rock.	0.7	0.00	0-7	40-55	0.06 - 0.2	No irrigation operations impact
					7-21	40-60	0.06 - 0.2	
					21-48	40-60	0.57 - 1.98	
					48-66	10-26	0.57 - 1.98	
188	Lokern clay, saline-alkali, drained	Deep, somewhat poorly drained soil in basins. Formed in alluvium derived dominantly from mixed rock sources, dominantly granitic rock.	68.0	0.07	0-7	40-55	0.06 - 0.2	No irrigation operations impact
					7-21	40-60	0.06 - 0.2	
					21-48	40-60	0.57 - 1.98	
					48-66	10-26	0.57 - 1.98	
189	Lokern clay, saline-alkali, partially drained	Deep, somewhat poorly drained soil is on basins. Formed in alluvium derived from mixed rock sources, mainly granitic rock. Slope is 0-2 percent.	88.8	0.10	0-7	40-55	0.06 - 0.2	No irrigation operations impact
					7-21	40-60	0.06 - 0.2	
					21-48	40-60	0.57 - 1.98	
					48-66	10-26	0.57 - 1.98	
196	Milham sandy loam, 0-2% slopes	Deep, well-drained soil on alluvial fans, plains, and low terraces. Formed in alluvium derived dominantly from granitic and sedimentary rock.	24505.6	26.38	0-10	5-20	1.98 - 5.95	No irrigation operations impact
					10-49	20-35	0.2 - 0.57	
					49-60	5-25	0.57 - 1.98	
197	Milham sandy loam, 2-5% slopes	Deep, well drained soil on alluvial fans, plains, and low terraces. Formed in alluvium derived dominantly from granitic and sedimentary rock.	5157.9	5.55	0-10	5-20	1.98 - 5.95	No irrigation operations impact
					10-49	20-35	0.2 - 0.57	
					49-60	5-25	0.57 - 1.98	
198	Milham sandy loam, 5-9% slopes	Deep, well drained soil on alluvial fans, plains, and low terraces. Formed in alluvium derived dominantly from granitic and sedimentary rock.	515.0	0.55	0-10	5-20	1.98 - 5.95	No irrigation operations impact
					10-49	20-35	0.2 - 0.57	
					49-60	5-25	0.57 - 1.98	
211	Panoche clay loam, 0-2% slopes	Deep, well-drained soil on alluvial fans and plains. Formed in alluvium derived dominately from granitic or sedimentary rock.	28984.0	31.20	0-16	27-35	0.57 - 1.98	No irrigation operations impact
					16-60	18-35	0.57 - 1.98	
212	Panoche clay loam, 2-5% slopes	Deep, well-drained soil on alluvial fans and plains. Formed in alluvium derived dominately from granitic or sedimentary rock.	2028.9	2.18	0-16	27-35	0.57 - 1.98	No irrigation operations impact
					16-60	18-35	0.57 - 1.98	
214	Panoche clay loam, saline-alkali, 0-2% slopes	Deep, well drained soil on alluvial fans and plains. Formed in alluvium derived dominately from granitic or sedimentary rock.	1116.1	1.20	0-16	27-35	0.57 - 1.98	No irrigation operations impact
					16-60	18-35	0.57 - 1.98	
235	Twisselman clay, 0-2% slopes	Deep, well-drained soil on alluvial fans. Formed in alluvium derived dom-inantly from sedimentary rock.	862.2	0.93	0-14	40-60	0.06 - 0.2	No irrigation operations impact
					14-60	35-60	0.06 - 0.2	
251	Yribarren loam, 0-2% slopes	Deep, well drained soil on alluvial fans and plains. Formed in alluvium derived dominantly by sedimentary rock.	395.2	0.43	0-7	20-27	0.57 - 1.98	No irrigation operations impact
					7-19	35-55	0 - 0.06	
					19-22	15-35	0 - 0.06	
					22-60	15-30	0.2 - 0.57	

Land use within BWSD is primarily for agriculture and petroleum production. 34,461 acres are in agricultural production with the most common crops being almonds, pistachios and citrus. Other crops include carrots, and persimmons. ***Table 9.*** below shows the water year 2020 land use in the District. Approximately 9,173 acres in the District are used to support petroleum production. The balance of the acreage in the District is used for grazing or is not farmed.

Table 9. 2020 Water Year Land Use

Crop	Acreage
Almonds	14,547
Pistachios	13,747
Citrus	3,609
Carrots	2,558
Total Irrigated Acreage	**34,461**
Non-Irrigated	**62,935**
Total	**97,396**

4. Climate

BWSD is characterized by a Mediterranean type climate with dry, hot summers and mild, semi-arid winters with little rainfall and normally low humidity. Average daily maximum temperature in BWSD ranges from 91 to 97 degrees Fahrenheit in the summer, and from 58 to 69 degrees in the winter. The area is classified as a hot desert where precipitation is less than half of the potential evaporation. The rain season typically occurs from November to April, and ranges from 2.9 to 9.3 inches per year, with an average of 5.1 inches per year, where nine-tenths of the rainfall occurs from November through April. Effective precipitation averages about 2.6 inches (50% of rainfall) annually. The rainfall is sufficient for grazing purposes, but not sufficient for intensive agricultural purposes. Historical average climatology is presented in Table 10 and Table 11.

The growing season runs from May through October, although various crops are grown year-round. Reference evapotranspiration ranges from 52.4 to 62.8 inches per year with an average of 58.3 inches per year. The length of the growing season (frost-free period) is about nine months, or around 250 days per year that are available for growing most agricultural crops. The crops must be sustained by irrigation during the hot, dry summers.

Table 10. Summary Climate Characteristics	
	#054 Blackwells Corner, 2006-2020
Climate Characteristic	Value
Average Annual Evapotranspiration (inches)	5.5
Average Annual Precipitation (inches)	0.4
Annual Minimum Precipitation (inches)* (2016)	(0) 0
Annual Maximum Precipitation (inches)* (2018)	(1.98) 1.8
Average Annual Minimum Temperature (ºF)	49.1
Average Annual Maximum Temperature (ºF)	76.7
Average Minimum Temperature (ºF) (January)	34.4
Average Maximum Temperature (ºF) (July)	97.2
Average Minimum Temperature Range (ºF) (November-April)	39.3
Average Maximum Temperature Range (ºF) (May-October)	89.3
Note:	
* Annual minimum and maximum precipitation correspond to the total minimum and maximum value recorded in the corresponding years.	

Table 11. Detailed Climate Characteristics				
	CIMIS Station #054 - Blackwells Corner, 2006-2020			
Month/Time	**Average Precipitation, Inches**	**Average Reference Evapotranspiration (ET_o), Inches**	**Average Minimum Temperature, ºF**	**Average Maximum Temperature, ºF**
January	1.09	1.71	34.39	56.25
February	0.71	2.52	35.87	61.86
March	0.99	4.28	42.41	67.85
April	0.51	6.11	46.55	74.72
May	0.44	8.20	52.86	82.56
June	0.01	9.19	60.46	91.67
July	0.02	9.90	66.15	97.21
August	0.02	8.78	64.58	95.83
September	0.08	6.49	59.45	90.03
October	0.14	4.32	50.19	78.69
November	0.44	2.42	41.17	66.79
December	0.67	1.60	35.30	57.01
Wet Season* (Nov-Apr)	0.74	3.13	39.33	64.17
Dry Season* (May-Oct)	0.71	46.89	58.95	89.33
Extreme Conditions (if applicable) [e.g., 100-year event]	NA	NA	NA	NA
Other	NA	NA	NA	NA
Notes:				
Wet season is defined for November through April. Dry season is defined for May through October.				
NA = Not applicable				

B. Operational characteristics

1. Operating rules and regulations

Belridge Water Storage District Rules and Regulations for Distribution and Use of Water (April 13, 1999 revision (Appendix 6) are used as a guideline for the operation and delivery of water to the Water Users. Appendix 7 includes the Standard Provisions that are incorporated into each Water Supply Contract. The rules contain procedures to distribute irrigation water in a fair and equitable manner to the Water Users. The Standard Provisions establish, among other things, the formula to calculate the Water User's unit cost per AF of SWP water in the District, District billing procedures, and provides governance for the interpretation of Water Supply Contracts between the District and Water Users. The Standard Provisions also define a "Water User" as it relates to BWSD matters. Water Supply Contracts are the mechanism by which Water Users obtain a water supply from the District. The Water Supply Contract establishes, among other things, a Water User's Annual Entitlement of SWP water, a point-of-delivery (i.e., turnout), and delivery schedule.

BWSD follows the same general procedure for water ordering with its Water Users that KCWA requires of its Member Units, as well as what DWR requires of KCWA. Water Users are required to submit weekly orders showing the delivery rate (a 24-hour continuous uniform flow in gpm), required at each of the designated turnouts. District staff then converts Water Users cumulative orders from gpm to cfs prior to placing orders with KCWA. Change orders must be requested 48 hours in advance. Table 12 shows the variation of water orders and shut-off lead times. BWSD is also a member of the Westside District Water Authority (WDWA), who manages SGMA compliance and its landowners are members of the Westside Water Quality Coalition (WWQC), who manages compliance with the Irrigated Lands Regulatory Program (ILRP).

BWSD operates a centralized water ordering system**.** Water orders are placed via telephone, fax or email to the District office and are entered by either the O&M Superintendent or Administrative Assistant daily. Water Orders are then processed and a Water Project Report is generated and given to the canal operator (personnel who manage the water delivery to the Water Users), who coordinates deliveries based on demand and water flow capacity of the distribution system. The District operates a flexible "arranged demand" water delivery system, thus the canal operators' duties become less routine and more Water User oriented. There are no restrictions on how often a grower can request water, but the quantity of water taken during a season is restricted to the grower's water allocation (Table 13). The only restriction on maximum flowrate is the limitation of the delivery structures. At the discretion of the superintendent and/or manager, Water Users may operate their own turnouts given that instructions have been specified on the proper operation of valves. The privilege of operating turnouts will be withdrawn from any Water User who makes unauthorized turn-ons or turn-offs, sets delivery rate at turnouts different from that ordered, makes changes at times others than those prearranged in the Rules. Improper operation of turnouts would result in turnouts being locked and operated by District personnel only.

Water Users with micro irrigation systems may request irrigation water on an arranged demand (availability of water on request as consumed by the crop - typically from daily to every 2-3 days). Therefore, water order lead times may vary depending on the time of year, system capacity to move the water, and where water is needed in the system. For example, Water Users close to the water source, next to a large canal, and early in the season would have a greater probability of receiving water on short notice than Water Users at the end of the canal, away from the water source, and in the middle of the summer. The District's goal is to supply water to the Water User when the water is needed for the crop. As summarized in Table 12, BWSD delivers water to its Water Users using an on-demand and arranged demand schedule.

Table 12. Supplier Delivery System

Type	Check if Used	Percent of System Supplied
On Demand		
Modified Demand		
Rotation		
Other (flexible arranged demand schedule)	x	100

Table 13. Water Allocation Policy

	(Check if applicable)			Allocation	
Basis of Water Allocation	**Flow**	**Volume**	**Seasonal Allocations**	**Normal Year**	**Percent of Water Deliveries (%)**
Area within the service area					
Amount of land owned					
Riparian rights					
Other (Water supply contract amount)	*	x		2020	20% SWP Table A

Note:
* Some turnouts can be prorated on some days based upon delivery capacity of facilities serving them. Available delivery capacities of distribution facilities are shared in proportion to water supply contract amounts held by turnout operators.

Table 14. Actual Lead Times

Operations	Hours/Days
Water orders	0-48 hours
Water shut-off/changes	2 hours

2. Water delivery measurements or calculations

BWSD employs a variety of water measurement methods (**Table** 15). DWR operates and maintains the venturi flowmeters installed at each of District's three SWP delivery points (Bel 1A, Bel 3 and Bel 5). Measurements are recorded daily. Deliveries from District facilities are metered at each lateral and measured at each individual turnout by propeller flowmeters. The propeller meters read in both instantaneous flow and totalizer readings for volume. The District flowmeters are read at least twice a week and correlated to the daily flow rate and monthly total volume measured by DWR for the same time period.

Table 15. Water Delivery Measurements

Measurement Device	Frequency of Measurement (Days)	Frequency of Calibration (Months)	Frequency of Maintenance (Months)	Estimated Level of Accuracy (%)
Orifices (meter gates)				
Propeller Meters	cfs twice a week / AF monthly	As needed	As needed	<4%
Weirs				
Flumes				
Venturi Meters (i.e, DWR)	cfs and AF daily	As needed	As needed	<2%
Pump, Run Time				
Pump, KWH				
Other (e.g., some land owner operators have propeller meters)	cfs and AF daily	As needed	As needed	<4%

The District maintains software that allows the District to track daily water deliveries and water transactions within the District, calculate water costs and provide for a more standardized billing process. The software has also created a database of landowner information including cropping patterns, water transfers, water usage, property ownership, water contract information, and historical water use.

In 1995, the District installed and implemented a **S**upervisory **C**ontrol and **D**ata **A**cquisition (SCADA) system on its pump stations, Aqueduct Turnouts and at various locations along its distribution canals. The SCADA system gathers information, such as high water levels in the canals, transfers the information back to a central site, alerting the home station and operators that a problem has occurred. SCADA allows District staff to monitor and manage water levels within its distribution canals and in forebays of pumping plants thus minimizing spills and overflows. An added benefit is collecting, displaying, and storing real time pump efficiency (kwh/AF) and motor information (temperature, vibration, etc).

The DWR-owned **C**alifornia **I**rrigation **M**anagement **I**nformation **S**ystem (CIMIS) weather station located at Blackwell's Corner (CIMIS station (#54), gives landowner's real time and historical data reports. Data is retrieved each day including reference Evapotranspiration (ETo), solar radiation, net radiation, air temperature, soil temperature, vapor pressure/relative humidity, precipitation, and wind speed which can be viewed at anytime. Station #54 has been operational since October 19, 1986 and continues to gather data. CIMIS has helped farmers with irrigation scheduling, duration, quantity and other important factors since its development.

The District maintains delivery records for each turnout being used and maintains records of daily water orders made to the SWP. A grower's water use to date and remaining allocation is maintained and calculated in the District computerized water information system.

DWR maintains records of daily diversions to the District and records of all diversions, water quality, and storage operations related to the SWP. Operational reports are distributed weekly and monthly to the District and published annually in DWR Bulletin 132.

On average, operational losses account for less than 1% of the total deliveries in the District. Five (5) percent of the District's total annual contract supply (Table A) is withheld as "Operations Water" to cover operational losses. BWSD expended considerable resources in the early 2000s to purchase and install new open-flow and in-line flow meters at District facilities. This program decreased measured losses and metering accuracy considerably. Operations Water that exceeds actual annual operations losses is either sold to water users in the District or banked by the District to cover losses in dry years when the SWP allocation is low.

3. Water rate schedules and billing

A Water User's or "Buyer's" annual payment obligation for Entitlement water (Table 16) is comprised of several components. The components can be put into two general categories: 1) the cost of water, and 2) the cost to deliver water in the District. The cost of water is established for each acre-foot of water under a Water Supply Contract and varies slightly depending upon the Aqueduct Turnout from which deliveries are made (Table 17 and Table 18). Simply put, it is the cost of SWP water including SWP variable costs. The current base water toll rate is about $95-100 per AF.

The charge to deliver water in the District varies depending upon location in the District and includes, fixed costs, such as capital, O&M, etc., and variable costs such as District pumping (i.e., power) costs. District power costs range from about $20 to $37 per AF. SWP variable costs are about $24 per AF at the Aqueduct Turnout.

The unit cost per AF is dependent upon point-of-delivery location, capital obligations, and pumping lift. Current unit rates range from approximately $125 per AF to $180 per AF.

In October, the District establishes water tolls for the ensuing year based upon the costs and charges the District expects to incur in delivering water. Notice of the Water User's annual payment obligation for the ensuing year is sent out on or before November 15th. Sixty-five percent of the annual obligation is payable by December 15. The remaining thirty-five percent is due on May 15th of the ensuing year. Adjustments related to prior years deliveries and Water Charges are performed independent of the annual billings.

Table 16. Water Rate Basis

Water Charge Basis	Check if Used	Percent of Water Deliveries (%)	Description
Volume of Water Delivered			
Rate and Duration of Water Delivered			Per AF basis
Acre			
Crop			
Land Assessment			
Other			
Landowner contract by ac-ft	x	100	AF

Table 17. Rate Structure

Type of Billing	Check if Used	Description
Declining		
Uniform		
Increasing Block Rate		
Other (Variable rate)	x	$/AF (based on point-of-delivery location, capital obligations, and pumping lift)

Table 18. 2020 Belridge Water Storage District Entitlement Water Charges

Entitlement Per Acre-Foot											
	Zone 1	Zone 2	Zone 3	Zone 5-2A1	Zone 5-2A2	Zone 5-2B1	Zone 5-2B2	Zone 5-3	Zone 6	Zone 7	Industrial
Capital	$ -	$ -	$ -	$ 18.63	$ 14.81	$ -	$ -	$ -	$ -	$ -	$ -
KCWA	$131.76	$131.76	$131.76	$ 123.84	$ 123.84	$ 123.84	$ 123.84	$123.84	$131.76	$131.76	$123.84
State VAR	$ 22.49	$ 22.49	$ 22.49	$ 22.49	$ 22.49	$ 22.49	$ 22.49	$ 22.49	$ 22.49	$ 22.49	$ 22.49
OVERHEAD	$ 11.92	$ 11.92	$ 11.92	$ 11.92	$ 11.92	$ 11.92	$ 11.92	$ 11.92	$ 11.92	$ 11.92	$ 11.92
O&M	$ 15.68	$ 15.68	$ 15.68	$ 2.27	$ 2.27	$ 6.01	$ 6.01	$ 6.01	$ 15.68	$ 15.68	$ -
P.S. 1-A	$ 24.24	$ 24.24	$ 24.24	$ -	$ -	$ -	$ -	$ -	$ 24.24	$ 24.24	$ -
P.S. 1-B	$ -	$ 16.52	$ -	$ -	$ -	$ -	$ -	$ -	$ 16.52	$ 16.52	$ -
Total	$206.09	$222.61	$206.09	$ 179.15	$ 175.33	$ 164.26	$ 164.26	$164.26	$222.61	$222.61	$158.25
Top Contract Water Per Acre-Foot											
	Zone 1	Zone 2	Zone 3	Zone 5-2A1	Zone 5-2A2	Zone 5-2B1	Zone 5-2B2	Zone 5-3	Zone 6	Zone 7	Industrial
Capital	$ -	$ -	$ -	$ 18.63	$ 14.81	$ -	$ -	$ -	$ -	$ -	$ -
KCWA	$131.76	$161.76	$131.76	$ 123.84	$ 123.84	$ 123.84	$ 123.84	$123.84	$131.76	$131.76	$ -
State VAR	$ 22.49	$ 22.49	$ 22.49	$ 22.49	$ 22.49	$ 22.49	$ 22.49	$ 22.49	$ 22.49	$ 22.49	$ -
OVERHEAD	$ 11.92	$ 11.92	$ 11.92	$ 11.92	$ 11.92	$ 11.92	$ 11.92	$ 11.92	$ 11.92	$ 11.92	$ -
O&M	$ 15.68	$ 15.68	$ 15.68	$ 2.27	$ 2.27	$ 6.01	$ 6.01	$ 6.01	$ 15.68	$ 15.68	$ -
P.S. 1-A	$ 24.24	$ 24.24	$ 24.24	$ -	$ -	$ -	$ -	$ -	$ 24.24	$ 24.24	$ -
P.S. 1-B	$ -	$ 16.52	$ -	$ -	$ -	$ -	$ -	$ -	$ 16.52	$ 16.52	$ -
Total	$206.09	$252.61	$206.09	$ 179.15	$ 175.33	$ 164.26	$ 164.26	$164.26	$222.61	$222.61	$ -

Table 19. Frequency of Billing

Frequency	Check if Used
Weekly	
Biweekly	
Monthly	
Bimonthly	
Semiannually (35% by Dec 15, 65% by May 15)	x
Annually	

4. Drought Management Plan and Water Shortage Allocation Policy

As described in Section IV the District relies on water transfers, supplemental water purchases, and groundwater banking programs as its primary mechanism for enduring periods of drought. Unlike farmers in other areas who can fallow lands during periods of drought, farmers in the District have permanent plantings (trees and vines) that require a minimum water supply to keep alive. In water short years these farmers use deficit irrigation (the application of water below full crop-water requirements) to reduce irrigation water use. This can result in reduced crop yields and, if taken to the extreme, no crop yield and long-term damage.

Determining Drought Severity

The District's primary water source is imported surface water supplies from the SWP. In the fall of each year, DWR operations staff review current Project storage and projected deliveries through the end of the year, and develop allocation projections for the following year based on a range of forecasted hydrology. DWR declares the initial allocation forecast for the following year at the end of November; this allocation is adjusted up or down as hydrology dictates.

District management maintains a close relationship with Kern County Water Agency and DWR operations staff and uses these allocation projections to determine water supply availability and level of drought severity. These projections are conveyed to District landowners for use in planning their farming operations and projecting supplemental water needs.

Water Shortage Allocation

In water- short years (less than 100% allocation), a water user's annual entitlement will be reduced pro-rata in the proportion the water user's annual entitlement bears to the District's total. Table 20 summarizes how decreased water supplies are allocated.

Alternative Water Supplies

As discussed in Section IV, the District relies on banking, transfers, and exchanges to supplement its annual water supply. At all but the higher SWP water allocations, the District is proactive in seeking and securing supplemental water supplies. Since 2009, the District has collaborated in securing additional water with four other agricultural water districts that also rely heavily on the SWP for their water supplies. The other districts are Berrenda Mesa Water District, Dudley Ridge Water District, Lost Hills Water District, and Wheeler Ridge–Maricopa Water Storage District. Due to their common location on the Westside of the southern San Joaquin Valley, the five districts are informally referred to at the Westside Districts or Westside 5.

Coordination and Collaboration

In addition to the Westside 5, the District coordinates with neighboring local districts where there are common landholders to utilize limited supplies in the most beneficial manner.

Revenues and Expenditures

The majority of the District's expenses are DWR charges that are due regardless of the amount of water delivered. As the SWP allocation gets reduced, the actual cost of the water to the water users increases proportionately. For example, the District spent $13,190,844 million for its 2020 SWP water supply. At 100% allocation, this would equate to approximately $156/AF, but at the 2020 allocation of 20%, the unit charge rises to over $661/AF.

In addition, at lower SWP allocations, the market for supplemental water becomes more active, which results in higher unit costs to the water users.