



Cawelo Water District

AGRICULTURAL WATER MANAGEMENT PLAN

February 2014



CAWELO WATER DISTRICT

AGRICULTURAL WATER MANAGEMENT PLAN

SUBMITTED TO THE
CALIFORNIA DEPARTMENT OF WATER RESOURCES
IN ACCORDANCE WITH THE
WATER CONSERVATION BILL OF 2009 (SBx7-7)

February 2014
SECTION I

Table of Contents

I Table of Contents	1
II List of Figures	3
III List of Tables	4
IV List of Acronyms	6
V DWR Agricultural Water Management Plan Checklist	7
1 Introduction	13
1.1 Overview	13
1.2 Purpose	15
1.3 Description of Previous Water Management Activities	16
1.4 Coordination Activities	17
1.5 Plan Adoption and Submittal	18
2 The District	19
2.1 Organization and Size of Service Area	19
2.2 Location of the Service Area	20
2.3 District Water Management Facilities	21
2.4 Terrain and Soils	30
2.5 Climate	33
2.6 Operational Characteristics	34
2.7 Water Delivery Measurements or Calculations	37
2.8 Water Rate Schedules and Billing	38
2.9 Water Shortage Allocation Policies	40
2.10 Basis for Reporting Water Quantities	41
3 Quantification of District Water Uses	42
3.1 Agricultural Water Use	42
3.2 Environmental Water Use	45
3.3 Recreational Water Use	46
3.4 Municipal and Industrial Water Use	46
3.5 Groundwater Recharge Use	46
3.6 Transfer and Exchange Use	48
3.7 Other Water Use	49
3.8 Projected Water Use	49
4 Quantification and Quality Assessment of District Water Resources	51
4.1 Surface Water Supply	51
4.2 Groundwater Supply	55
4.3 Other Water Supplies	59
4.4 Drainage from the Surface Area	59
4.5 Water Supply Quality	60
4.6 Water Quality Monitoring Practices	61

5 Water Accounting and Water Supply Reliability	63
5.1 Quantification of Water Supplies	63
5.2 Quantification of Water Uses	66
5.3 Overall Water Budget	68
5.4 Future Water Supply Reliability	70
6 Analysis of the Effects of Climate Change	72
6.1 Effects of Climate Change on Water Supply	72
6.2 Response to Effects on Agriculture’s Water Demand	73
6.3 Response to Effects of Climate Change	74
7 Water Use Efficiency Information	75
7.1 EWMP Implementation and Reporting	75
7.2 Documentation for Non-Implemented EWMPs	84
8 Supporting Agricultural Water Measurement Regulation Documentation	85
8.1 Description of Water Measurement Best Professional Practices	85
8.2 Engineer Certification and Apportionment	86
8.3 Documentation of Water Measurement Conversion to Volume	86
8.4 Legal Certification and Apportionment (Access to Farm-gates)	87
8.5 Device Corrective Action Plan	87
8.6 Farm Gate Measurement and Device Accuracy Compliance	88
9 List of References	92

Appendices

A Public Hearing Notice – Proof of Publication

B Notification Letters

C Resolution of AWMP Adoption

D Cawelo Water District: Rules and Regulations for Distribution and Use of Water

SECTION II

List of Figures

1 Management Area and Neighboring Water Agencies	14
2 Facilities and Water Service Areas	23
3A District Pump Station "A"	24
3B District Pump Station "B"	24
4 District Reservoir "B", Location of Oil Produced Water Blending	25
5 SWP Water Delivery Routes to Cawelo	29
6 Generalized Soil Texture Map	32
7 Typical Farm Turnout	37
8 Map of District in Relation to Groundwater Basin(s)	56
9 Typical Cawelo District-Owned Groundwater Well	58

SECTION III

List of Tables

IA AWMP Water Code Requirement Checklist	7
IB AWMP Water Code Requirement Checklist (Continued)	8
IC AWMP Water Code Requirement Checklist (Continued)	9
ID AWMP Water Code Requirement Checklist (Continued)	10
IE AWMP Water Code Requirement Checklist (Continued)	11
IF AWMP Water Code Requirement Checklist (Continued)	12
1 Summary of Plan Coordination, Adoption and Submittal Activities	18
2 Water Supplier History and Size	20
3 Expected Changes to the Service Area	21
4 Water Conveyance and Delivery Systems	22
5 Water Supplier Reservoirs	26
6 Tailwater/Operational Outflow Recovery System	27
7 Landscape Characteristics	31
8 Summary Climate Characteristics	33
9 Detailed Climate Characteristics	34
10 Supplier Delivery System	35
11 Water Allocation System	36
12 Actual Lead Times	36
13 Water Delivery Measurements	38
14 Water Rate Basis	39
15 Rate Structure	39
16 Frequency of Billing	39
17 Decreased Water Supply Allocation	40
18 Enforcement Methods of Allocation Policies	40
19 Representative Year	41
20 Agricultural Water Use for 2009 (AF)	42
21 Agricultural Crop Data for 2009 (AF)	43
22 District Irrigated Acreage (Acres)	44
23 Multiple Crop Information for 2009 (AF)	45
24 Environmental Water Uses for 2009 (AF)	45
25 Recreational Water Uses for 2009 (AF)	46
26 Municipal/Industrial Water Uses for 2009 (AF)	46
27 Groundwater Recharge Water Uses for 2009 (AF)	47
28 Transfers and Exchanges Water Uses for 2009 (AF)	49
29 Other Water Uses for 2009 (AF)	49
30 Surface Water Supplies (AF)	54

31 Restrictions on Water Sources	55
32 Groundwater Basins	55
33 Groundwater Management Plan	57
34 Groundwater Supplies (AF)	59
35 Drainage Discharges	60
36 Source Water Supply Quality Assessment for 2012	60
37 Drainage Reuse Effects	61
38 Water Quality Monitoring Practices	62
39 Water Quality Monitoring Programs for Surface/Sub-Surface Drainage	62
40 Surface and Other Water Supplies for 2009 (AF)	64
41 Groundwater Supplies Summary for 2009 (AF)	65
42 Effective Precipitation Summary for 2009 (AF)	66
43 Applied Water for 2009 (AF)	66
44 Quantify Water Uses for 2009 (AF)	67
45 Quantify Water Leaving the District for 2009 (AF)	68
46 Irrecoverable Water Losses for 2009 (AF)	68
47 Quantify Water Supplies for 2009 (AF)	69
48 Budget Summary for 2009 (AF)	69
49A Report of EWMPs	76
49B Report of EWMPs (Continued)	77
49C Report of EWMPs (Continued)	78
49D Report of EWMPs (Continued)	79
49E Report of EWMPs (Continued)	80
50A Schedule to Implement EWMPs	81
50B Schedule to Implement EWMPs (Continued)	82
51 Report of EWMPs Efficiency Improvements	83
52 Non-Implemented EWMP Documentation	84

SECTION IV

List of Acronyms

AF	acre-feet
AWMC	Agricultural Water Management Council
AWCP	Agricultural Water Conservation Plan
AWMP	Agricultural Water Management Plan
cfs	cubic feet per second
CIMIS	California Irrigation Management Information System
CVC	Cross Valley Canal
CVP	Central Valley Project
CVRWQCB	Central Valley Regional Water Quality Control Board
CWD	Cawelo Water District
DWR	Department of Water Resources
EPA	U.S. Environmental Protection Agency
ET	Evapotranspiration
ET _c	Crop Evapotranspiration
ET _o	Reference Evapotranspiration
EWMP	Efficient Water Management Practice
ID	Irrigation District
ILRP	Irrigated Lands Regulatory Program
ITRC	Irrigation Training & Research Center (Cal Poly)
GWMP	Groundwater Management Plan
KCWA	Kern County Water Agency
KRWCA	Kern River Watershed Coalition Authority
M&I	Municipal and Industrial
MOU	Memorandum of Understanding
NPDES	National Pollutant Discharge Elimination System (EPA)
OCAP	Operations Criteria and Plan for CVP Deliveries (USBR)
ppm	parts per million
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
SBx7-7	Water Conservation Act of 2009
SCADA	Supervisory Control and Data Acquisition
SWP	State Water Project
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
WSD	Water Storage District

SECTION V

DWR Agricultural Water Management Plan Checklist

Table I is the plan checklist which is set forth in Section 2.1 the *DWR Guidebook to Assist Agricultural Water Suppliers to Prepare a 2012 Agricultural Water Management Plan*.

**TABLE IA
AWMP WATER CODE REQUIREMENT CHECKLIST**

AWMP Location	Guidebook Location	Description	Water Code Section (or other, as identified)
S.1.1	1.4	AWMP Required?	10820, 10608.12
S.2.1	1.4	At least 25,000 irrigated acres or	10853
N/A	1.4	Less than 25,000 irrigated acres and funding provided.	10853
S.1	1.4	Initial AWMP prepared and adopted by December 31, 2012?	10820(a)
	1.4	December 31, 2015 update.	10820(a)
S.1	1.4	5-year cycle update.	10820(a)
S.1	1.4	New agricultural water supplier after December 31, 2012 – AWMP prepared and adopted within 1 year.	10820(b)
S.7.1	1.5, 4.2	1999 AWMC MOU: Report on EWMP implemented or scheduled for implementation included.	10827
S.1.1	1.5, 5	USBR water management/conservation plan:	10828(a)
S.1.1	1.5, 5.1	Adopted and submitted to USBR within the previous four years, AND	10828(a)(1)
S.1.1	1.5, 5.1	The USBR has accepted the water management/conservation plan as adequate.	10828(a)(2)
N/A	1.4	UWMP or participation in area wide, regional, watershed, or basin wide water management planning: does the plan meet requirements of SBx7-7 2.8 (use checklist)	10829
S.1.3	3.1 A	Description of previous water management activities.	10826(d)

TABLE IB
AWMP WATER CODE REQUIREMENT CHECKLIST (CONTINUED)

AWMP Location	Guidebook Location	Description	Water Code Section (or other, as identified)
S.1.4	3.1 B.1	Was each city or county within which supplier provides water supplies notified that the agricultural water supplier will be preparing or amending a plan?	10821(a)
S.1.4	3.2 B.2	Was the proposed plan available for public inspection prior to plan adoption?	10841
APP. A	3.1 B.2	Publically-owned supplier: Prior to the hearing, was the notice of the time and place of hearing published within the jurisdiction of the publicly owned agricultural water supplier in accordance with Government Code 6066?	10841
APP. A	3.1 B.2	14 days notification for public hearing?	GC 6066
APP. B	3.1 B.2	Two publications in newspaper within those 14 days?	GC 6066
APP. B	3.1 B.2	At least 5 days between publications? (not including publication date)	GC 6066
APP. A	3.1 B.2	Privately-owned supplier: was equivalent notice within its service area and reasonably equivalent opportunity that would otherwise be afforded through a public hearing process provided?	10841
S.1.5	3.1 C.1	After hearing/equivalent notice, was the plan adopted as prepared or as modified during or after the hearing?	10841
S.1.4	3.1 C.2	Was a copy of the AWMP, amendments, or changes, submitted to the entities below, no later than 30 days after the adoption?	10843(a)
S.1.4	3.1 C.2	The department.	10843(b)(1)
S.1.4	3.1 C.2	Any city, county, or city and county within which the agricultural water supplier provides water supplies.	10843(b)(2)

**TABLE IC
AWMP WATER CODE REQUIREMENT CHECKLIST (CONTINUED)**

AWMP Location	Guidebook Location	Description	Water Code Section (or other, as identified)
S.1.4	3.1 C.2	Any groundwater management entity within which jurisdiction the agricultural water supplier extracts or provides water supplies.	10843(b)(3)
S.1.4	3.1 C.2	Any urban water supplier within which jurisdiction the agricultural water supplier provides water supplies.	10843(b)(4)
S.1.4	3.1 C.2	Any city or county library within which jurisdiction the agricultural water supplier provides water supplies.	10843(b)(5)
S.1.4	3.1 C.2	The California State Library.	10843(b)(6)
S.1.4	3.1 C.2	Any local agency formation commission serving a county within which the agricultural water supplier provides water supplies.	10843(b)(7)
S 1.5	3.1 C.3	Adopted AWMP availability.	10844
N/A	3.1 C.3	Was the AWMP available for public review on the agricultural water supplier's Internet Web site within 30 days of adoption?	10844(a)
S.1.5	3.1 C.3	If no Internet Web site, was an electronic copy of the AWMP submitted to DWR within 30 days of adoption?	10844(b)
	3.1 D.1	Implement the AWMP in accordance with the schedule set forth in its plan, as determined by the governing body of the agricultural water supplier.	10842
S.2	3.2	Description of the agricultural water supplier and service area including:	10826(a)
S.2.1	3.2 A.1	Size of the service area.	10826(a)(1)
S.2.2, S.2.3	3.2 A.2	Location of the service area and its water management facilities.	10826(a)(2)
S 2.4	3.2 A.3	Terrain and soils.	10826(a)(3)
S 2.5	3.2 A.4	Climate.	10826(a)(4)
S 2.6	3.2 B.1	Operating rules and regulations.	10826(a)(5)

TABLE ID
AWMP WATER CODE REQUIREMENT CHECKLIST (CONTINUED)

AWMP Location	Guidebook Location	Description	Water Code Section (or other, as identified)
S.2.7	3.2 B.2	Water delivery measurements or calculations.	10826(a)(6)
S.2.8	3.2 B.3	Water rate schedules and billing.	10826(a)(7)
S.2.9	3.2 B.4	Water shortage allocation policies.	10826(a)(8)
S.3	3.3	Water uses within the service area, including all of the following:	10826(b)(5)
S.3.1	3.3 A	Agricultural.	10826(b)(5)(A)
S.3.2	3.3 B	Environmental.	10826(b)(5)(B)
S.3.3	3.3 C	Recreational.	10826(b)(5)(C)
S.3.4	3.3 D	Municipal and industrial.	10826(b)(5)(D)
S.3.5	3.3 E	Groundwater recharge.	10826(b)(5)(E)
S.3.6	3.3 F	Transfers and exchanges.	10826(b)(5)(F)
S.3.7	3.3 G	Other water uses.	10826(b)(5)(G)
S.4	3.4 A	Description of the quantity of agricultural water supplier's supplies as:	10826(b)
S.4.1	3.4 A.1	Surface water supply.	10826(b)(1)
S.4.2	3.4 A.2	Groundwater supply.	10826(b)(2)
S.4.3	3.4 A.3	Other water supplies.	10826(b)(3)
S.4.4	3.4 A.4	Drainage from the water supplier's service area.	10826(b)(6)
S.4	3.4 B	Description of the quality of agricultural waters suppliers supplies as:	10826(b)
S.4.5	3.4 B.1	Surface water supply.	10826(b)(1)
S.4.5	3.4 B.2	Groundwater supply.	10826(b)(2)
S.4.5	3.4 B.3	Other water supplies.	10826(b)(3)
S.4.6	3.4 C	Source water quality monitoring practices.	10826(b)(4)
S.4.6	3.4 B.4	Drainage from the water supplier's service area.	10826(b)(6)
S.5	3.5	Description of water accounting, including all of the following:	10826(b)(7)
S.5.1	3.5 A	Quantifying the water supplier's water supplies.	10826(b)(7)(A)
S.5.2	3.5 B	Tabulating water uses.	10826(b)(7)(B)

TABLE IE
AWMP WATER CODE REQUIREMENT CHECKLIST (CONTINUED)

AWMP Location	Guidebook Location	Description	Water Code Section (or other, as identified)
S.5.3	3.5 C	Overall water budget.	10826(b)(7)(C)
S.5.4	3.5 D	Description of water supply reliability.	10826(b)(8)
S.6.1	3.6	Analysis of climate change effect on future water supplies analysis.	10826(c)
S.1	3.7	Water use efficiency information required pursuant to Section 10608.48.	10826(e)
S.7.1	3.7A	Implement efficient water management practices (EWMPs).	10608.48(a)
S.7.1	3.7 A.1	Implement Critical EWMP: Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10 and to implement paragraph (2).	10608.48(b)
S.7.1	3.7 A.1	Implement Critical EWMP: Adopt a pricing structure for water customers based at least in part on quantity delivered.	10608.48(c)
S.7.1	3.7 A.2	Implement additional locally cost-effective and technically feasible EWMPs.	10608.48(c)
S.7.2	3.7 B	If applicable, document (in the report) the determination that EWMPs are not locally cost-effective or technically feasible.	10608.48(d)
S.7.1	3.7 A	Include a report on which EWMPs have been implemented and planned to be implemented.	10608.48(d)
S.7.1	3.7 A	Include (in the report) an estimate of the water use efficiency improvements that have occurred since the last report, and an estimate of the water use efficiency improvements estimated to occur five and 10 years in the future.	10608.48(d)
	5	USBR water management/conservation plan may meet requirements for EWMPs.	10608.48(f)

TABLE IF
AWMP WATER CODE REQUIREMENT CHECKLIST (CONTINUED)

AWMP Location	Guidebook Location	Description	Water Code Section (or other, as identified)
S.8.4	6 A	Lack of legal access certification (if water measuring not at farm gate or delivery point).	CCR §597.3(b)(2)(A)
N/A	6 B	Lack of technical feasibility (if water measuring not at farm gate or delivery point).	CCR §597.3(b)(1)(B), §597.3(b)(2)(B)
N/A	6 A, 6 B	Delivery apportioning methodology (if water measuring not at farm gate or delivery point).	CCR §597.3.b(2)(C)
S.8.1	6 C	Description of water measurement BPP.	CCR §597.4(e)(2)
S.2.7, S.8.6D	6 D	Conversion of measurement to volume.	CCR §597.4(e)(3)
S.8	6 E	Existing water measurement device corrective action plan? (if applicable, including schedule, budget and finance plan)	CCR §597.4(e)(4)

SECTION 1

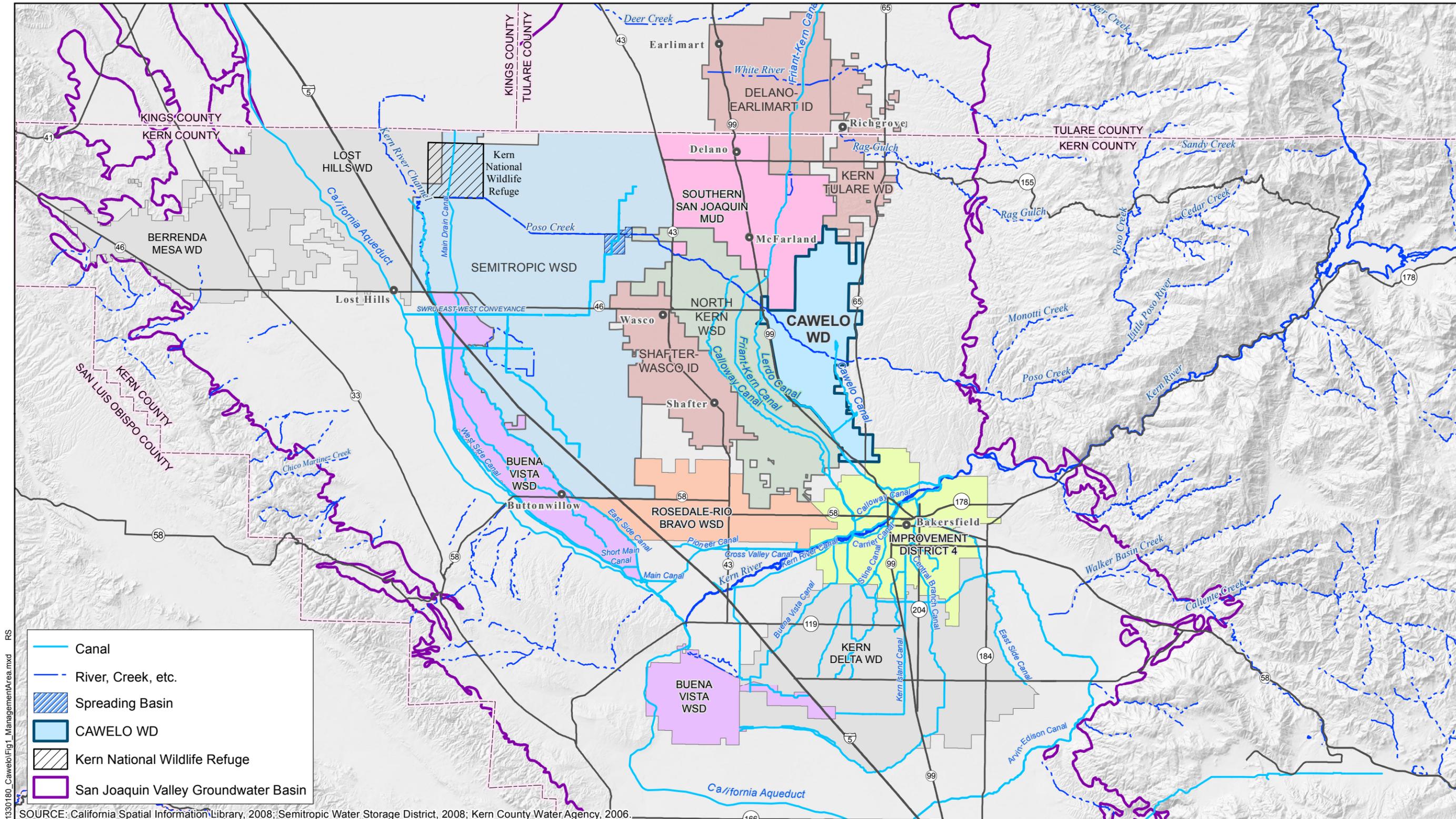
Introduction

1.1 Overview

The Agricultural Water Management Plan (AWMP) involves the planning, the implementation of the plan, and the operations required to provide an adequate, reliable and acceptable agricultural water supply for the landowners of the Cawelo Water District (Cawelo, the District, or CWD). The District's water supplies are defined as water which is delivered to Cawelo's water management facilities for the purposes of agricultural, environmental, municipal and industrial, groundwater recharge, transfer and exchange, or irrigation water uses. Agricultural water supply, primarily for crop irrigation, includes the volume of water delivered to the District's service area from both surface water and groundwater sources. Figure 1 is a map showing the District's primary water management facilities as well as the location of the service area.

This document conforms to the framework presented in *A Guidebook to Assist Agricultural Water Suppliers to Prepare a 2012 Agricultural Water Management Plan* (Guidebook) that was issued by the California Department of Water Resources (DWR) on October 24, 2012 to aid water suppliers in preparing AWMPs in accordance with the requirements of SBx7-7.

Much of this document is based on information contained in the District's *2010 Water Conservation Plan, Warren Act Contract*, which was submitted to the U.S. Bureau of Reclamation (USBR) pursuant to the transfer and conveyance regulations of the Reclamation Law of 1902 (ch. 1093, 32 Stat. 388), specifically the enacted sections 523 to 525 popularly known as the "Warren Act". The Water Conservation Plan was an updated version of the District's *2005 Agricultural Water Conservation Plan* (AWCP) which was submitted to the California State Water Resources Control Board (SWRCB). The AWCP was intended as a guide for the development of additional water sources, along with the efficient distribution and use of all of the District's water supplies.



- Canal
- - - River, Creek, etc.
- Spreading Basin
- CAWELO WD
- Kern National Wildlife Refuge
- San Joaquin Valley Groundwater Basin

SOURCE: California Spatial Information Library, 2008; Semitropic Water Storage District, 2008; Kern County Water Agency, 2006.



Cawelo Water District
Kern County, California



MANAGEMENT AREA AND
NEIGHBORING WATER AGENCIES

11-Nov-2013 Z:\Projects\1330180_Cawelo\Fig1_ManagementArea.mxd RS

1.2 Purpose

The purpose of the AWMP is to document the existing water management activities of the District and describe proposed programs and activities. The requirements introduced by SBx7-7 are intended to encourage agricultural water suppliers to assess current efficient water management practices, to evaluate additional practices that may conserve water, and to provide for the accurate measurement of water. The AWMP is used to document implemented, or proposed, monitoring and management programs designed to improve water use efficiency.

SBx7-7 Efficient Water Management Practices

Included in Section 7 of this plan is an analysis of each of the Efficient Water Management Practices (EWMPs) presented in the Guidebook. The EWMPs are grouped into the following categories:

Critical Efficient Water Management Practices

1. Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10 and to implement paragraph (2) of the legislation.
2. Adopt a pricing structure for water customers based at least in part on quantity delivered.

Conditional Efficient Water Management Practices

1. Facilitation of alternative land use for lands with exceptionally high water duties or whose irrigation contributes to significant problems, including problem drainage.
2. Facilitation of use of available recycled water that otherwise would not be used beneficially, meets health and safety criteria, and does not harm crops or soils. The use of recycled urban wastewater can be an important element in overall water management.
3. Facilitate the financing of capital improvements for on-farm irrigation systems.
4. Implement an incentive pricing structure that promotes one or more of the following goals:
 - A. More efficient water use at the farm level such that it reduces waste;
 - B. Conjunctive use of groundwater;
 - C. Appropriate increase of groundwater recharge;
 - D. Reduction in problem drainage;
 - E. Improved management of environmental resources, and

- F. Effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.
5. Expand lined or piped distribution systems, construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance, and reduce seepage.
6. Increase flexibility in water ordering by, and delivered to, water customers within operational limits.
7. Construct and operate supplier operational outflow and tailwater systems.
8. Increase planned conjunctive use of surface water and groundwater within the supplier service area.
9. Automate canal control devices.
10. Facilitate or promote customer pump testing and evaluation.
11. Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress reports.
12. Provide for the availability of water management services to water users. These services may include, but are not limited to, all of the following:
 - A. On-farm irrigation and drainage system evaluations;
 - B. Normal year and real-time irrigation scheduling and crop evapotranspiration information;
 - C. Surface water, groundwater, and drainage water quantity and quality data, and
 - D. Agricultural water management educational programs and materials for irrigators.
13. Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional change to allow more flexible water deliveries and storage.
14. Evaluate and improve the efficiencies of the suppliers' pumps.

1.3 Description of Previous Water Management Activities

Listed below is the District's Water management activities either previously implemented or now being implemented. Information regarding the implementation of each EWMP is also presented in Section 7 of this AWMP.

- Encourage and facilitate the construction of irrigation distribution system facilities to lands which rely exclusively on pumped groundwater for the purpose of expanding the District's capability to deliver surface water in lieu of groundwater pumping.

- Deliver surface water in lieu of groundwater pumping when practicable; use water pricing, as appropriate, to encourage such deliveries.
- Maximize use of available surface water supplies for irrigation; use water pricing, water exchanges and water banking as appropriate.
- Develop water exchanges and/or water banking arrangements that result in a net increase in District water supplies, when practicable.
- Encourage and support neighboring water agencies with the importation of available surface water supplies.
- Recharge the aquifer with surface water of quality suitable for irrigation.
- Promote water use efficiency through financial support of the DWR Mobile Laboratory, encouraging landowners to take advantage of this resource by requesting field irrigation evaluations, and encouraging landowners to apply for financial assistance for on-farm irrigation application efficiency improvements through existing federal and state programs.
- Actively participate in local water resource management forums, including the Poso Creek Integrated Regional Water Management Plan (Poso Creek IRWM Plan) as a member of the Regional Water Management Group (RWMG), the Kern River Watershed Coalition Authority (KRWCA), and the Kern Groundwater Management Committee.
- Develop the District's website to include data on groundwater levels and quality.
- Encourage the installation of flow meters on private wells.
- Serve as a Monitoring Entity to maintain reporting compliance with the California Statewide Groundwater Elevation Monitoring (CASGEM) program.
- Identify wells monitored by DWR and consolidate water level readings from these wells with readings from wells measured by Cawelo.
- Identify wells which are sampled for water quality by DWR.

1.4 Coordination Activities

SBx7-7 does not specify how much advance notice is required to cities and counties regarding plan preparation, does not require notification to any other agency(s), and does not require that comments from any city, county or other agency must be solicited and considered. To avoid any complications in complying with these provisions, Cawelo notified the entities as shown in Table 1. Public participation activities associated with preparation of the AWMP are also presented.

TABLE 1
SUMMARY OF PLAN COORDINATION, ADOPTION AND SUBMITTAL ACTIVITIES

Interested Parties	Notified (Prep)	Assisted	Rec. Draft	Notified (Public Meetings)	Notified (Adopted)	Copy of Plan
Kern County Water Agency	X			X		
California Dept. of Water Resources	X			X		X
City of Bakersfield	X			X		X
North Kern WSD	X			X		
Semitropic WSD	X			X		
Shafter-Wasco ID	X			X		
Kern-Tulare WD	X			X		
Delano-Earlimart ID	X			X		
Rosedale-Rio Bravo WSD	X			X		
Southern San Joaquin MUD	X			X		
California State Library						X

1.5 Plan Adoption and Submittal

The AWMP is used by agricultural water suppliers to assess compliance with the requirements of the SBx7-7 guidelines (Steinberg Statute of 2009), the associated Agricultural Water Management Planning Act (Section I, Part 2.8, Division 6 of the Water Code), and the subsequent Agricultural Water Measurement Regulation requirements (described in Title 23 California Code of regulations). The AWMP describes the District's status with regard to implementation of two new mandatory EWMPs and includes a discussion of the potential impacts of climate change on District operations.

The AWMP, as adopted by the District following a public hearing, will be available from the District by request. A copy of the plan will be submitted to the DWR within 30 days of adoption by the District.

SECTION 2

The District

2.1 Organization and Size of Service Area

The District was formed in 1965 under the provisions of Division 13 of the Water Code of the State of California for the purpose of obtaining a “supplemental or partial water supply” for irrigation. In other words, the District was formed for the purpose of obtaining water supplies to supplement the pumping of groundwater for irrigation. Prior to formation of the District, water for irrigation was obtained almost exclusively from groundwater sources, resulting in a decline in groundwater levels averaging about ten feet per year. At the time the District was formed, approximately 38,200 acres within the District were under full irrigation. Although the total number of irrigated acres has since decreased, the District still encompasses an area of nearly 45,000 acres.

The District provided a public entity for entering a contract for the importation of supplemental surface water from the State Water Project through the Kern County Water Agency (KCWA or the Agency). The KCWA was formed to contract with the State of California for State Water Project (SWP) water to be delivered through the California Aqueduct. The District began surface water deliveries in February of 1976. In addition to SWP supplies, other water sources include the Kern River water, the Friant Division of the Central Valley Project (CVP) water, Poso Creek, and water recycled from local oil extraction operations. These sources of supply have been used to supplement groundwater pumped in the District.

Cawelo has based its irrigation distribution system on conjunctive management of its surface water and groundwater resources. The District’s distribution system and service areas are shown on Figure 2. The District relies on conjunctive management to ensure the long-term sustainability of its resources. In addition, the District coordinates its activities with neighboring districts and continually reviews and modifies its management practices to preserve and enhance the groundwater resources for the benefit of its landowners. Table 2 provides an overview of the District history and size.

**TABLE 2
WATER SUPPLIER HISTORY AND SIZE**

Date of Formation	February 16, 1965
Source(s) of Water	
Federally Regulated Water ⁽¹⁾	X
State (SWP) Regulated Water	X
Local Surface Water ⁽²⁾	X
Local Groundwater	X
Gross Acreage at Time of Formation	44,700
Gross Acreage - Current Service Area (2012)	33,071
Current Irrigated Acreage (2013)⁽³⁾	37,750

(1) Occasional water supplies from CVP.

(2) Primarily Kern River water supplies delivered to District, however, Poso Creek is also an infrequent source of local surface water.

(3) Includes irrigated acreage outside of District's "service area" but within the District's boundary. This area is primarily reliant on groundwater resources but does occasionally receive surface water in particularly "wet" years.

The District is governed by a five-member Board of Directors elected by the District Voters. Each member represents a geographical area within the District known as a division.

2.2 Location of the Service Area

Cawelo is located in the north-central portion of Kern County, between U.S. Highway 99 on the west and State Highway 65 on the east, Oildale on the south and the community of McFarland on the north. Figure 1 illustrates the District location within the State and Kern County. Neighboring irrigation districts include North Kern Water Storage District (North Kern WSD) to the west and Kern-Tulare Water District (Kern-Tulare WD) to the north, with the Southern San Joaquin Municipal Utilities District (SSJMUD) to the north-northwest. Poso Creek traverses Cawelo about midway between the District's northern and southern boundaries.

Farm lands in Cawelo are approximately five miles or more from any urban areas, such as the Cities of Bakersfield and McFarland, and combined with the topographical makeup of the service area, there is little to no interest to convert these lands to urban uses. Urbanization is occurring throughout Kern County and other water districts have been facing this issue to a far greater extent. The current irrigated land area within the

District is expected to remain relatively stable for the foreseeable future (reference Table 3). However, there is potential for some minor growth in irrigated acreage since there are undeveloped or un-irrigated lands within the District that could be converted to farmland.

**TABLE 3
EXPECTED CHANGES TO THE SERVICE AREA**

Change to Service Area	Estimate of Magnitude	Cause of Change	Effect on Water Supplier
Reduction (Service Area)	Negligible	Urbanization	No substantive impact.
Increase (Service Area)	Negligible		None
Reduction (Irrigated Area)	Negligible		None

2.3 District Water Management Facilities

The District has constructed extensive facilities for the purpose of conveyance and distribution of imported surface water supplies within the District. These project facilities include canals, pipelines, pumping plants, and reservoirs. To round out the District's conjunctive-use program, groundwater recharge facilities and deep wells have also been constructed. In addition to District-owned facilities, the District has participated in the construction or expansion of certain joint-use facilities with the neighboring North Kern Water Storage District. These joint-use facilities include the Beardsley Canal, portions of the Lerdo and Calloway canals, the Calloway-to-Lerdo intertie, and the Cross Valley Canal-to-Calloway Canal Intertie. Finally, the District was a participant, along with several other agencies, in the construction of the Cross Valley Canal (CVC). The District's irrigation distribution system is shown on Figure 2, and these facilities are listed below:

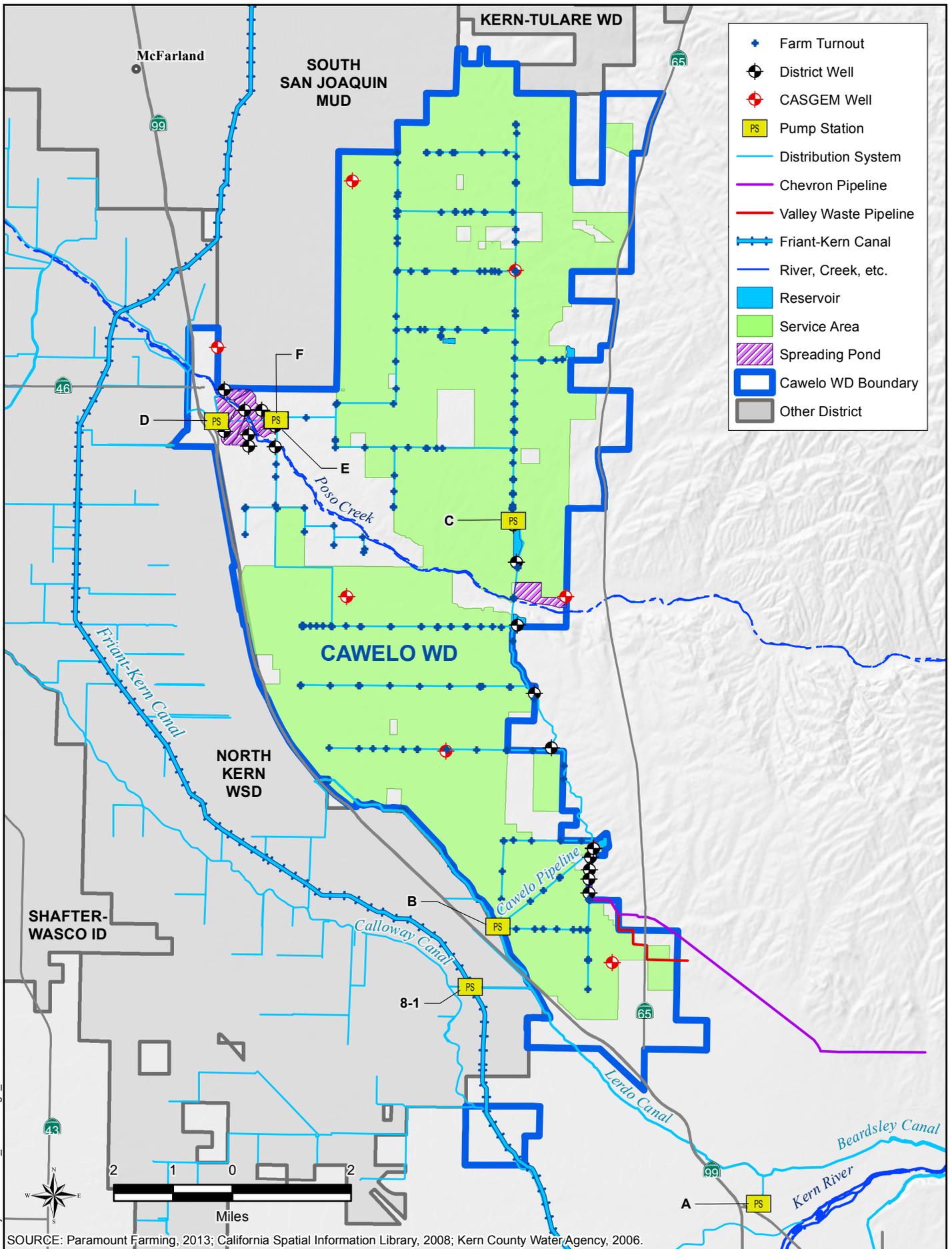
- Pump Stations and Discharge Pipelines
 - Pump Station and Conduit "A" [165.0 cfs]
CVC Extension to Beardsley Canal
 - Pump Station and Conduit "B" [212.0 cfs]
Lerdo Canal to Reservoir "B"
 - Pump Station and Conduit "C" [120.0 cfs]
North of Poso Service Area

- Pump Station and Conduit “D” [130.0 cfs]
Lerdo Canal to Pump Station “E” and “F”
 - Pump Station and Conduit “E” [80.0 cfs]
Western Service Area
 - Pump Station and Conduit “F” [30.0 cfs]
Famoso Service Area
- Eastside “42” Pipeline of Chevron U.S.A. Inc. (8.3 miles).
 - Irrigation distribution system comprised of 6.5 miles of lined canals [200 cfs capacity], and about 50 miles of main and lateral pipelines of various sizes and capacities.
 - Five reservoirs, which are used to manage mismatches between supply and demand; for short-term storage; and for recharge;
 - Reservoir “B” [140 AF]
 - Robertson Reservoir [120 AF]
 - Poso Reservoir [400 AF]
 - Reservoir “C” [125 AF]
 - Reservoir “E” [49 AF]
 - Recharge Basins: Famoso Groundwater Banking Project Basins [400 AF]

The current distribution system, as a whole, is capable of delivering 250 cfs to landowners within the primary service area. Table 4 provides a summary of these existing irrigation distribution facilities located within Cawelo. Note that there are lands within the District but outside the surface water (primary) service area; these lands (“groundwater-only”) depend exclusively on pumped groundwater for their irrigation supply. On occasion, typically in particularly wet years, the District is capable of delivering surface water supplies to these areas.

TABLE 4
WATER CONVEYANCE AND DELIVERY SYSTEMS

System Used	Length (mi)
Lined Canals	6.5
Pipelines	53.0



16-Dec-2013 Z:\Projects\1330180_Cawelo\Fig2_Facilities.mxd RS

SOURCE: Paramount Farming, 2013; California Spatial Information Library, 2008; Kern County Water Agency, 2006.

Cawelo Water District
Kern County, California

2013 Agricultural Water Management Plan



FACILITIES AND WATER SERVICE AREA

DECEMBER 2013

FIGURE 2

Pump Station “A”, Conduit “A” and the enlargement of Beardsley and Lerdo canals were necessary to transport the District’s water supplies from the CVC Extension and/or the Kern River to the District. The remaining facilities were constructed within the District for distribution of the supplemental water supplies to lands within the District’s service area.

Delivery of water within the District’s distribution system, during the period of peak summer irrigation demand (June through August), has been limited by the pumping capacity of Pump Station “B”. The District added storage capacity along the distribution system to mitigate this limitation. The additional storage also increases the total quantity of water which can be delivered and adds flexibility to the District’s operations.

The District receives SWP water at the California Aqueduct, transports the water through the CVC to the District’s Pump Station “A” for discharge to the Beardsley Canal. The CVC is approximately 16.8 miles in length with seven pump lifts and varies in capacity from 736 cfs to 646 cfs depending upon the reach as shown schematically in Figure 2. Since 1975, CWD has had a right to 135 cfs of the flow capacity within each reach of the CVC and 165 cfs of the flow capacity in the so-called CVC Extension. With the CVC expansion in 2012, the District now has a capacity in the CVC of up to 173 cfs. SWP water, as well as Kern River water, is wheeled through the Beardsley and Lerdo canals, under an agreement with the North Kern WSD, to the District’s Pump Station “B”, where it is then pumped to Reservoir “B” and delivered to the users through the District’s distribution system. Figures 3A and 3B are photographs of the District’s Pump Stations “A” and “B”.



FIGURE 3A
DISTRICT PUMP STATION “A”



FIGURE 3B
DISTRICT PUMP STATION “B”

Cawelo has agreements with local oil well operators including Chevron USA Inc. (Chevron), Valley Waste Disposal Company (Valley Waste), and the Schaefer Oil Company (Schaefer) to receive oilfield produced water in conformance with the Central Valley Regional Water Quality Control Board's (CVRWQCB) waste discharge requirements. Chevron and Valley Waste typically pump the oilfield produced water to the District's Reservoir "B" through a series of pipeline extensions. Chevron utilizes the Eastside "42" pipeline (listed above) which was constructed by the District in 1995. Valley Waste delivers oilfield-produced water to the District through a 3.4-mile 20-inch pipeline from the Kern Front No. 2 Oil Production Water Facility. The oilfield-produced water from Schaefer is typically discharged to several unlined reservoirs within their oilfield, to Little Creek, and to CWD's Reservoir "C". All oilfield produced water is blended with water from other sources in Reservoir "C" and subsequently delivered to the District's water users. The District's Reservoir "C" is shown on Figure 4.



FIGURE 4
DISTRICT RESERVOIR "B", LOCATION OF OIL PRODUCED WATER BLENDING

Cawelo relies on the storage and recovery of groundwater for the year-to-year regulation which is required to manage variations in the District's surface water supplies. The District does not have access to storage in a large external reservoir (such as Lake Isabella) to regulate seasonal or year-to-year water supplies. Cawelo does, however, have small volumes of operational storage available in mid-system reservoirs within its service area as listed above.

The Poso Creek Recharge and Regulation Reservoir, with a capacity of 400 acre-feet, was added to the system during the Fall of 1980. Although this reservoir fulfills a minor groundwater recharge function, its primary purpose is to provide operational flexibility. During peak irrigation demand periods (usually Monday through Friday during June, July and August), three pumping units with capacities of 5, 10 and 15 cfs can deliver as much as 30 cfs from the reservoir into the northern portion of the distribution system; thus, a prorated additional quantity of water can be retained in the southern part of the system for distribution. The reservoir is refilled during off-peak demand periods. The reservoir's operation reduces variations in flow through Pump Station "C", and also provides operational flexibility during contingencies such as a pipeline lateral break.

The Robertson Reservoir, located south of Poso Creek near the end of the Distribution Canal, was constructed by CWD in 1984 and was enlarged early in 1990 to increase its capacity to approximately 150 acre-feet. The storage of the separate Regulating Reservoir "B" was increased from an original capacity of 29 acre-feet to 100 acre-feet in 1992. Since these reservoirs are all used exclusively for canal regulation, their capacity is not included as part of the water 'supply' reservoirs as seen in Table 5.

**TABLE 5
WATER SUPPLIER RESERVOIRS**

Reservoir	Capacity (AF)	Storage Rights (AF)
Cawelo District Reservoirs ⁽¹⁾	N/A	N/A

(1) District regulating reservoirs have a cumulative capacity of about 834 acre-feet, however, since these are conveyance regulating reservoirs their capacity is not a factor in assessing the District's water supply.

The majority of land within the District’s service area is well drained. The need for on-farm surface drainage is non-existent, especially with low-volume irrigation application methods. Table 6 summarizes the existence of tailwater/operational outflow recovery systems. Currently, Cawelo has no District-operated recovery systems.

**TABLE 6
TAILWATER/OPERATIONAL OUTFLOW RECOVERY SYSTEM**

System	Yes/No
District Operated Tailwater Recovery	No
Landowner Operated Tailwater Recovery	No

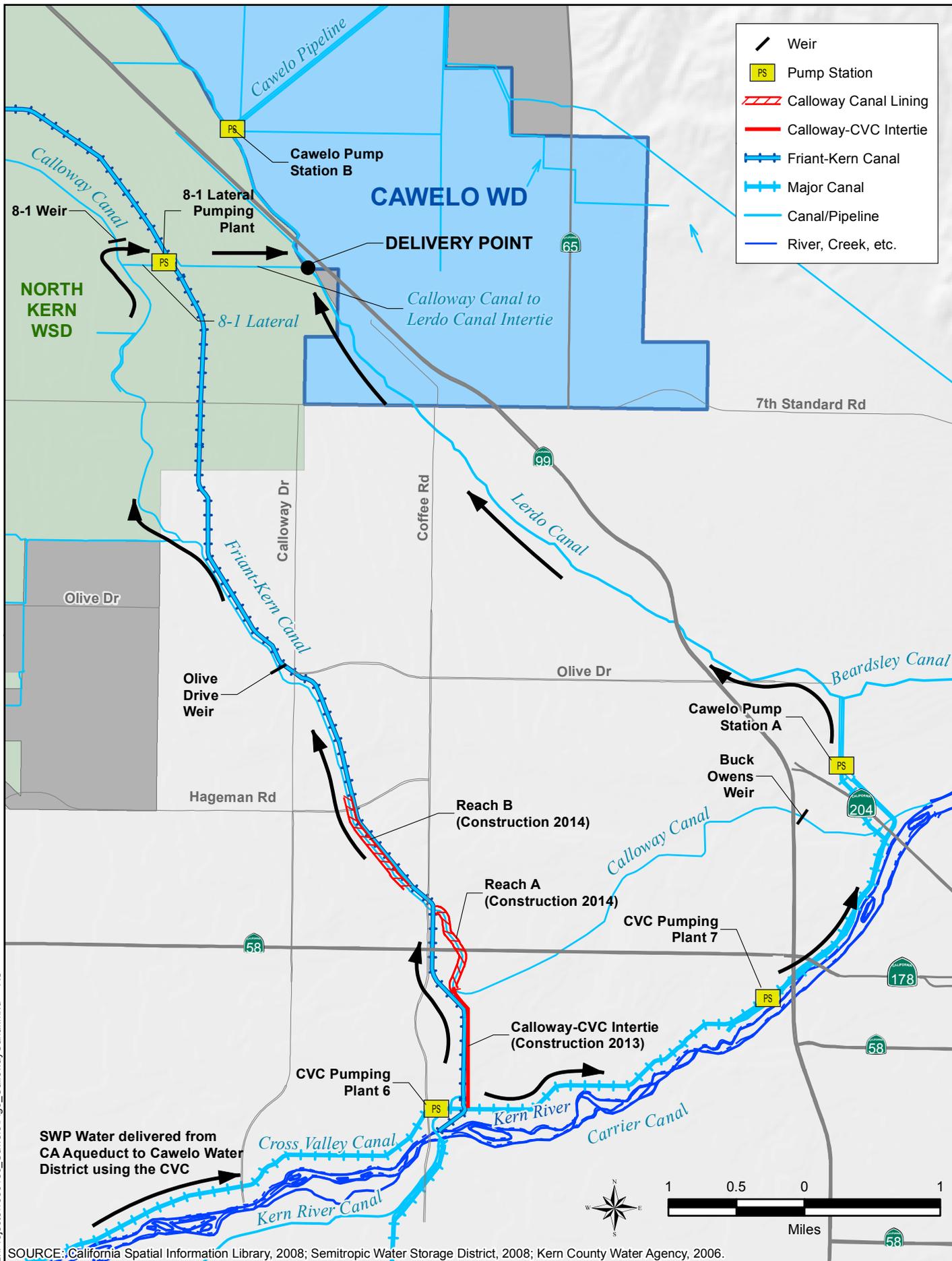
Following is a list of ongoing water management improvements and programs, enacted by the Board of Directors, for the Cawelo service area. This list supplements the description of previous water management activities presented in Section 1 and the description of specific EWMP implementation and reporting, included in Section 7 (Table 49).

- Expansion of the District’s conjunctive use program, including addition of groundwater recovery wells throughout the District. This includes the addition of approximately 400 acres of groundwater recharge basins and 11 District-owned recovery wells, allowing the District to bank more water in “wet” years and deliver more water to landowners in “dry” years.
- Establishment of a Water Purchase Reserve Fund to obtain additional water from available sources in “wet” years.
- Exploration of additional water supplies from the City of Bakersfield.
- Expansion of additional facilities for the blending of oilfield water with other water supplies, and increased capacity for receiving produced water, to allow delivery of increased water supplies to the land owners for irrigation.
- Establishment of a Drought Year Reserve Fund to partially mediate the very large cost increases associated with drought year operations. Dry years may occur in succession and therefore a large enough reserve funds needs to be created to cover such costs for at least two consecutive years.
- Establishment of a Capital Facility Reserve Fund to ensure that the District can quickly repair or replace a major capital feature of the District’s system upon failure. This fund is also used to replace or repair facilities that are beyond their service life.

- Administration of new State mandated programs; in particular, the California Statewide Groundwater Elevation Monitoring (CASGEM) program and the Irrigated Lands Regulatory Program (ILRP).

All of these programs were proposed by the District to maintain the goal of providing an annual supplemental surface water supply of 1.8 to 2.0 AF/acre to the landowners within the primary service area, and thereby extend the utility of the groundwater underlying the District. Due to the extensive permanent plantings within the District, on-farm distribution systems have been converted to sprinkler, drip and fan-jet systems, which provide highly efficient irrigation operations. The District also provides funds annually to the North West Kern Resource Conservation District (NWKRCDD), which supports the evaluation of the efficiency of on-farm irrigation systems.

A specific example of district facility improvement is the recently completed Calloway Canal-to-Lerdo Canal Intertie Project. The 400 cfs intertie connects the Calloway, Friant-Kern, and Lerdo canals allowing conveyance of CVP-Friant supply to Cawelo's recharge facilities. The intertie was completed under a cost sharing agreement with North Kern WSD and received \$5M in federal funding that was matched with local funds. In addition, the District is cost-sharing the construction of the CVC-to-Calloway Canal Intertie and the Calloway Canal Lining; both projected to be completed in July 2014. Once completed, SWP water can be delivered more efficiently into the districts through use of the canals that route the water through the North Kern WSD, as seen in Figure 5. The last two conveyance improvements are partially funded through the DWR's IRWMP and Water Use Efficiency programs. Benefits of the improved conveyance system include conserved water (through increased utilization of local spreading grounds); and decreased pumping costs (to the extent that use of Pump Station "A" can be avoided).



Z:\Projects\1330180_Cawelo\Fig5_CallowayCanal.mxd RS

SOURCE: California Spatial Information Library, 2008; Semitropic Water Storage District, 2008; Kern County Water Agency, 2006.

Cawelo Water District
Kern County, California

2013 Agricultural Water Management Plan



DECEMBER 2013

SWP WATER DELIVERY ROUTES
TO CAWELO WD

FIGURE 5

26-Nov-2013

2.4 Terrain and Soils

The District is located on the valley floor of the southeastern portion of the San Joaquin Valley. The San Joaquin Valley comprises the southerly two-thirds of the Central Valley from the Sacramento-San Joaquin River Delta on the north to the Tehachapi Mountains on the south. The valley floor is characterized by low alluvial plains and fans, overflow lands, and old lakebeds.

Unconsolidated deposits on the east side of the San Joaquin Valley consist of materials derived from the Sierra Nevada and are divided into three stratigraphic units: continental deposits, older alluvium, and younger alluvium. These unconsolidated deposits serve to transmit and store most of the groundwater pumped in the area.

The formations underlying the District consist of continental deposits of poorly bedded, loosely consolidated sands, gravels, silts and clays. Very deep deposits of old alluvium were deposited by several small intermittent streams that flowed in a westerly direction from the foothills. More recent alluvium is found along Poso Creek which is the largest of the streams in this area. The terminus for these flows in the geologic past was Tulare Lake, located to the north of Kern County on the west side of the San Joaquin Valley. Now, the Tulare Lake bed is separated from the San Joaquin River drainage by a low divide approximately 120 miles north of the southern end of the valley. The permeable alluvial deposits which underlie the District form an aquifer system which is naturally replenished by the flow of groundwater originating from precipitation in the Greenhorn Mountains to the East of the District.

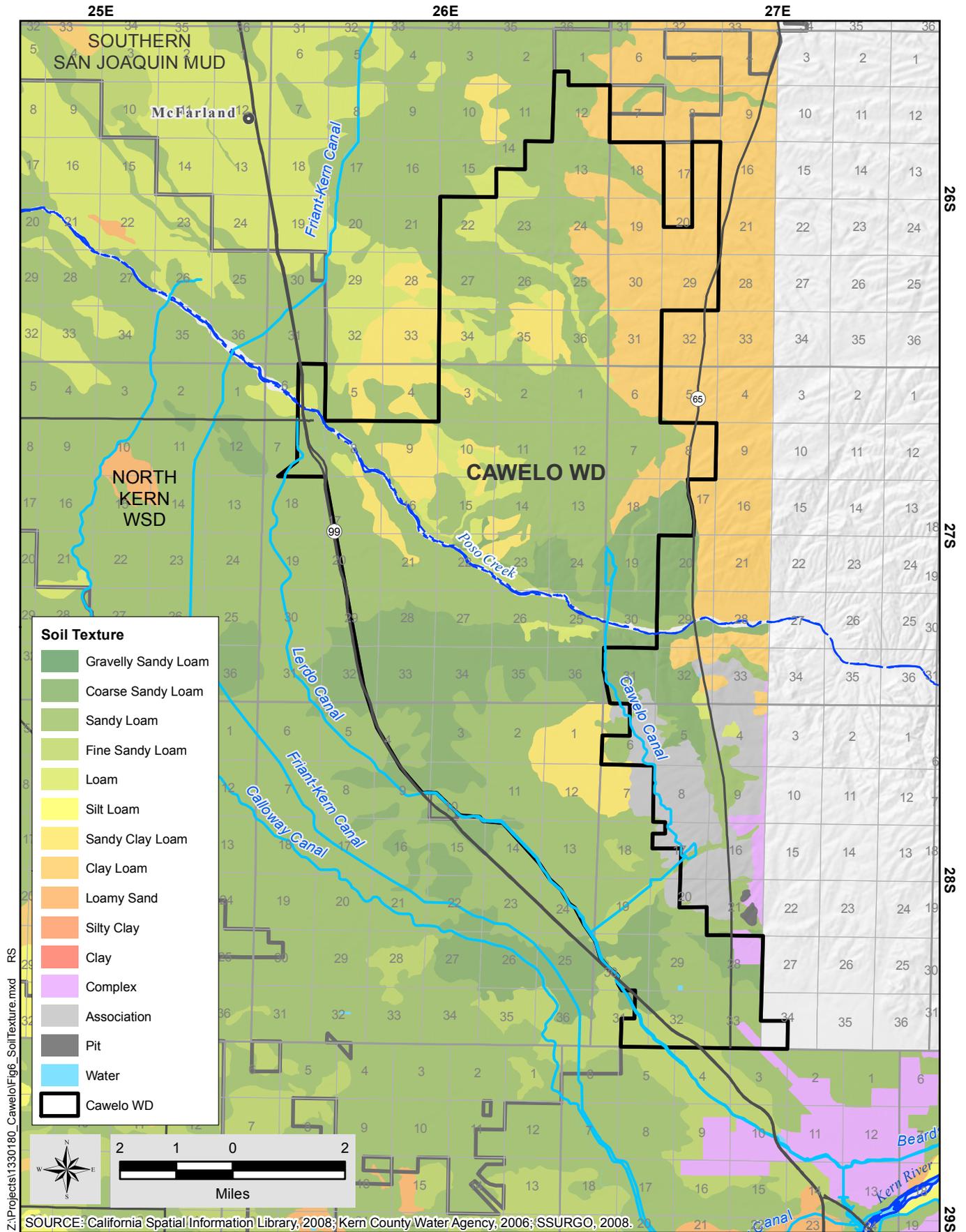
The topography in the District consists of flat and rolling land sloping in a westerly direction. Elevations range from 375 feet above mean sea level in the southwest portion of the District to 825 feet above mean sea level in the northeast portion. The topographic features within the District do not have any identifiable impacts upon the District's water operations and management, as noted in Table 7.

TABLE 7
LANDSCAPE CHARACTERISTICS

Topography Characteristic	% of the District	Effect on Water Operations and Drainage
Flat Land	35%	Land is adaptable to sprinkler and micro irrigation systems.
Rolling Land	65%	Land is adaptable to sprinkler and micro irrigation systems.

The soil types in Kern County vary in structure, texture, and chemistry with geographical location. Valley floor soils within Cawelo are derived mostly from mixed granitic and sedimentary rocks and are characterized as saline-alkaline. The generalized soils map units or soil associations underlying the area are described in the published “*Soil Survey, The Wasco Area, California, 1936*” and were prepared by the U.S. Natural Resources Conservation Service under the SSURGO (Soil Survey Geographic Database) Program as seen in Figure 6. A general soil map unit consists of one or more major soil types and some minor soils that occur together in a recognizable pattern.

Soils are described in this report in terms of associations because of the size of the District and because of their similarities to each other. Soils within the District do not have any identifiable impacts upon water operations and management in the service area.



Z:\Projects\1330180_Cawelo\Fig6_SoilTexture.mxd RS
26-Nov-2013

SOURCE: California Spatial Information Library, 2008; Kern County Water Agency, 2006; SSURGO, 2008.

Cawelo Water District
Kern County, California
2013 Agricultural Water Management Plan



GENERALIZED SOIL TEXTURE
DECEMBER 2013
FIGURE 6

2.5 Climate

The District is located at the southern end of the San Joaquin Valley, a portion of the valley that is partially surrounded by a horseshoe-shaped ring of mountains. The Sierra Nevada Mountains to the east shut out most of the cold air that flows southward over the continent in the winter. It also catches and accumulates snow, the runoff of which provides water for many of the local surface water sources (e.g. Kern River) during the dry summer months.

Summers in the southern portion of the valley are typically hot and dry. Winters are typically cooler and are characterized by frequent fog or low clouds which occur mostly at night. These conditions prevail when cold, moist air is trapped in the valley by a high pressure system. The depth of fog or clouds is usually less than 3,000 feet above ground level. There are usually clear skies and mild temperatures in the surrounding foothill and mountain areas. Most of the precipitation occurs in the winter with little to none occurring during the summer months.

Table 8 summarizes climate conditions as measured at the District Office on the northeast side of Bakersfield. Mean temperatures vary throughout the year from 45°F in January to around 82°F in July, with summers generally in the upper 90s and winters in the low to mid 40s. Annual precipitation typically ranges between five to seven inches, with most of the rainfall occurring during the “Wet Season” of November through March. Climate characteristics for the District service area are presented in Table 9.

**TABLE 8
SUMMARY CLIMATE CHARACTERISTICS**

Climate Characteristic	Unit	Annual Value ⁽¹⁾
Average Precipitation (per month)	in	0.61
Minimum Precipitation (per month)	in	0
Maximum Precipitation (per month)	in	6.21
Minimum Temperature (December Min)	deg-F	35.6
Maximum Temperature (July Max)	deg-F	97.1

(1) Obtained from measurements at Cawelo Water District office for the period extending from 1982 to 2012.

**TABLE 9
DETAILED CLIMATE CHARACTERISTICS**

Month/Time	Season	Avg Precipitation ⁽¹⁾	Avg Reference ET _o ⁽²⁾	Avg Min Temp ⁽¹⁾	Avg Max Temp ⁽¹⁾
January	"Wet"	1.34	1.60	35.5	55.5
February		1.41	2.41	38.1	61.5
March		1.3	4.36	40.7	68.5
April	"Dry"	0.62	5.67	44.6	74.4
May		0.23	6.96	52.3	83.6
June		0.10	8.12	59.2	90.9
July		0.0	8.10	65.4	97.1
August		0.02	7.75	64.4	96.0
September		0.11	5.74	59.5	90.1
October		0.36	3.97	49.9	76.2
November	"Wet"	0.68	1.82	41.3	65.1
December		1.20	0.99	35.6	55.1
"Wet" Season Total		5.93	11.18	-	-
"Dry" Season Total		1.44	46.31	-	-
Annual Total		7.37	57.49	-	-

(1) Obtained from measurements at Cawelo Water District office for the period extending from 1982 to 2012.

(2) Obtained from DWR CIMIS data for Shafter/USDA Station #5 for the period extending from 1982 to 2012.

2.6 Operational Characteristics

As stated previously, Cawelo has based its irrigation distribution system on conjunctive management of its surface water and groundwater resources in order to increase the efficient use of both resources. The District is divided into two areas, those lands which are outside the surface water service and thus rely exclusively on privately-pumped groundwater for irrigation water supplies ("Groundwater-only" service area), and those lands where delivery of imported surface water supplies is supplemented by groundwater supplies ("Primary" service area).

The District relies on conjunctive management to ensure the long-term sustainability of its water resources. In addition, the District coordinates its activities with neighboring districts and continually reviews and modifies its management practices to preserve and enhance the groundwater resource for the benefit of its landowners. Over the years,

Cawelo has implemented various measures to promote in-lieu recharge, enhance groundwater conditions, and ameliorate the consequences of water supply deficiencies of the SWP.

Cawelo’s adopted *Rules and Regulations for Distribution and Use of Water* (“Rules and Regulations”; copy included in Appendix A) is the guideline for District operations and delivery of water. The Rules and Regulations cover the procedures which are followed to distribute irrigation water in an orderly, efficient, and equitable manner.

As presented in the Rules and Regulations, water “turn on” orders are desired to be placed at least 48 hours prior to the time that service is requested, and water deliveries run continuously until the scheduled amount of water has been delivered. The District will accept orders for immediate water delivery through special arrangements. For the purpose of properly scheduling District activities and facilities, “turn off” orders are given at the same time as “turn on” orders.

On the day a water order is put into effect, the landowner turns the delivery gate on or off, in accordance with the scheduled delivery. Generally, “turn ons”, “turn offs” and adjustments to the gates are made by the landowner as scheduled with the District. In general, service is provided as requested; however, at times, the District may require the rescheduling of service due to capacity limitations within the District’s distribution system or necessary shutdowns beyond the District’s control.

**TABLE 10
SUPPLIER DELIVERY SYSTEM**

System	Yes/No	% of System	Description
On Demand	No		
Arranged Demand	Yes	100%	At least 48 hour notice.
Rotation	No		
Other	No		

Cawelo’s Board of Directors annually adopts and establishes an allocation of water and cost of water for landowners. The allocation is based on the area to be served and the hydrologic year type (“wet” or “dry”), where the latter affects both demand and supply. The allocation is not finalized and adopted until after seasonal information has been made available from the DWR. Table 11 illustrates factors used to allocate water in Cawelo.

**TABLE 11
WATER ALLOCATION SYSTEM**

Basis of Water Alloc.	Yes/No			Allocation	
	Flow	Volume	Seas. Allocations	Normal Year	% of Deliveries
Land in Service Area	No	Yes	No	1.8 AF/AC	100%
Water Year Type	No	Yes	No		

Although the District makes every reasonable effort to comply with water orders, system capacity constraints make it necessary at times, and particularly during periods of peak irrigation use, to run an essentially 24-hour daily operation. The District will consider adjusting their operations, based on the operational costs and demand, to assure that water users receive adequate supplies of irrigation water.

In the event of emergencies, water users may turn off the supply of water to their turnout. In these events, water users must immediately notify the District office by telephone or in person. Table 12 summarizes the lead times which are currently in place for the District’s arranged-demand water service program.

**TABLE 12
ACTUAL LEAD TIMES**

Operations	Hours/Days
Water Orders	48 hours
Water Shut-Off	48 hours

2.7 Water Delivery Measurements or Calculations

Deliveries of surface water and groundwater to farm delivery points, or “turnouts”, are owned and metered by the District. Meter readings at each turnout are taken every day that a turnout is running and also at the end of every month by District staff, using propeller meters that are equipped with totalizers and periodically checked for measurement accuracy as part of the District’s maintenance program. When properly calibrated, the meters provide a very accurate method of measuring both the flow rate and the volume of water delivered at the District’s turnouts.

Since all propeller meters used by the District are equipped with totalizers, the District can equate the calibrated accuracy of the flow meter to volumetric accuracy. According to the publication *SBx7-7 Flow Rate Measurement Compliance for Agricultural Irrigation Districts* by the Irrigation Training & Research Center (ITRC) of the California Polytechnic Institute, San Luis Obispo, devices with totalizers provide measurements that are sufficiently precise (in monitoring flow duration) to assume that the flow rate accuracy is equivalent to the calibrated volumetric accuracy. As a result, the devices used by the District to measure delivery rates provide data that enables reliable computation of volumes of water delivered at each turnout. Figure 7 is a photograph of a typical farm turnout.



FIGURE 7
TYPICAL FARM TURNOUT

Table 13 provides District flow meter information in tabular form, along with the typical levels of accuracy for typical types of measurement devices.

**TABLE 13
WATER DELIVERY MEASUREMENTS**

Type of Measurement	Freq. of Measurement (Days)	Freq. of Calibration (Months)	Freq. of Maintenance (Months)	Est. Level of Accuracy (%)
Propeller Meters	Daily	Infrequently	As Needed	± 5%

District Staff routinely monitor each meter for abnormalities and District policy is to replace a meter if the abnormal reading cannot be rectified in the field (see Section 8 of the plan). Section 8 also discusses steps the District intends to take in the near-future to maintain compliance with the water measurement requirements of SBx7-7 by verifying the accuracies of metering devices.

2.8 Water Rate Schedules and Billing

The Cawelo Board of Directors annually establishes a “Special Assessment” which is applied on a per-acre basis. The District operates on a calendar year for budget and accounting purposes. The structure of charges by the District to cover costs of water, operation, maintenance, administration and debt service is comprised of three elements: Special Assessment, “Dry” standby charge, and a water toll.

Annual water tolls depend upon the transportation and pumping costs for the delivery of the supplemental surface water to the various land areas of the District, with a separate toll fixed for deliveries 1) from the Lerdo Canal (1,647 acres); 2) to the lands south of Poso Creek (14,014 acres); 3) to the lands north of Poso Creek (12,323 acres); and 4) to the lands of the Western Service Area (5,062 acres). The charge for deliveries to farm turnouts is based on the volume of water delivered (metered), as indicated in Table 14.

**TABLE 14
WATER RATE BASIS**

Type of Billing	Yes/No	% of Water Deliv.	Description
Volume of Water Delivered	Yes	100%	Water billings are based on volume of water delivered.
Area (acres)	No		
Crop	No		
Land Assessment	No		

Effective November 21, 2013, the water toll for the 2014 growing season will vary from \$24 to \$74 per acre-foot depending on the aforementioned delivery areas, with an area-weighted average of almost \$53 per acre-foot. Table 15 identifies the District's adopted rate structure.

**TABLE 15
RATE STRUCTURE**

Type of Billing	Yes/No	Description
Declining Block Rate	No	
Uniform	Yes	Varies from year-to-year based on availability of SWP water.
Increasing Block	Yes	Supplemental water when available.

Currently Cawelo bills its irrigation water users at the beginning of each year, which includes all water allocated for the year. The frequency of billing is shown in Table 16.

**TABLE 16
FREQUENCY OF BILLING**

Frequency	Yes/No
Weekly	No
Monthly	No
Seasonally	No
Annually	Yes

2.9 Water Shortage Allocation Policies

Under its contract with the Kern County Water Agency, Cawelo receives an annual allocation of SWP water which is diverted from the California Aqueduct. The amount of water available from this source varies with the type of year (“dry” versus “wet”) and any court-ordered constraints on the amount of pumping allowed from the Sacramento-San Joaquin River Delta. Similarly, Kern River water supplies vary from year-to-year, as supplies are dependent on watershed precipitation and snow melt runoff in the Sierra Nevada Mountains. Water supply planning must take this year-to-year variability into consideration when formulating each year’s plan of operations. During years of short supply, Cawelo supplements available surface water through the operation of District-owned wells. Table 17 lists the measures that the Cawelo Board has exercised in responding to water shortages.

**TABLE 17
DECREASED WATER SUPPLY ALLOCATIONS**

Allocation Method	Yes/No
Decrease Allocated Water	Yes
Shorten Irrigation Season	No
Restrict Water to Specific Crops	No

The District may refuse to deliver water to irrigators as a consequence for wasting water, either willfully, carelessly, or on account of defective ditches or pipelines. The District may also refuse to deliver water to inadequately prepared land or users who flood certain portions of the land to an unreasonable depth or amount in order to properly irrigate other portions. Water service may be resumed when these conditions have been remedied. Table 18 summarizes enforcement methods available to curtail wasteful water use.

**TABLE 18
ENFORCEMENT METHODS OF ALLOCATION POLICIES**

Enforcement Method	Yes/No
Shut-off of Water Supplies	Yes
Refuse Service	No
Fines/Penalties	No

2.10 Basis for Reporting Water Quantities

Cawelo’s primary surface water supplies come from an annual allocation of SWP water and diversions from the Kern River. As previous noted (reference Section 2.9) year-to-year variability in those supplies is to be expected. In “dry” years, surface water supplies are generally not sufficient to meet water demands, thus pumping from District-owned wells is significant. In “wet” years, surface water supplies are not only sufficient to satisfy irrigation water requirements (and thereby avoid the use of District-owned deep wells) but are adequate to make significant deliveries to spreading ponds for direct groundwater recharge.

Based on the reliability of water from the SWP, Kern River, and other sources, an “intermediate” year in terms of supply availability was considered to be the most appropriate choice for a “representative year”. For example, owing to the degree of variability, an “average” or greater water supply year has historically occurred about once every three years. After considering relatively recent years that reflect the current level of development, the year 2009 was selected as the “representative year”. The allocation of SWP water in 2009 was 40 percent. The selection of calendar year 2009 as the representative year for purposes of this plan is noted in Table 19.

**TABLE 19
REPRESENTATIVE YEAR**

Representative Year Based Upon	2009
First Month of Representative Year	January
Last Month of Representative Year	December

SECTION 3

Quantification of District Water Uses

3.1 Agricultural Water Use

Permanent crops, primarily citrus, nut trees and grapes, account for around 82 percent of the crops planted in Cawelo Water District's service area. The crop makeup of the District is largely the result of the conversion of annual crops to high value permanent crops during the last several decades, at a rate of approximately 600 acres per year on average. The change from annual to permanent crops has led to a "hardening" of the total water requirement. Table 20 summarizes the agricultural water use within the District for 2009.

TABLE 20
AGRICULTURAL WATER USE FOR 2009 (AF)

Source	Delivery (AF)
<i>Agricultural Water Supplier Delivered</i>	
Surface and Groundwater	83,072
Other (M&I Use)	0
<i>Other Water Supplies</i>	
Surface Water	0
Groundwater (Private Pumping) ⁽¹⁾	Unknown
Other	0

(1) Private pumping exists, but is not reported to the District.

(2) Value includes Private Wells and water carried over to 2010.

Table 21 presents the water requirement for specific crops grown on the irrigated lands of the District in 2009. Total crop acreage is based on the District's annual crop survey for the representative year. Estimated ET_c values were obtained from ITRC documentation. As mentioned above, permanent crops, such as citrus, nut trees and grapes have been among the crops with the most rapidly expanding acreages.

TABLE 21
AGRICULTURAL CROP DATA FOR 2009 (AF)

Crop	Total Acres	% of Total	Estimated ET_C (Ft)	Crop Water Req. (AF)	Est. Leaching Req. (AF)	Total Crop Water Req. (AF)
Almonds	6,458	16%	3.34	21,570	2,157	23,727
Grain – Wheat	60	< 1%	1.70	102	10	112
Grapes	10,812	27%	2.41	26,057	2,606	28,663
Pomegranates	256	1%	3.42	876	88	963
Open Land	5,725	14%	0	0	0	0
Citrus	10,084	25%	3.60	36,302	3,630	39,933
Pistachios	4,878	12%	3.34	16,293	1,629	17,922
Cherries	136	< 1%	3.42	465	47	512
Vegetables (Misc)	210	1%	2.61	548	55	603
Others	1,131	3%	2.92 ⁽²⁾	3,303	330	3,633
Totals	39,750	100%	--	105,515	10,551	116,066⁽¹⁾

(1) Leaching requirements vary by crop, soil type, and other factors. For the purposes of this table, a leaching requirement of 10 percent of the crop water requirement was assigned District-wide.

(2) Average of other crop ET_C values for miscellaneous and unidentified crop types.

Leaching requirements vary by crop, soil type, and other factors; however, for the purposes of this description of water uses, a uniform leaching requirement of 10 percent was assigned to all crops (KCWA 2008). The 10 percent leaching requirement is included in the estimated total crop water requirement. As seen in Table 21, the applied water requirement of the District's irrigated lands was approximately 116,000 acre-feet, which implies an average of 3.41 acre-feet per irrigated acre. As noted above, approximately 82 percent of the survey acres were planted with permanent crops. The remaining land is devoted to miscellaneous vegetables and other unidentified crop types. Owing to water costs, the District does not contain much land devoted to pasture or grain crops.

Table 22 shows the District's current (2013) and representative year (2009) gross service areas and acreage irrigated from surface water and groundwater sources. The service area acreage has changed little over time, while the irrigated acreage has varied due to many factors.

**TABLE 22
DISTRICT IRRIGATED ACREAGE (ACRES)**

	2009	2013
Service Area	33,067	33,071
Surface Water and Groundwater Irrigated Area	34,025 ¹	35,903

(1) Irrigated area based on sum of crop areas from survey (Table 21) minus "open land".

Cropped acres as shown in Table 21 are not all irrigated acres. The amount of irrigated land not cropped at any time during the year is shown in Table 21 as "Open Land". Inter-cropping is not a common practice within the Cawelo service area. District crop surveys were used to assess cropping acreage for the representative year, and the survey did not indicate any acres as being double cropped. Accordingly, there is no multiple crop information to report in Table 23.

**TABLE 23
MULTIPLE CROP INFORMATION FOR 2009 (AF)**

Cropping Pattern	Acres
Cropped	34,025
Inter-Cropping	Negligible
Double	Negligible

3.2 Environmental Water Use

While Cawelo does not make deliveries of water specifically for environmental purposes, there may be environmental benefits are incidental to the District's operations. In particular, to the extent that there is water in the District's canals, regulating reservoirs, and/or spreading ponds, that water is available to local wildlife.

These potential sources do not qualify as consumptive environmental water uses applicable to the AWMP water balance, and Table 24 has been completed accordingly.

**TABLE 24
ENVIRONMENTAL WATER USES FOR 2009 (AF)**

Environmental Resources	Volume (AF)
In-Stream Flow Releases	0
Streams	0
Lakes or Reservoirs	0
Riparian Vegetation	0
Totals	0

3.3 Recreational Water Use

Cawelo does not supply water to recreational facilities within the service area, which is noted in Table 25.

**TABLE 25
RECREATIONAL WATER USES FOR 2009 (AF)**

Recreational Facility	Volume (AF)
Totals	0

3.4 Municipal and Industrial Water Use

All M&I water use in the Cawelo service area is supplied by groundwater pumping. In particular, rural residences and businesses pump groundwater from the Kern County Subbasin for domestic and commercial uses. When available surface water supplies permit, the District replenishes the underlying groundwater through recharge operations which are conducted at district spreading ponds. The spreading operations are carried out in support of the pumping required to satisfy the irrigation water requirements in the District; however, as a practical matter, the same groundwater system supplies both agricultural users and M&I uses. In summary, the District does not supply water for municipal and industrial water uses which is noted in Table 26.

**TABLE 26
MUNICIPAL/INDUSTRIAL WATER USES FOR 2009 (AF)**

Entity	Volume (AF)
Municipal Entities	N/A
Industrial Entities	N/A
Totals	0

N/A = Not applicable to District operations.

3.5 Groundwater Recharge Use

Indirect recharge occurs to the extent that the District delivers surface water in lieu of pumped groundwater to satisfy irrigation water requirements. In addition, Surface water

supplies which are surplus to immediate irrigation requirements are available for direct groundwater recharge. In this regard, the District makes use of over 400 acres of spreading ponds which consist of several ponds or cells within a given spreading site, which are created and separated by contour dikes. The largest spreading site encompasses about 370 acres and is referred to as the Famoso Project Basins (reference Figure 2). Table 27 shows the volume of water recharged in the representative year, which is relatively modest. However, during particularly wet years, recharge through the use of spreading ponds is significant.

TABLE 27
GROUNDWATER RECHARGE USES FOR 2009 (AF)

Location/Groundwater Basin	Method of Recharge	Volume (AF)
District Spreading Ponds	Spreading of Surface Water	3,489 ⁽¹⁾
Totals		3,489

(1) Values have not been reduced by evaporation, thus represent gross estimates.

The District operates a long-term “In-Lieu Water Banking Program” that allows “banking partners” to store “surplus” water, in the District and to recover their water when needed. Water banking involves the regulation of surplus surface water supplies, by placing the water into groundwater storage for subsequent recovery. The storage is achieved through either indirect or direct recharge. Indirect recharge is based on the delivery of surface water in-lieu of pumping groundwater. Direct recharge is based on the surface spreading and percolation of water supplies in basins or ponds (such as the District’s Famoso Project Basins).

Banking partners include the Zone 7 Water Agency (located in the Livermore area) and the Dudley Ridge Water District (located in Western Kings County). The following agreements govern the banking arrangements with these agencies.

- “Agreement Between Alameda County Flood Control and Water Conservation District, Zone 7 and Cawelo Water District for a Water Banking and Exchange Program”, which became effective in 2006.
- “Amended and restated Agreement for Water Regulation Program between Cawelo Water District and Dudley Ridge Water District”, which became effective in 2002.

The In-Lieu Water Banking Program provides up to 120,000 acre-feet of groundwater storage capacity for a banking partner(s) with an annual recharge and recovery capacity of approximately 1,500 to 5,500 acre-feet per year.

3.6 Transfer and Exchange Use

Recall that Cawelo's primary source of surface water is the SWP and this water must be pumped from California Aqueduct into the Bakersfield area via the Cross Valley Canal. When practicable, the District engages in operational exchanges with other agencies in order to avoid the cost of some or all of this pumping. These operational exchanges do not alter the District's water supply.

Through not a long-term CVP contractor, Cawelo has purchased CVP water that has been available from time to time, typically during the peak runoff period of wet years. In this regard it is noteworthy that the District has received deliveries from the Friant-Kern Canal using conveyance facilities in the North Kern Water Service District, to facilitate such purchases. The recent completion of the Calloway-to-Lerdo Intertie enhances this capability.

The District was in agreement with the neighboring Improvement District No. 4 (ID4) for the use of water that allowed surplus M&I water to be transferred into CWD for irrigation purposes and groundwater replenishment. The ID4 water includes water permitted to entities in the City of Bakersfield and other local communities. Historically, these transfers into CWD were relatively small, on the order of less than 1,000 acre-feet. Table 28 lists the amount of water transferred from ID4 into the District in 2009. Note that a total of 1,585 acre-feet were included in the 2009 arrangement, however, 694 acre-feet were carried over into the following year (2010). Also note that the agreement between ID4 and Cawelo has since ended.

**TABLE 28
TRANSFER AND EXCHANGE USES FOR 2009 (AF)**

From Agency	To Agency	Type of Transfer/Exchange⁽¹⁾	Volume (AF)
ID4	Cawelo WD	M&I to Agricultural	891
Totals			891

(1) Typical transfer/exchange types: Ag to M&I, M&I to Ag, or Ag to Ag.

Note that the District views these transfers and exchanges with non-district entities as separate from those made as part of their In-Lieu Water Banking Program (mentioned earlier) with banking partners. The banking transfers are not applicable to agricultural water uses within the District and are not shown in Table 28.

3.7 Other Water Use

All water uses of any significance have been described previously in this section. Negligible volumes of water are used within the District for dust abatement and mixing with agricultural chemicals before spraying. Table 29 notes that the cumulative water use for these purposes is insignificant.

**TABLE 29
OTHER WATER USES FOR 2009 (AF)**

Water Use	Volume (AF)
Totals	0

3.8 Projected Water Use

Cawelo's surface water supplies, delivered via the SWP and from the Kern River, will likely be reduced in the future; however the amount and timing of the reduction is somewhat uncertain. Whereas the Kern River supply will likely be reduced due to increased use of this supply by the City of Bakersfield, the District's contracted SWP water supply is constrained by the following management and regulatory factors:

- The conservation facilities to be constructed as part of the SWP have not been completed, which has the effect of reducing the yield of the District's contract supply;
- Federal and State regulatory agencies have, particularly since the mid-1990s, placed additional constraints on pumping from the SWP's Banks Pumping Plant, which were not contemplated, and have resulted in reductions in reliability and yield; and
- The annual allocation of water from the SWP during a given year is a moving target until as late as August in a given year; accordingly, District growers must make decisions regarding annual plantings before knowing their water allocation.

Finally, while CVP 215 water has been an infrequent and relatively small source of supply, recent actions to "restore" the San Joaquin River are expected to reduce the availability of such supplies in the future.

Permanent crops dominate Cawelo's irrigated lands, most of which rely on low-volume irrigation methods. Without any foreseeable pressure to urbanize, the landscape is not expected to change in the near term. Permanent crops represent a "hard" demand for water that must be met each and every year. To the extent that surface water supplies are reduced, there is an offsetting increase in groundwater pumping to meet irrigation water requirements. In this regard, it is noted that groundwater levels evidenced a declining trend prior to Cawelo's importation of surface water supplies. Accordingly, reductions in the availability of surface water supplies threaten to induce a long-term decline in groundwater levels.

SECTION 4

Quantification and Quality Assessment of District Water Resources

4.1 Surface Water Supply

As mentioned earlier, the Cawelo Water District began importing surface water in February of 1976. The primary source of surface water is SWP water delivered through the California Aqueduct and the CVC. Besides SWP supplies, the District supplements deliveries with water originating from other sources, including the Kern River, CVP via the Friant-Kern Canal, and water produced by local oil well operations.

A. State Water Project

Cawelo imports SWP water under a contract with the KCWA for 38,200 acre-feet per year. The contract with the KCWA was signed in 1972, simultaneously with the construction and operation agreements for the Cross Valley Canal. Over the last 36 years, this source of supply has averaged about 27,500 acre-feet annually. Going forward, the average yield of Cawelo's contract amount is expected to be around 61 percent of the 38,200 acre-feet or about 23,300 acre-feet annually (based on the *2011 SWP Water Supply Reliability Report*). Shortages in SWP supplies are occurring more frequently and are larger than originally envisioned, mainly due to the regulatory restrictions on exports from the Sacramento-San Joaquin River Delta.

From time to time, additional SWP supplies, referred to as "Article 21" water, are made available. Historically, Cawelo has seen an annual Article 21 allocation of approximately 6,800 acre-feet; however, due to the aforementioned restrictions on pumping water from the Delta, Article 21 water is becoming less available to Cawelo and other districts over time.

B. Kern River

The other major contractual source of surface water supply is Kern River water purchased from the City of Bakersfield. Under this 35-year contract (which expired in 2011 and was not renewed), the City sold Kern River water to the District in an amount

which averaged 27,000 acre-feet annually. The contract's basic delivery schedule called for 2,700 acre-feet per month to be delivered during March and April, and 5,400 acre-feet per month during May through August. The contract also provided for the sale and delivery to Cawelo of "miscellaneous water" which occasionally was available in addition to the contract amount. Since expiration of this contract, the District has been in discussions with the City of Bakersfield to reach a new agreement for the diversion of Kern River water.

C. Central Valley Project

While Cawelo is not a long-term CVP contractor, the U.S. Bureau of Reclamation has historically made annual contracts available to non-CVP contractors for the purchase and diversion of "Section 215" water, which is generally characterized as unstorable and unmanaged flood flows of short duration. The availability of CVP Section 215 water depends on the hydrologic conditions of the San Joaquin River and diversions are made from the Friant-Kern Canal. Given the recent completion of the Calloway-to-Lerdo Intertie, Cawelo is now capable of receiving CVP Section 215 deliveries when available.

D. Oilfield-Produced Water

Cawelo has agreements with a few local oil well operators to receive oilfield-produced water in conformance with the CVRWQCB waste discharge requirements. The agreements are as follows:

- The "Agreement for Delivery of Oilfield Produced Water" (revised 2006) between Chevron USA Inc. (Chevron) and Cawelo provides Chevron the right but not the obligation to deliver 29,405 acre-feet per year. The record of direct delivery of oilfield-produced water from Chevron, which began in 1996, has averaged almost 19,000 acre-feet annually. [CVRWQCB Permit, NPDES Permit No. CA 0082295.]
- The "Agreement with Valley Waste Disposal Company" (1980) provides for the delivery of 3.22 acre-feet per day of oilfield-produced water to Cawelo facilities. [CVRWQCB Permit, NPDES Permit No. CA 0081311.]
- The "Agreement between Cawelo and Schaefer Oil Company" (2003) provides for the discharge of approximately 3.3 acre-feet per day in conformance with NPDES Permit No. CA 0078859, Order No. 93-125 and renewals thereof. The record of direct delivery of oilfield produced water from Schaefer Oil, which

began in 1992, has averaged 1,155 acre-feet annually. [*CVRWQCB Permit, NPDES Permit No. CA 0078859*. The permit was reissued as Order No. 98-035 in 1998.]

Most oilfield-produced water is blended with other waters of the District and delivered to the users through the main distribution system (see Section 2.3). Actual deliveries of oilfield-produced water have totaled about 30,000 acre-feet per year in recent years.

E. Poso Creek

In 1982, Cawelo constructed a streamflow gaging station on Poso Creek near State Highway 65, located approximately one mile upstream of the eastern boundary of the District. The 43-year average (1961 through 2003) annual flow of Poso Creek at the State Highway 65 gaging station has been about 20,250 acre-feet; however, it is noted that runoff during a few very wet years comprises most of this annual average. While flows are infrequent, some District landowners do exercise their riparian rights from time to time and divert water from Poso Creek.

In 2000, the District was issued a Permit to divert water from Poso Creek for beneficial use at a rate of approximately 110 cfs, with the volume limited to 30,000 acre-feet between November 1 and June 14 of the following year. An agreement between Cawelo Water District, North Kern Water Storage District, and Semitropic Water Storage District allocated the first 135 cfs of Poso Creek flow, as measured at the State Highway 65 gaging station, to Cawelo and the riparian lands therein.

Table 30 shows Cawelo's diversions from surface water sources for the years 2007 through 2012. These diversions exclude Poso Creek.

**TABLE 30
SURFACE WATER SUPPLIES (AF)**

Source	Diversion Restriction	2007	2008	2009	2010	2011	2012
Kern River	Water year type and priority rights.	3,638	28,000	27,000	31,251	37,635	10,760
State Water Project (SWP)	Water year type and priority rights (state).	22,920	13,370	15,280 ²	29,800	30,560	24,830
Central Valley Project (CVP) ⁽¹⁾	Water year type and priority rights (federal).	0	0	0	0	0	0
Oilfield Produced		20,291	28,422	31,700	33,139	27,359	37,107
	Totals	43,211	69,792	73,980	94,190	95,554	72,697

(1) District facilities were not capable of accepting CVP water during these years, see Section 4.1 C.

(2) Value represents total District SWP allocation for year. Note that 4,624 AF were carried over into following year (2010), resulting in only 10,656 AF delivered in-District in 2009.

Table 31 lists restrictions or imposed limitations on sources of Cawelo's surface water supply; in particular, the District's supply of SWP water via the California Aqueduct. Restrictions on this supply generally result from Court Orders and regulatory actions of wildlife agencies related to endangered species actions and actions of the SWRCB that restrict the pumping operations managed by the DWR. Pumping restrictions have adversely affected the reliability of this source of supply.

The use of oilfield-produced water is restricted by the waste discharge requirements of the CVRWQCB and the specific agreements between the District and the oilfield water producers. All transfers of oilfield-produced water into the District for irrigation purposes are authorized by the EPA Waste Discharge Reports (WDR) permit program within the State of California. The quality of oilfield-produced water is measured monthly, as explained in Section 4.6 with the restrictions or imposed limitations shown in Table 31.

**TABLE 31
RESTRICTIONS ON WATER SOURCES**

Source	Restrictions or Imposed Limitations	Name of Agency	Operational Constraints
State Water Project (SWP)	Delivery Schedule and Volume	DWR	Reduced reliability of SWP deliveries south of the Sacramento-San Joaquin River Delta due to court-ordered constraints on pumping.
Oilfield Produced Water	Water Quality Monitoring/Water-Use Restrictions	CVRWQCB	Restrictions on water quality of oilfield produced water for use in irrigated agriculture (i.e. District operations).

4.2 Groundwater Supply

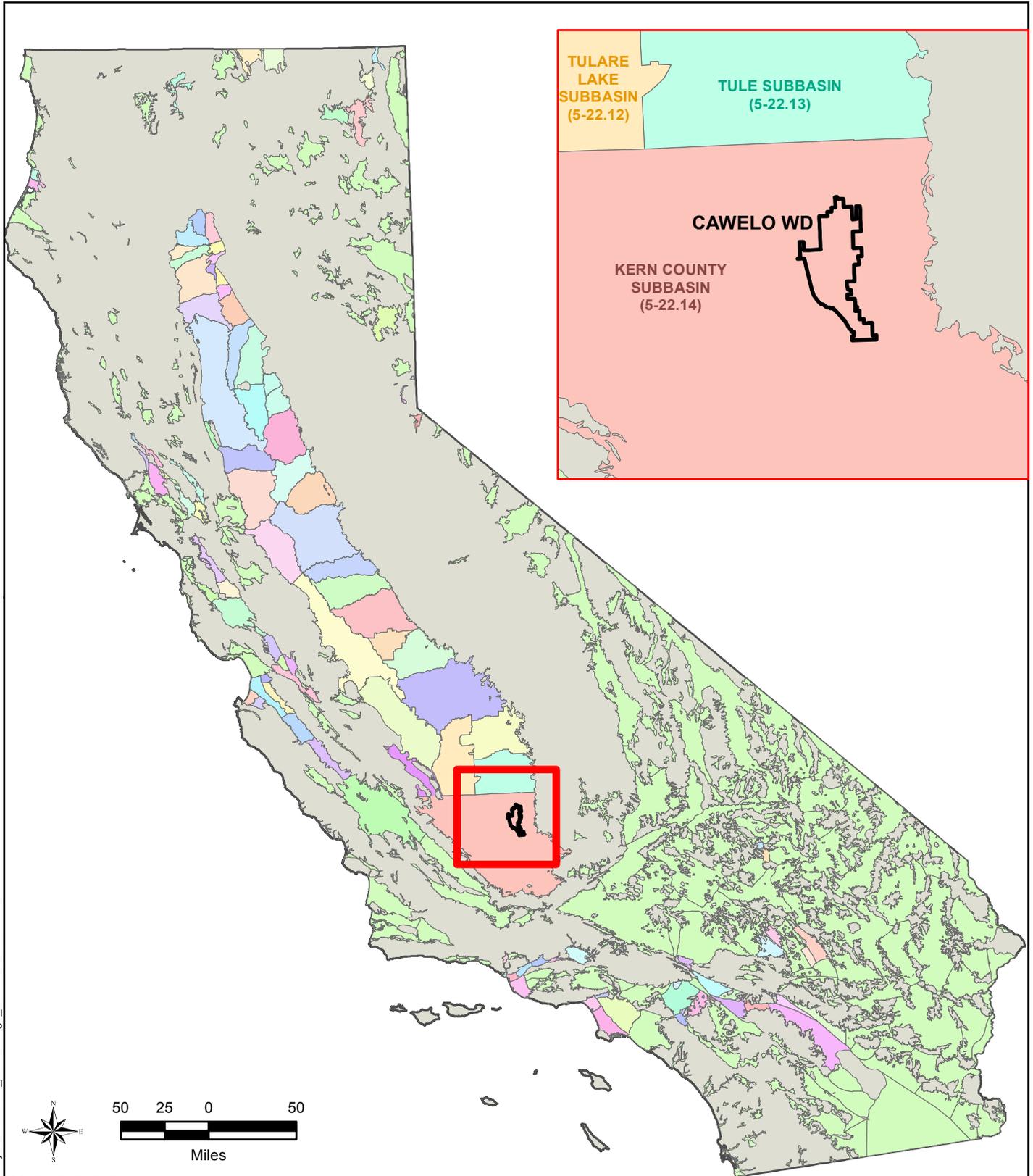
A significant portion of the District overlies a usable groundwater basin; in particular, the Kern County Subbasin of the Tulare Lake Basin, which is part of the Central Valley aquifer system. *DWR Bulletin 118 (2003 Update)* identifies the Kern County Subbasin as No. 5-22.14. The Kern County Subbasin is shown in relation to the District's service area on Figure 8, and the size of the basin (as published by DWR) is indicated in Table 32.

**TABLE 32
GROUNDWATER BASINS**

Basin Name	Size (Sq. Mi.)	Est. Capacity (AF)	Safe Yield (AFY)
Kern County Groundwater Subbasin	3,040	40,000,000	Unknown

DWR San Joaquin District Kern County Groundwater Basin Information:

http://www.water.ca.gov/pubs/groundwater/bulletin_118/basindescriptions/5-22.14.pdf



Z:\Projects\1330180_Cawelo\Fig8_GWBasins.mxd RS
 26-Nov-2013

SOURCE: DWR Bulletin 118, v.3, 2003.

Cawelo Water District
 Kern County, California

2013 Agricultural Water Management Plan



DISTRICT BOUNDARY IN RELATION
 TO GROUNDWATER BASINS

DECEMBER 2013

FIGURE 8

As mentioned in Section 2.4, underlying the District service area are deposits of the Kern River formation consisting of poorly bedded, loosely consolidated sands, gravels, silts, and clays. The permeable alluvial deposits form an aquifer system that is naturally replenished by the flow of underground water originating from precipitation in the hills and mountains to the east of the District. In addition, the use of imported surface water and oilfield-produced water, coupled with the District's groundwater recharge and water banking programs, help to replenish the underlying groundwater system and mitigate the effects of groundwater pumping.

The District commenced a Groundwater Monitoring Program in the fall of 1979, and currently measures groundwater levels in approximately 250 wells on a semi-annual basis. While water levels have gone up during "wet" periods and down during "dry" periods, average water levels throughout the District were about the same in the spring of 2012 as they were in 1980. However, as previously noted, reductions in historically available surface supplies, with a commensurate increase in groundwater pumping, can be expected to adversely affect groundwater levels going forward.

More information on groundwater management in the District, as well as the geology of the aquifer underlying the District's service area, is presented in the Cawelo Water District's *2007 Groundwater Management Plan*. Table 33 indicates the date of the Plan and lists the firm responsible for its preparation.

**TABLE 33
GROUNDWATER MANAGEMENT PLAN**

Prepared By	R.L. Schafer & Assoc.
Year	2007
Is Appendix Attached?	Yes

While most of the groundwater pumping within the District is attributable to on-farm pumping, the District maintains and operates 16 deep wells to supplement deliveries of surface water as needed (reference Figure 1 for the locations of these wells). Typical District-constructed wells vary from 1,200 to 1,500 feet in depth, with perforated intervals around 500 feet to the bottom, in a 30-inch (minimum) diameter bore hole. Pumping lifts vary with hydrology and location; however, the average lift has been

approximately 500 feet in recent years. A typical District-owned deep well is shown in Figure 9.

Estimates of pumping from privately-owned wells are not reported to the District boundaries unless the water is pumped into the District's system for conveyance and delivery. Although infrequent, water pumped from certain private wells is used for District purposes through an agreement with the private well owner.



FIGURE 9
TYPICAL CAWELO DISTRICT-OWNED GROUNDWATER WELL

Table 34 shows groundwater pumped by District wells for the years 2007 through 2012 in acre-feet per year.

**TABLE 34
GROUNDWATER SUPPLIES (AF)**

Groundwater Basin	2007	2008	2009	2010	2011	2012
District Wells	11,349	10,175	1,825	1,030	109	4,865
Totals	11,349	10,175	1,825	1,030	109	4,865

4.3 Other Water Supplies

The District does not actively import surface water from sources other than those listed in Sections 4.2. In general, there are no uncontrolled inflows to the District, with the exception of Poso Creek, which is frequently dry but which, at times, is a source of unregulated inflow. Flows from Poso Creek are measured at weirs which enable the District to estimate inflows, except during storms when accurate measurements are not practicable.

4.4 Drainage from the Surface Area

Drainage wells and surface drainage systems are not employed by the District. In some areas, groundwater below the root zone from excessive deep percolation is recoverable and can be used to supplement surface water. In these areas, the recovered water is generally of poorer quality than surface water but is suitable for agriculture. As Table 35 summarizes, there are no flows to saline sinks or perched water tables.

**TABLE 35
DRAINAGE DISCHARGES**

Surface/Subsurface Drainage Path	AF
Flows to saline sink	none
Flows to perched water table	none

4.5 Water Supply Quality

Recall that the District's principal sources of imported water include the SWP, Kern River, and from oilfield operations. In addition, the District pumps and delivers groundwater from time to time. Water quality data are collected for each source of supply as it relates to agricultural suitability and these data are presented in Table 36 for 2012.

**TABLE 36
SOURCE WATER QUALITY ASSESSMENT FOR 2012**

Parameter	Units	SWP	Kern River	Oilfield
B	mg/l	0.02	0.16	0.98
Ca	mg/l	22.5	18.2	21.31
Mg	mg/l	12.13	3.2	2.88
Na	mg/l	56.6	51.1	167.29
K	mg/l	N/A	2.38	4.12
Cl	mg/l	79.8	72.0	107.69
SO ₄	mg/l	38.87	24.5	61.57
NO ₃	mg/l	3.2	0.47	0.015
TDS	mg/l	280.87	229.55	495.44

Furthermore, recall that Cawelo delivers water exclusively for irrigation uses. From this perspective, the quality of SWP water and Kern River water is considered good to excellent. On the other hand, oilfield-produced water can be problematic for salt-sensitive crops. Accordingly, oilfield-produced water is typically blended with other sources of supply in the District's regulating reservoirs. The TDS concentration of oilfield-produced water ranges up to 700 mg/L; however, after blending, the quality is typically no more than 450 mg/L, which is satisfactory for most agricultural uses in the

District. While the groundwater quality is good in most parts of the District, there are areas where the concentrations of TDS and chlorides have exceeded the limits normally desired for irrigation of salt-sensitive crops levels, 450 mg/L and 140 mg/L, respectively.

The District is a member of the Kern River Watershed Coalition Authority (KRWCA), which is in turn a member of the Southern San Joaquin Valley Water Quality Coalition (SSJVWQC) and in that capacity, participates in, and contributes financially to, a Regional Water Quality Control Board program to monitor and improve surface water and groundwater quality associated with agricultural activities. The Regional Board has promulgated a broader ILRP to address both surface water and groundwater quality. As a service to its landowners, the District does participate in and help facilitate the ILRP in cooperation with the SSJVWQC.

Since Cawelo does not provide drainage facilities or assessment of on-farm subsurface drainage systems, the limitations associated with drainage reuse are not applicable to District operations, as noted in Table 37.

TABLE 37
DRAINAGE REUSE EFFECTS
(Not Applicable to Cawelo)

Analyte	Drainage Reuse Limitations				
	Increased Leaching	Blending Supplies	Restricted Area of Use	Restricted Crops	Other
N/A					

N/A = Not applicable to District operations.

4.6 Water Quality Monitoring Practices

The District actively monitors surface water and groundwater quality. The majority of monitoring locations are at District pumping stations where the principal surface water supplies from the SWP and Kern River are imported to the District. In particular, samples are collected and analyzed monthly at each of Pump Stations “A” and “B” on a monthly basis. Water quality reports for this source of supply are prepared by the oilfield producers and provided to the CVRWQCB to illustrate compliance with regulations and guidelines contained in their respective discharge permits. Groundwater pumped from District deep wells is sampled in years of heavy use --- typically during years of reduced

surface water supplies. Table 38 provides general information on monitoring of source water quality in the District.

**TABLE 38
WATER QUALITY MONITORING PRACTICES**

Source	Monitoring Location	Monitoring Practice	Frequency of Analysis
SWP	Pump Sta. "A"	Agricultural Suitability	Monthly ¹
Kern River	Pump Sta. "B"	Agricultural Suitability	Monthly
Oilfield		Agricultural Suitability	Monthly
Groundwater ²		Agricultural Suitability	Annually

(1) Monitored by other entities and the DWR, on behalf of the District.

(2) Primarily on District-owned wells, but periodically includes some privately-owned wells.

Drainage water is essentially non-existent in the District. As noted in Table 39, Cawelo does not need to conduct monitoring of surface drainage.

**TABLE 39
WATER QUALITY MONITORING PROGRAMS FOR
SURFACE/SUB-SURFACE DRAINAGE**

Monitoring Program	Analyses Performed	Frequency of Analysis
Surface Water and Groundwater	EC and NO ₃	Not needed

SECTION 5

Water Accounting and Water Supply Reliability

5.1 Quantification of Water Supplies

The Cawelo Water District distribution system is composed mostly of pipeline laterals and some concrete-lined canals as described in Section 2.3. Meters are installed in all pumping plant discharges and at all canal and pipeline turnouts for monitoring the quantities of irrigation water delivered throughout the distribution system. For the purposes of the AWMP, 2009 was chosen to illustrate water delivery operations in the District. Table 40 includes a monthly accounting of the amounts of water arriving within District boundaries from each source of supply in 2009, after consideration of operational losses which occur outside the District's service area (i.e. canal seepage and evaporative losses).

TABLE 40
SURFACE AND OTHER WATER SUPPLIES FOR 2009 (AF)

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Kern River	0	0	482	2,257	5,030	7,295	6,536	5,400	0	0	0	0	27,000
State Water Project (SWP)	0	0	0	0	0	0	1,099	2,412	4,725	2,196	224	0	10,656
Central Valley Project (CVP)	0	0	0	0	0	0	0	0	0	0	0	0	0
Oilfield Produced	2,691	2,379	2,742	2,630	2,664	2,654	2,651	2,753	2,622	2,690	2,660	2,565	31,700
Recycled Water	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	2,691	2,379	3,224	4,887	7,694	9,949	10,286	10,565	7,347	4,886	2,884	2,565	69,356¹

(1) Value does not include Private Wells and water carried over towards 2010.

The Cawelo Water District, along with many other districts and local communities, pump groundwater from the Kern County Subbasin. The District measures and records groundwater pumping from district-owned wells; however, pumping from privately-owned wells is not reported to the District unless the water is pumped into the District's system for conveyance and delivery. Table 41 presents a monthly summary of the quantity of groundwater pumped within the Cawelo service area in 2009.

**TABLE 41
GROUNDWATER SUPPLIES SUMMARY FOR 2009 (AF)**

Month	District Wells¹	Totals
January	0	0
February	0	0
March	43	43
April	54	54
May	227	227
June	401	401
July	11	11
August	2	2
September	3	3
October	1	1
November	544	544
December	539	539
Totals	1,825	1,825

(1) Private pumping not included in tables, as pumped volumes are not reported to the District.

The imported surface water, oilfield produced, and the pumped groundwater are the primary sources of water for the District. Effective precipitation, however, constitutes an uncontrolled source of supply which reduces the applied irrigation water requirement to some extent. As noted in Section 2.5, most of the precipitation occurs in the winter with little to none occurring during the summer months. Accordingly, most of the precipitation that falls within the District's service area provides soil moisture at the beginning of the growing season.

Table 42 shows the estimated volume of effective precipitation for 2009, based on Cawelo's total irrigated area. The estimate is based on KCWA's published estimate of the average effective precipitation per acre for 2009 (KCWA 2009) and the 39,750 total irrigated acres within the service area. The total rainfall in the Cawelo service area for calendar year 2009 was 4.63 inches, as measured at the Cawelo Water District office. The unit effective precipitation for 2009 was estimated at 1.64 inches per acre for the San Joaquin Valley portion of Kern County (KCWA 2009).

**TABLE 42
EFFECTIVE PRECIPITATION SUMMARY FOR
2009 (AF)**

Year	Precip. (in)	Effective Precip. (AF)
2009	4.63	5,433

5.2 Quantification of Water Uses

Table 43 shows the volume of water delivered to Cawelo's irrigation customers in 2009. The volume of water delivered is based on flow measurements at the farm turnouts.

**TABLE 43
APPLIED WATER FOR 2009 (AF)**

Delivered To	Volume
Farm Turnouts	71,608

Table 44 summarizes water uses within the Cawelo service area for 2009. The calculated crop ET_c was used in developing the District's crop water requirement as seen in Table 21 and described in the text which accompanies the table. The estimate of losses from the canal system is based on balancing measured system inflows and outflows and is recorded in Table 44 as "conveyance seepage and evaporation" (item 4). Refer to Section 3 for the description of other agricultural water uses included in Table 44.

**TABLE 44
QUANTIFICATION OF WATER USE FOR 2009 (AF)**

Estimated Water Use	Total
Crop Water Use	
1 Crop Water Requirement ⁽¹⁾	116,066
2 Leaching ⁽²⁾	--
3 Cultural Practices ⁽²⁾	--
Conveyance and Storage System	
4 Conveyance Seepage & Evaporation ⁽³⁾	7,751
5 Conveyance Operational Outflows	--
6 Reservoir Evaporation	N/A
7 Reservoir Seepage	N/A
Environmental Use	
8 Environmental Wetland Use	N/A
9 Environmental Use (Other)	N/A
10 Riparian Vegetation Use	N/A
11 Recreational Use	N/A
Municipal and Industrial	
12 Municipal ⁽⁴⁾	N/A
13 Industrial ⁽⁴⁾	N/A
Outside the District	
14 Transfers or Exchanges Out of Service Area ⁽⁵⁾	N/A
Conjunctive Use	
15 Groundwater recharge ⁽⁶⁾	3,489
Other Uses	
Subtotal	127,306

(1) Includes ET_c and allowance for leaching, see Table 21 and preceding text.

(2) Included in Item 1.

(3) District evaporation and seepage (deep percolation) losses estimated, based on approximate average of 10% loss of total supply (Table 47), as stated in District's 2012 Engineer's Report.

(4) See Table 26 and preceding text.

(5) See Table 28 and preceding text.

(6) This amount reflects volume supplied directly to spreading ponds.

Table 45 intended to summarize the amount of monitored on-farm surface and subsurface drainage water leaving the service area; however, as discussed previously, drainage wells and surface drainage systems are not employed by the District.

TABLE 45
QUANTIFICATION OF WATER LEAVING DISTRICT FOR 2009 (AF)

Drain Water Leaving District	Volume
Surface	0
Subsurface	0
Subtotal	0

Table 46 shows that there are no irrecoverable losses within the District.

TABLE 46
IRRECOVERABLE WATER LOSSES FOR 2009 (AF)

Drain Water Leaving District	Volume
Flows to Saline Sink	0
Flows to Perched Water Table	0
Subtotal	0

5.3 Overall Water Budget

The total water supplies made available by Cawelo to the lands within its service area in 2009 are summarized in Table 47. The supply side of the water budget presented in this AWMP identifies the total deliveries by the District, which includes both surface water and groundwater pumped from District-owned wells. As described previously, on-farm pumping is not reported to the District except in instances where water from private wells is discharged into District facilities for conveyance. Refer to Section 5.1 for a description and quantities of these sources.

**TABLE 47
QUANTIFICATION OF WATER SUPPLIES FOR 2009 (AF)**

Water Supplies (From)	Volume
1 Surface Water (Table 40)	69,356
2 Groundwater (Table 41)	1,825
3 Annual Effective Precipitation (Table 42)	5,433
4 Water Purchases ⁽¹⁾	--
5 Transfers or Exchanges into District ⁽²⁾	891
Subtotals	77,505

(1) Included in Item 1.

(2) See Table 28 and preceding text.

Table 48 summarizes the water budget for the service area for 2009. The budget summary identifies the total uses within the CWD service area, including the uses met by on-farm pumping. The budget summary for 2009 is not intended to be representative of the long-term water balance. Since on-farm pumping is not explicitly accounted for, the water balance closure term represents the extent to which on-farm pumping is used to satisfy water demands within the District. In addition, this budget does not account for sub-surface inflow to or outflow from the District, which would be included in a complete, long-term water balance.

**TABLE 48
BUDGET SUMMARY FOR 2009 (AF)**

Water Accounting (From)	Volume
1 Subtotal of Water Supplies (Table 47)	77,505
2 Subtotal of Water Uses (Table 44)	127,306
3 On-farm Drainage Water Leaving Service Area (Table 45)	0
Water Balance Closure Term	49,801

The “water balance closure term” represents the amount of on-farm (or private) groundwater pumping necessary to meet water requirements for irrigated lands located outside the service area (i.e. outside the surface water delivery area), as well as those lands within the service area that required more than the water allocation from the

District. Presently, 33,071 acres of the total 44,700 District acres (approximately 74 percent) can receive District deliveries.

5.4 Future Water Supply Reliability

Recall that the District contracted with the KCWA for the delivery of SWP water; however, shortages in this source of supply have been more frequent and larger than originally envisioned. This observation is largely due to the incomplete status of SWP facilities and increased regulatory restrictions on exports from the Sacramento-San Joaquin River Delta. In this regard, DWR Bulletin 160-09 (2009) articulated some of the water supply “challenges” facing the Tulare Lake Basin, of which Cawelo is a part. These challenges include the following:

- A. Water quality and environmental needs for the Delta are reducing the export volume of water pumped and available for delivery. For example, new biological opinions for endangered species and statutory requirements in December 2008 reduced export pumping by around 20-30 percent.
- B. Changes in the OCAP (Operations Criteria and Plan, USBR) could worsen delivery reliability issues of imported water from the CVP and SWP.
- C. The San Joaquin River Settlement will reduce CVP water diverted into the Friant-Kern Canal, possibly by as much as 15 percent (on average) as interim flows began October 1, 2009, which also affects the availability of CVP 215 water.

According to the 2011 State Water Project Delivery Reliability Report (DWR 2012), the long-term reliability of surface water supplies to Southern California from the Delta is expected to average 60 percent of the contractual amounts.

Under a long-term contract with the City of Bakersfield, Cawelo received Kern River water in annual amounts which varied from less than 3,000 acre-feet in a “dry” year to nearly 40,000 acre-feet in a “wet” year. This contract expired in 2011 and discussions are underway between the District and the City of Bakersfield regarding the possibility of future deliveries; however, this source of supply remains uncertain at this time.

Cawelo is under contract with three oilfield operators to receive oilfield-produced water in conformance with the CVRWQCB waste discharge requirements (Section 4.1). Supplies from this source are dependent on local oil production, inasmuch as the water is incidental to the production of oil. In recent years, the total delivery of oilfield-produced water has ranged between 20,000 and 40,000 acre-feet and is expected to remain in this range for the foreseeable future.

Groundwater is pumped to the extent that irrigation water requirements exceed the other supplies available through the District. Accordingly, any reductions in the reliability of these other supplies will result in a commensurate increase in the use of groundwater. Increased use of pumped groundwater will contribute to lower groundwater levels (and higher costs of energy for pumping) and may contribute to land surface subsidence.

Therefore, efficient water management practices and conjunctive management are critical for the well-being of the communities and districts that depend on these sources of water. In 2007, Cawelo joined several neighboring water agencies in adopting an Integrated Regional Water Management Plan (Poso Creek IRWMP) which identified “water supply reliability” as the Region’s principal water resources concern going forward. The Poso Creek IRWMP identified and prioritized a number of projects to mitigate anticipated reductions in water supply reliability, several of which have been constructed, are under construction, or will be under construction in the near term. Some examples of the efforts Cawelo is making through the IRWMP, regarding improvements to district facilities and management, are illustrated in Sections 2 and 7 of this AWMP. A discussion of future changes to the District’s water supplies, in particular, from climate change, is presented in Section 6 of the plan.

SECTION 6

Analysis of the Effects of Climate Change

6.1 Effects of Climate Change on Water Supply

Cawelo's surface water supply is currently dictated by changes in the volume, nature, and timing of precipitation in the Sierra Nevada Mountains, for Kern River and CVP water supplies, and pumping restrictions or reliability constraints along the California Aqueduct for SWP water supplies. This section describes analyses of how climate change may affect the hydrology of the Central Valley including these water supply sources.

The DWR examined 12 future climate scenarios in a report titled *Using Future Climate Projections to Support Water Resources Decision Making in California* (Chung et al. 2009) to assess future reliability issues with the SWP and the CVP due to climate change. The 12 scenarios represent projections from six Global Climate Models for higher and lower greenhouse gas emissions while taking into account potential Delta salinity intrusion due to sea level rise. For all climate projections studied, the reliability, and thus volume of water delivered, by the SWP and CVP water supply systems is expected to be reduced. For instance, by mid-century, median Delta exports through the SWP's Banks Pumping Plant are expected to be reduced by 7 percent for the lower greenhouse gas emissions scenario and by 10 percent for the higher emissions scenario. Mid-century changes in Delta exports for the 12 future climate scenarios ranges from an increase of 2 percent to a decrease of 19 percent. Current long-term reliability predictions of surface water deliveries via the California Aqueduct are expected to average 60 percent (DWR, 2011). Decreases in annual Delta exports due to climate change would reduce reliability even further, resulting in less water delivered south of the Delta, which directly affects the amount of water supplied to Cawelo.

Several investigations were conducted by the USGS California Water Science Center (CAWSC) regarding hydrological effects of climate scenarios in the Sierra Nevada Mountain Range (USGS 2009; Water Resources Research, 2012). As noted, Kern River and CVP water supplies are directly affected by the quantities of runoff and recharge in the Sierras. Each of these investigations predict that California's climate will

become warmer (+2 to +4° C) and drier (10-15 percent) during the mid- to late-21st century, relative to historical conditions. These scenarios were based on a commonly accepted projection of 21st century climate from the GFDL CM2.1 (Geophysical Fluid Dynamics Lab Climate Model 2.1) global climate model, responding to assumptions of rapidly increasing greenhouse-gas emissions. If these predictions materialize, the level of runoff from the Sierra Nevada Mountains, and thus the Kern River Watershed, is expected to be much less reliable with quantities presumably declining over time. Reduced surface water deliveries for agriculture in the Central Valley, combined with increased demands for irrigation water due to the increasingly warmer, drier climate, will result in increased use of groundwater, the impacts of which could include the following:

- Reduced base flow in streams;
- Reduced groundwater outflows;
- Increased depths to groundwater, and
- Increased land subsidence.

Local communities, rural residences, and businesses also rely on groundwater from the Kern County Subbasin as their main supply. Should climate change result in a reduction in water available from surface supplies, the increased frequency of groundwater pumping, from agricultural water districts and other users, will lead to a decrease in groundwater storage without the necessary means of replenishing the depleted storage. According to another CAWSC study (Proceedings of the Eighth International Symposium on Land Subsidence, 2010); Kern County should expect land subsidence due to the increased demand on groundwater that will result from climate change.

6.2 Effects of Climate Change on Agriculture's Water Demand

The effects of climate change are expected to increase both daytime and nighttime temperatures in the Central Valley, resulting in lengthening of the growing season under much drier conditions. This general increase in temperatures, coupled with greater variability and unpredictability in precipitation, is expected to lead to increases in evapotranspiration resulting from warmer seasons; thereby creating an increase in agricultural water demand for irrigation purposes and greater year-to-year variability of such demand.

As seen in Section 3.1, permanent crops (e.g. temperate fruit and nut trees) account for around 82 percent of the total irrigated area in the District. These types of crops generally require adequate winter chill to produce economically viable yield. Increased temperatures in the Central Valley are expected to reduce winter chill hours, thus causing adverse effects on crop yield. By the end of the century, the winter chill needed for these crops is predicted to disappear. Today, the number of hours of winter chill in the San Joaquin Valley has shrunk from about 1,500 a few decades ago, to approximately 1,000 to 1,200 hours (PLoS ONE, 2009). Some farmers are beginning to overcome this change by using new varieties.

Studies with neighboring districts and the Poso Creek Regional Water Management Group are now underway to prepare farmers for the likely impacts of climate change. Such efforts include breeding varieties of fruit trees which can withstand the decreased winter chill hours, developing tools to aid the crops in coping with reduced chill, and researching the temperature responses of particular orchard crops to better understand potential long-term effects. However, some solutions, such as replanting orchards with altered crop varieties or the installation of tools, may not be feasible for many irrigators.

6.3 Response to Effects of Climate Change

The Cawelo Water District is committed to monitoring key indicators of climate change that affect the hydrology of key surface water sources (e.g. Kern River watershed and Sacramento-San Joaquin River Delta) and growing conditions in the District's service area. The District will work with the Department of Water Resources in an effort to continue to provide adequate surface water supplies to meet the growing conditions in the District's service area. Cawelo has little to no control over the availability of its imported water supplies; rather, the District will remain focused on maximizing the use of imported water supplies (when they are available) through the conjunctive management of both surface water and groundwater resources.

SECTION 7

Water Use Efficiency Information

7.1 EWMP Implementation and Reporting

The California Water Code sets forth specific Efficient Water Management Practices (EWMPs) for agriculture; two of which are identified as “critical”, and 14 of which are to be implemented if they are “locally cost effective and technically feasible”. The latter are referred to as “conditionally required” in DWR’s Guidebook. The EWMPs are also listed in DWR’s Guidebook and in Section 1.2 hereof. Table 49 has been prepared to summarize the status of Cawelo’s implementation of the EWMPs. The two “critical” EWMPs are listed first and are followed by the 14 “conditionally required” EWMPs.

Table 50 presents the District’s schedule for implementing EWMPs. The District’s budget includes funding for general operations without explicitly identifying individual EWMPs. The District funds capital improvements for individual projects and not for individual EWMPs.

**TABLE 49A
REPORT OF EWMPs**

Water Code Ref.	EWMP	Current Status	Status of EWMP
10608.48.b(1)	Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10 and to implement paragraph (2) of the legislation.	On-going.	All deliveries to growers are metered at the farm turnouts. The District is committed to compliance with the requirements of SBx7-7 by verifying the accuracy of measurement of irrigation water deliveries using the methodology described in Section 7 of this plan.
10608.48.b(2)	Adopt a pricing structure for water customers based at least in part on quantity delivered.	On-going.	CWD charges water users based on the volume of water delivered.
10608.48.c(1)	Facilitate alternative land use for lands with exceptionally high water duties or whose irrigation contributes to significant problems, including drainage.	On-going.	The District has also supported voluntary land retirement as a means of reducing local demands upon the groundwater basin. CWD assesses the quality of agricultural land when requests are made to bring new lands into the District. CWD has converted land in flood plains to recharge basins. CWD has historically cooperated with other local agencies to modify District boundaries so that utility service is provided by those best suited to serving the projected land use.
10608.48.c(2)	Facilitate use of available recycled water that otherwise would not be used beneficially, meets all health and safety criteria, and does not harm crops or soils.	Already Implemented.	CWD presently integrates the use of significant quantities of water produced from oilfield operations and considers other requests for use of recycled water. Presently, oilfield-produced water is the principal source of recycled water available to Cawelo.

**TABLE 49B
REPORT OF EWMPs (CONTINUED)**

Water Code Ref.	EWMP	Current Status	Status of EWMP
10608.48.c(3)	Facilitate financing of capital improvements for on-farm irrigation systems.	Not applicable.	CWD is a water purveyor, not a provider of on-farm capital. The District does, however, provide funds for irrigation efficiency evaluations, which is a free service to landowners. The District will also provide information to landowners regarding grant programs, low interest loans, energy efficiency programs, etc. that may be available from time to time.
10608.48.c(4)	Implement an incentive pricing structure that promotes one or more of the following goals: (A) more efficient water use at the farm level; (B) conjunctive use of groundwater; (C) appropriate increase of groundwater recharge, (D) reduction in problem drainage; (E) improve management of environmental resources; (F) effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.	Already Implemented.	The CWD Board of Directors annually establishes a water rate that is the basis for volumetric pricing of delivered water. In addition, water is priced higher in dry years when the District incurs significant pumping costs, and lower in wet years with little or no District pumping. Water rate increases may be among the factors that lead water users to convert from flood irrigation to low-volume irrigation systems.
10608.48.c(5)	Expand line or pipe distribution system, and construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance and reduce seepage.	Already Implemented.	All conveyance systems within the District have been lined since 1975. CWD has completed projects to increase conveyance capacity to farmers in the various service areas of the District. Since the latest project was completed, expansion of delivery capacity to North Service Area, most District deliveries will not be limited by capacity constraints.

**TABLE 49C
REPORT OF EWMPs (CONTINUED)**

Water Code Ref.	EWMP	Current Status	Status of EWMP
10608.48.c(6)	Increase flexibility in water ordering by, and delivery to, water customers within operational limits.	On-going.	The District's ability to operate on an on-demand basis is limited as the District's primary source of surface water, the State Water Project, does not provide flexibility to the District in the water that is ordered and delivered. Cawelo has, however, started organizing and implementing a web-based system for water ordering by District users. This system will link demand operations to water billing and allows users to track and organize their annual water demands.
10608.48.c(7)	Construct and operate supplier operational outflows and tailwater recovery systems.	Already Implemented	Irrigated lands are mostly planted in permanent crops with high-efficiency irrigation methods. Accordingly, there are very few drainage systems in the District and any farm tail water is handled by individual growers through their own on-farm tail water recovery systems. The District's distribution system includes regulating reservoirs to manage mismatches between supply and demand and thereby avoid operational spills.
10608.48.c(8)	Increase planned conjunctive use of surface water and groundwater within the supplier service area.	On-going.	The District continues to expand its conjunctive use practices by constructing distribution systems to deliver surface water to land otherwise reliant on groundwater for irrigation, thereby accomplishing in-lieu recharge. The District will continuously evaluate additional conjunctive use programs.
10608.48.c(9)	Automate canal control structures.	Already Implemented.	All District-managed pumps and canals are automatically controlled, and the control system was upgraded in 1997.

**TABLE 49D
REPORT OF EWMPs (CONTINUED)**

Water Code Ref.	EWMP	Current Status	Status of EWMP
10608.48.c(10)	Facilitate or promote customer pump testing and evaluation.	Not applicable.	Pump efficiency tests (measured KWh/AF) are performed by utilities and pump companies as requested by farmers. No further work is proposed by the District.
10608.48.c(11)	Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress reports.	Already Implemented.	The function of Water Conservation Coordinator is performed by the District Engineer.
10608.48.c(12)	Provide for the availability of water management services to water users.	On-going.	The District provides water management services to customers that include maintaining an engineering and operations staff, and providing funding support for a mobile irrigation evaluation laboratory.
10608.48.c(13)	Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional changes to allow more flexible water deliveries and storage.	On-going.	<p>The District receives surface water from the SWP, contracted through the KCWA, and is party to turn-in agreements and point-of-delivery agreements with DWR.</p> <p>Kern River supplies are regulated by Isabella Reservoir (a USACE-operated facility). Due to dam safety considerations, USACE has imposed a storage restriction on Isabella Reservoir in 2006, and this restriction will likely be in place for several years to come.</p> <p>The District occasionally receives "215 water" from the USBR; however, the Friant SJR Settlement has affected the availability of this supply.</p> <p>The District has completed environmental documents that allow for banking, transfer, and exchange of available water supplies with neighboring districts with federal and state water contracts.</p>

**TABLE 49E
REPORT OF EWMPs (CONTINUED)**

Water Code Ref.	EWMP	Current Status	Status of EWMP
10608.48.c(14)	Evaluate and improve the efficiencies of the supplier's pumps	On-going.	CWD pump tests are conducted as needed; the District most recently performed pump tests within the last 3 to 4 years. The District monitors pump efficiency on a continuous basis. Pumps needing work are serviced on an annual basis.
1999 AWMC MOU A-4	Improve communication and cooperation among water suppliers, users, and other agencies.	On-going.	CWD currently works with PG&E, the Resource Conservation District (RCD), and neighboring districts to minimize water costs, increase water use efficiency, and reduce power and energy costs. The District will continue to maintain and promote communication and cooperation with other entities.

**TABLE 50A
SCHEDULE TO IMPLEMENT EWMPs**

EWMP No.¹	EWMP	2013 Sch. Activities	Staffing Req.	Budget Allotment	AWMC MOU Demand
<i>Critical EWMPs</i>					
1	Water Measurement	On-going service.	GEN	OPT	C-1
2	Volume-Based Pricing	On-going service.	MGMT	OPT	
<i>Conditionally Required EWMPs (locally cost-effective and technically feasible EWMPs)</i>					
1	Alternate Land Use	On-going service.	MGMT	CIM	B-1
2	Recycled Water Use	Already Implemented.	DCS	CIM	B-2
3	On-Farm Irrigation Capital	Already Implemented	DCS	PFN/GFN	B-3
4	Incentive Pricing Structure	Already Implemented.	GEN	OPT	C-2
5	Infrastructure Improvements	Already Implemented.	DCS	CIM	B-5
6	Order/Delivery Flexibility	Already Implemented.	GEN	OPT	B-6
7	Supplier Operational Outflow and Tailwater Systems	Already Implemented.	GEN	OPT	B-7
8	Conjunctive Use	On-going service.	DCS	CIM	B-8
9	Automated Canal Controls	Already Implemented.	DCS	OPT	B-9
10	Customer Pump Test/Evaluation	Not Applicable.	DCS	OPT	
11	Water Conservation Coordinator	Already Implemented.	MGT	OPT	A-2

(1) EWMP numbers correspond to Water Code §10608.48(c).

MGT = District Management Staff

GEN = General District/Administrative Staff

DCS = District Engineer/Consulting Staff

N/A = Not Applicable Item

OPT = Operations Budget

CIM = Capital Improvements

PFN = Privately Funded

GFN = Grant Funded

**TABLE 50B
SCHEDULE TO IMPLEMENT EWMPs (CONTINUED)**

EWMP No.¹	EWMP	2013 Sch. Activities	Staffing Req.	Budget Allotment	AWMC MOU Demand
<i>Conditionally Required EWMPs (locally cost-effective and technically feasible EWMPs)</i>					
12	Water Management Services to Customers	On-going service.	GEN	OPT	A-3
13	Identify Institutional Changes	On-going service.	MGT	OPT	A-5
14	Supplier Pump Improved Efficiency	On-going service.	DCS	OPT	A-6
<i>Other Optional EWMPs (as applicable)</i>					
N/A	Improve Communication Among Suppliers	On-going service.	GEN	OPT	A-4
Grand Total of all EWMPs					

(1) EWMP numbers correspond to Water Code §10608.48(c).

MGT = District Management Staff

GEN = General District/Administrative Staff

DCS = District Engineer/Consulting Staff

N/A = Not Applicable Item

OPT = Operations Budget

CIM = Capital Improvements

PFN = Privately Funded

GFN = Grant Funded

Table 51 includes an estimate of key water use efficiency improvements identified to occur in the near future, partially dependent on the District's revenues.

**TABLE 51
REPORT OF EWMPs EFFICIENCY IMPROVEMENTS**

EWMP No. ¹	EWMP	Estimate of Water Use Efficiency That Occurred Since Last Report	Estimated Water Use Efficiency 5 and 10 years in Future
2	Recycled Water Use	District has used over 30,000 acre-feet/year of reclaimed water from oilfield operations. District is working with oil companies to take increased flows that meet quality standards.	District will extend agreements with oil companies and pursue additional opportunities.
8	Conjunctive Use	District is actively involved in projects to expand conjunctive use operations.	District to construct several additional in-lieu systems (recharge basins) including systems in land currently served by groundwater only.
12	Water Management Services to Customers	District maintained and improved communication with Growers.	District to consider additional water purchases to improve long-term water balance.
13	Identify Institutional Changes	District completed an environmental document with neighboring SWP, CVP, and Kern River Contractors that allows the districts to bank, transfer, and exchange surface water supplies for 25 years.	District to complete agreements between neighboring districts for use of banking facilities to assist in San Joaquin River Recirculation Water Management.

(1) EWMP numbers correspond to Water Code §10608.48(c).

7.2 Documentation for Non-Implemented EWMPs

Cawelo has chosen to implement each of the recommended EWMPs other than those categorized as “Not Applicable”. Although some measures are not locally cost-effective as individual water conservation measures, the District views them as elements of a broader, regional program that enables Cawelo to provide a high level of service to its agricultural customers and to responsibly manage surface water and groundwater resources in the District’s service area. This position is summarized below in Table 52.

**TABLE 52
NON-IMPLEMENTED EWMP DOCUMENTATION**

EWMP No. ¹	EWMP	(check one of both)		Justification/Documentation
		Technically Infeasible	Not Locally Cost-Effective	
3	On-Farm Irrigation Capital			CWD is not a provider of on-farm capital. All water conveyance facilities, including farm turnouts, are owned and operated by the District.

(1) EWMP numbers correspond to Water Code §10608.48(c).

SECTION 8

Supporting Agricultural Water Measurement Regulation Documentation

8.1 Description of Water Measurement Best Professional Practices

As stated in Section 10608.48(b) of the California Water Code, all governed agricultural water suppliers are required to, “Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10” of the legislation. Furthermore, Section 531.10(a) requires that, “An agricultural water supplier shall submit an annual report to the department (DWR) that summarizes aggregated farm-gate delivery data, on a monthly or bi-monthly basis, using best professional practices.”

The Cawelo Water District makes deliveries of surface water and groundwater to farm delivery points, or “turnouts”, which are owned and metered by the District as explained in Section 2.7 (shown in Figure 7). Meter readings (delivered volumetric recording) at each turnout are taken every day that a turnout is running and also at the end of every month by District staff, using propeller meters manufactured by McCrometer. These measurements support the District’s volumetric pricing structure, and compliance with volumetric measurement requirements.

Bar code readings at each turnout are used to track the time and location of each measurement and to reduce transcription errors by electronically downloading data into the District’s dispatch office. The data are then reviewed by a supervisor as a quality control procedure. Farm-level water delivery data are then assembled by the District and are made available to water users upon request throughout the season, which enables irrigators to monitor their water usage.

In practice, meters are only repaired or replaced when a meter is observed to be malfunctioning or when a water user questions a meter’s accuracy. In the latter case, if the questioned flow meter is tested and found to be within an acceptable accuracy, then the water user must pay for the testing process. Conversely, the District will fund the

process to repair or replace the flow meter if the flow meter is not within an acceptable accuracy range.

8.2 Engineer Certification and Apportionment

The flow meters at each farm turnout measure District deliveries of water to each irrigator's place of use. The flow meter is equipped with a "totalizer" which indicates the instantaneous flow rate and the cumulative total of water delivered.

The methodology used to determine whether the accuracy of a representative sample of District flow-measurement devices complies with the requirements of Section 597.3(a) is described later in Section 8.6D. Cawelo plans to adopt this methodology for field testing of existing flow metering devices and to present a report approved by a California-Registered Professional Engineer as the basis for ongoing compliance with SBx7-7. This practice complies with Section 597.3(a) of the California Water Code as stated below:

The methodology used to determine the individual device accuracy values found in Section 597.3(a) will be verified by a Professional Engineer using industry accepted standards. These methods will take into account the differential in water levels and/or fluctuations in the flow rate or velocity during the delivery event and the type, size and characteristics of the measuring device being verified.

8.3 Documentation of Water Measurement Conversion to Volume

SBx7-7 requires an annual volumetric accuracy of within ± 12 percent on existing devices. Since Cawelo's flow measurement devices include totalizers (which directly record cumulative flow volume), the devices' accuracy in measuring flow rates is representative of their ability to measure volumetric deliveries. Therefore, the discussion presented later in this section that relates testing the accuracy of measurement of flow rates applies equally to determination of the accuracy of measurement of volumes of delivered water.

Section 2.6 contains more information regarding specific District flow meter types and the assumption of volumetric measurement accuracy. The basis for this assumption can be found in the *SBx7-7 Flow Rate Measurement Compliance for Agricultural Irrigation*

Districts by the Irrigation Training & Research Center of the California Polytechnic Institute, San Luis Obispo.

8.4 Legal Certification and Apportionment (Access to Farm-gates)

Cawelo Water District staff may install, measure, maintain, operate, and monitor flow-measurement devices at all customer (farm) water diversions (turnouts) from the District's irrigation distribution system. As such, there are no institutional or legal impediments that restrict access to turnouts or measurement of water and, for the purposes of satisfying SBx7-7, there is no need to measure water upstream of points of delivery to individual customers.

8.5 Device Corrective Action Plan

As noted above, currently the District repairs or replaces flow meters only when there is some obvious deficiency in their performance or when a water user questions the accuracy of a meter. Cawelo will continue this practice on an ongoing basis separate from a sampled meter testing schedule for SBx7-7 compliance, assuming the meter in question was not part of the randomly-sampled compliance testing and found to be within acceptable accuracy limits.

All meter devices identified to have measurement accuracies that depart by more than ± 12 percent from flows measured by a calibrated device (shared with neighboring North Kern Water Storage District) will be sent to the district shop for assessment. If the shop is not able to correct the inaccuracy in flow measurement, the device will be replaced. After installation in the field, the accuracy of repaired meters will be verified using a calibrated device, and an affidavit will be submitted by a California-registered Professional Engineer certifying the accuracy of each repaired meter to be within ± 10 percent by volume. New replacement meters will be laboratory certified by their manufacturer prior to installation to have an accuracy of measurement within ± 6 percent by volume. Repair or replacement of these flow meters will be completed within three years of approval of this testing program by the DWR.

8.6 Farm Gate Measurement and Device Accuracy Compliance

SBx7-7 requires that agricultural water suppliers measure the volume of water delivered to customers with sufficient accuracy to comply with standards described in the legislation. These standards are presented below:

A. Measurement Options at the Delivery Point or Farm-gate of Single Customer

An agricultural water supplier shall measure the volume of water delivered at the delivery point or farm-gate of a single customer. If a device measures a value other than volume, for example, flow rate, velocity or water elevation, the accuracy certification must incorporate the measurements or calculations required to convert the measured value to volume. An existing measurement device shall be certified to be accurate to within ± 12 percent by volume.

B. Initial Certification of Device Accuracy

For existing measurement devices, the device accuracy shall be initially certified and documented by either:

- *Field-testing that is completed on a random and statistically representative sample of the existing measurement devices. Field-testing shall be performed by individuals trained in the use of field-testing equipment and documented in a report approved by an engineer.*
- *Field-inspections and analysis completed for every existing measurement device. Field-inspections and analysis shall be performed by trained individuals in the use of field inspection and analysis, and documented in a report approved by an engineer.*

C. Protocols for Field Testing

Field-testing shall be performed for a sample of existing measurement devices according to manufacturer's recommendations or design specifications and following best professional practices. It is recommended that the sample size be no less than 10 percent of existing devices, with a minimum of 5, and not to exceed 100 individual devices for any particular device type. Alternatively, the supplier may develop its own sampling plan using an accepted statistical methodology.

If during the field-testing of existing measurement devices, more than one quarter of the samples for any particular device type do not meet the relevant accuracy criteria, the agricultural water supplier shall provide in its Agricultural Water Management Plan a plan to test an additional 10 percent of its existing devices, with a minimum of 5, but not to exceed an additional 100 individual devices for the particular device type. This second round of field-testing and corrective actions shall be completed within three years of the initial field-testing.

Field-inspections and analysis protocols shall be performed and the results shall be approved by an engineer for every existing measurement device to demonstrate that the design and installation standards used for the installation of existing measurement devices meet the relevant accuracy standards and that operation and maintenance protocols meet best professional practices.

D. District Compliance with Water Measurement Requirements

SBx7-7 offers the water supplier the opportunity to “develop its own sampling plan using an accepted statistical methodology”. Therefore, to comply with the requirements of SBx7-7 Cawelo intends to identify a set of randomly-selected turnouts that equates to approximately 10 percent of the District’s total irrigated area (around 3,600 acres served) instead of simply 10 percent of the 365 active District turnouts. Note there are 379 total turnouts in the District; however, only 365 are regularly supplied by the District.

As with many other irrigation districts, there is a wide range in the acreage served by a given farm turnout (turnouts range from 4 to 18 inches in size and serve 1 to 640 acres) and the population of turnouts is skewed towards turnouts serving small fields (<100 acres). The skewed distribution among field sizes served by a type of turnout leads to the result that a simple random selection of measurement devices is likely to generate a sample for testing that includes a disproportionately large number of turnouts making small deliveries. The likely outcome of random selection of 10 percent of the turnouts from this population would be to identify a sample that served substantially less than 10 percent of the irrigated acreage and thus delivered less than 10 percent of the water.

According to the publication SBx7-7 Flow Rate Measurement Compliance for Agricultural Irrigation Districts by the Irrigation Training & Research Center of the California Polytechnic Institute, San Luis Obispo, a precise methodology can be developed where the selected sample of measuring devices is based not upon a

percentage of the number of turnouts but upon a percentage of the acreage served and water delivered. The ITRC manual recommends application of a probability-proportional-to-size (PPS) sampling method designed to generate a randomly selected sample of measurement devices that serves at least 10 percent of the irrigated acreage.

Flow rates measured at each of those turnouts within the sample population will be compared with measurements recorded by a calibrated ultrasonic flowmeter to determine the accuracy of measurement. For these tests, all readings will be taken for a period of 10 minutes at each turnout. Because the propeller meters used by the District are equipped with totalizers, errors detected in the measurement of flow rates correspond with errors in measurement of delivered water volumes, with measurement error being defined as the percentage departure between the propeller flowmeter reading and the corresponding reading taken with the calibrated ultrasonic meter. This formula for computing error conforms to the following language from Section 572.2 of the legislation.

“Accuracy” means the measured volume relative to the actual volume, expressed as a percent. The percent shall be calculated as $100 \times (\text{measured value} - \text{actual value}) / \text{actual value}$, where the “measured value” is the value indicated by the device or determined through calculation using a measured value by the device, such as flow rate, combined with a duration of flow, and “actual value” is the value as determined through laboratory, design or field testing protocols using best professional practices.

The sequence of steps proposed to identify a representative population of turnouts for verification of flow measurement is as follows:

Step 1: *Formulate a list of turnouts* with the relative acreage land supplied by each turnout (i.e. size of farm).

Step 2: *Assign a number range to each turnout based on the acreage served by the device.* For example, a turnout serving two acres would be assigned two numbers in sequence and a turnout serving 120 acres would be assigned 120 numbers. As such, each device will be weighted by the acreage served and, hence, by the volume of water delivered. This weighting process structures the randomly selected sample so that it will be statistically representative of the

accuracy of flow measurement for the total volume of water delivered within the District.

Step 3: *Select a random set of turnouts* from the entire list that represents at least 10 percent of the total irrigated area serviced. This can be accomplished by numbering each of the turnouts (1 through 365) and using a limited random number generator for the selection process.

Once a particular device is selected, that device would be designated for testing and the device would be withdrawn from the pool available for future selection. This procedure will be followed until devices that represent 10 percent of the irrigated acreage, based on the assigned number range, are identified for testing.

Step 4: *Evaluate selected turnouts with calibrated device and record data.* Flow measurement devices at turnouts selected for testing in Step 3 will be evaluated by Cawelo for accuracy, and measured accuracy will be retained for ten years or two AWMP cycles as per §597.4(c).

Step 5: *Determination of compliance.* Cawelo will estimate the annual volumetric accuracy of measurement of the selected sample of flow measurement devices. The District will expand their number of turnout samples if the accuracy is determined to be outside the limit imposed by SBx7-7 to determine the extent of any measurement issues. Non-compliant turnouts will be repaired or replaced by the District.

SECTION 9

References

California Water Code Section 20500. 1887. California Irrigation Districts Act.

California Department of Water Resources. 2012. "A Guidebook to Assist Agricultural Water Suppliers to Prepare a 2012 Agricultural Water Management Plan".

California Code of Regulations; Title 23; Water; Division 2, DWR. Chapter 5.1 Water Conservation Act of 2009. Article 2. Ag Water Measurement.

California Department of Water Resources. 2010. "The State Water Project Delivery Reliability Report 2009."

Chung et al. California Department of Water Resources. 2009. "Using Future Climate Projections to Support Water Resources Decision Making in California."

Cawelo Water District. 2000. "Consolidated Rules and Regulations for Distribution of Water in the Cawelo Water District."

Cawelo Water District. 2007. "2007 Amended Groundwater Management Plan", draft.

Cawelo Water District. 2010. "2010 Water Conservation Plan: Warren Act Contract Plan (Zone 7)", draft.

Hanson, R.T.; Flint, A.L.; Flint, L.E.; Faunt, C.C.; Schmid, W.; Dettinger, M.D.; Leake, S.A.; and Cayan, D.R., 2010. "Integrated Simulation of Consumptive Use and Land Subsidence in the Central Valley, California, for the Past and for a Future Subject to Urbanization and Climate Change". Proceedings of the Eighth International Symposium on Land Subsidence (EISOLS).

Irrigation Training and Research Center. 2012. "SBx7 Compliance for Agricultural Districts", draft.

Kern County Water Agency. 2009. "Water Supply Report: 2009".

Luedeling, E; Zhang, M; Girvetz, E.H., July 2009. "Climatic Changes Lead to Declining Winter Chill for Fruit and Nut Trees in California during 1950-2099". PLoS ONE 4(7).

Poso Creek Integrated Regional Water Management (IRWM) Group. Adopted 2007. "IRWM Plan (Poso Creek IRWMP).

United States Geological Survey. Fact Sheet 2009-3074. September 2009. "Effects of Climate Variability and Change on Groundwater Resources in the United States".

Water Resources Research, Vol. 48, 2012. "A Method for Physically Based Model Analysis of Conjunctive Use in Response to Potential Climate Change".

Appendix A
Public Hearing Notice

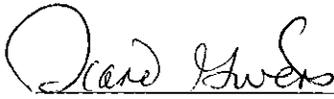
PROOF OF PUBLICATION

(2015.5 C.C.P.)
(GENERAL FORM)

STATE OF CALIFORNIA }
County of Kern } ss.

I, the undersigned, am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a part of or interested in the above entitled matter. I am the chief clerk/publisher of *The Shafter Press*, a newspaper of general circulation, printed and published weekly, in the City of Shafter, County of Kern, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court order number 29926, of the County of Kern; that the notice, of which the annexed is a printed copy, has been published in each regular and entire issue of said newspaper and in any supplement thereof on the following dates, to-wit: January 29, Feb 5, 2014

I certify (or declare) under the penalty of perjury that the foregoing is true and correct.


(Signature)

Executed on 2-5-14
at Shafter, California

(5) \$60⁰⁰

The *SHAFTER PRESS*
PO Box 1600
Shafter, CA 93263

Phone (661) 746-4942

PUBLIC NOTICE

PUBLIC HEARING NOTICE

Notice is hereby given that the Cawelo Water District (CWD) will hold a public hearing on:

FEBRUARY 13, 2013 at 10:00AM

Regarding:

2013 Agricultural Water Management Plan

The Water Conservation Act of 2009 (SBx7-7) requires certain agricultural water suppliers in California to prepare Agricultural Water Management Plans (AWMP). To meet the requirements of this legislation, CWD is preparing an AWMP to be reviewed and approved by the California Department of Water Resources (DWR). The AWMP includes a discussion of CWD and its irrigation facilities, water supply and demand, and various programs, policies and efficient water management practices being implemented now or planned in the coming years. The CWD Board of Directors will hold a hearing to consider public comments on the proposed AWMP.

A copy of the AWMP may be reviewed at the CWD office (17207 Industrial Farm Rd, Bakersfield, CA). Written comments, submitted prior to the hearing, should be directed to:

David R. Ansolabehere
Cawelo Water District
17207 Industrial Farm Rd.
Bakersfield, CA 93308

Comments may also be provided at the hearing.
If you have questions regarding the AWMP, please contact David Ansolabehere at (661) 393-6072.

Publish *Shafter Press* January 29, February 5, 2014

Appendix B
Notification Letters

Copy of DWR, CA State Library, and City of Bakersfield



17207 Industrial Farm Road
Bakersfield, CA 93308
Phone: (661) 393-6072
Fax: (661) 393-6073

David R. Ansolabehere, General Manager

April 2, 2014

Agricultural Water Use Efficiency
Department of Water Resources
Statewide Integrated Water Management
Water Use and Efficiency Branch
Attn: Sabrina Cook
901 P Street, Room 214
Sacramento, CA 95814

Subject: Agricultural Water Management Plan submission

To Sabrina Cook:

Please find enclosed one electronic copy and one hard copy of the Cawelo Water District's 2013 Agricultural Water Management Plan.

Please direct any questions to Dave Ansolabehere, General Manager, at (661) 393-6072, or by email to dansolabehere@cawelowd.org.

Sincerely,

David Ansolabehere
General Manager

Enclosed: (1) Electronic copy
(2) Hard copy of the AWMP and all applicable documentation



17207 Industrial Farm Road
Bakersfield, CA 93308
Phone: (661) 393-6072
Fax: (661) 393-6073

David R. Ansolabehere, General Manager

April 2, 2014

California State Library
Government Publications Section
Attn: Water Management Plan Coordinator
P.O. Box 942837
Sacramento, CA 94237-0001

Subject: Agricultural Water Management Plan submission

To Whom It May Concern:

Please find enclosed one electronic copy of the Cawelo Water District's 2013 Agricultural Water Management Plan.

Please direct any questions to David Ansolabehere, General Manager, at (661) 393-6072, or by email to dansolabehere@cawelowd.org.

Sincerely,

David Ansolabehere
General Manager

Enclosed: (1) Electronic copy of the AWMP and all applicable documentation



17207 Industrial Farm Road
Bakersfield, CA 93308
Phone: (661) 393-6072
Fax: (661) 393-6073

David R. Ansolabehere, General Manager

April 2, 2014

City of Bakersfield
Attn: Art Chianello
1000 Buena Vista Road
Bakersfield, CA 93311

Subject: Agricultural Water Management Plan submission

To Art Chianello:

Please find enclosed one electronic copy of the Cawelo Water District's 2013 Agricultural Water Management Plan.

Please direct any questions to Dave Ansolabehere, General Manager, at (661) 393-6072, or by email to dansolabehere@cawelofd.org.

Sincerely,

A handwritten signature in blue ink, appearing to read "David Ansolabehere", is written over a light blue circular stamp or watermark.

David Ansolabehere
General Manager

Enclosed: (1) Electronic copy

Appendix C

Resolution of AWMP Adoption

CAWELO WATER DISTRICT

RESOLUTION NO. 643

RESOLUTION OF THE BOARD OF DIRECTORS OF CAWELO WATER DISTRICT ADOPTING 2013 AGRICULTURAL WATER MANAGEMENT PLAN

WHEREAS, the Cawelo Water District completed an Agricultural Water Conservation Plan in March, 2005 that was sufficient to meet the Water Conservation Plan requirements for a Reclamation Warren Act Contract. The District has prepared an updated AWMP in accordance with the requirements of the Water Conservation Bill of 2009 (SBx7-7) and approved by the California Department of Water Resources (DWR); and

WHEREAS, this AWMP update conforms to the reorganized framework presented in *A Guidebook to Assist Agricultural Water Suppliers to Prepare a 2012 Agricultural Water Management Plan* issued by the California Department of Water Resources (DWR) on October 12, 2012 to aid water suppliers in preparing Agricultural Water Management Plans; and

WHEREAS, the requirements in SBx7-7 are intended to encourage agricultural water suppliers to assess current efficient water management practices, to evaluate additional practices that may conserve water, and to require a certain level of accurate measurement of water. As such the AWMP process presents an opportunity for water suppliers to demonstrate existing and planned activities and programs designed to improve the effective use of water and water use efficiency; and

WHEREAS, included in Section VII of this plan is a listing of the efficient management practices which have been implemented or planned to be implemented and an estimate of the water use efficiency improvements estimated to occur five and 10 years in the future; and

WHEREAS, the District is an authorized local agency and may therefore adopt and implement such an agricultural water management plan; and

WHEREAS, the District's General Manager prepared a 2013 Agricultural Water Management Plan Update at the direction of the District Board; and

WHEREAS, a public hearing was held on February 13, 2014, to consider adoption of the proposed 2013 Agricultural Water Management Plan Update and no comments were submitted nor formal protests were submitted on such proposal; and

WHEREAS, the Board believes that the adoption of the proposed 2013 Agricultural Water Management Plan is in the best interests of the District and its landowners.

NOW, THEREFORE, BE IT RESOLVED, that the Cawelo Water District approves and adopts the 2013 Agricultural Water Management Plan in accordance with part SBx7-7, as prepared by Cawelo Water District's General Manager.

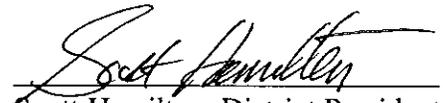
BE IT FURTHER RESOLVED, Cawelo Water District hereby authorizes the officers and staff of the District to execute all documents and take any other action necessary or advisable to carry out the purpose of this resolution.

PASSED AND ADOPTED by the board of Directors of Cawelo Water District this 13th day of March, 2014, upon a motion by Director Fenn, seconded by Director Blackwell, and unanimously passed and authorized by the following roll call vote:

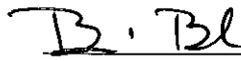
AYES:	4	Blackwell, Fenn, Smith, Watkins
NOES:	0	
ABSTAIN:	0	
ABSTAIN:	1	Hamilton

I HEREBY CERTIFY that the foregoing resolution is the resolution of Cawelo Water District as duly passed and adopted by the Boards of Directors on the 13th day of March, 2014.

(SEAL)



Scott Hamilton, District President



Brian Blackwell, District Secretary

Appendix D

Cawelo Water District: Rules and Regulations for Distribution and Use of Water

CAWELO WATER DISTRICT
RULES AND REGULATIONS
FOR
DISTRIBUTION OF WATER
(Amended February 8, 2000)

As authorized by the provisions of Section 35423 of the California Water Code, the Board of Directors of Cawelo Water District hereby adopts and establishes rules and regulations for the distribution of water by Cawelo Water District.

I.

DEFINITIONS

1. "Agent Authorization Form" means the form supplied by the District for a Landowner to designate authorized agents, including a Designated Representative.
2. "Agricultural Use" means use of water in the growing and producing of agricultural crops and products.
3. "Assessment" means the per acre charge upon land in the District (both the Service Area and the Non-Service area) fixed and levied by the Board pursuant the California Water Code.¹
4. "Board" means the Board of Directors of Cawelo Water District.
5. "Canal Service Area" means lands served through turnouts directly from the Lerdo Canal.
6. "Designated Representative" means a person or entity designated as such by a Landowner on an Agent Authorization Form to act on behalf of the Landowner in all matters relating to obtaining District water for Agricultural Use on the Landowner's Farm, including applying for water, ordering water, accepting delivery of water, paying District Water Charges, and communicating with the District. Provided, however, the Designated Representative may not bring land into or exclude land from the District Service Area.

¹See sections 35359, *et seq.*

7. “District” means the Cawelo Water District, a California Water District organized and existing pursuant to law, its agents, representatives, Directors and employees.²
8. “District Delivery Capacity” means the extent of capability of a District distribution facility to pump, carry, store, deliver or otherwise make available District water to Water Users for Agricultural Use at any given time.
9. “District Manager” means the person who is appointed by the Board of Directors to carry out the policies and directives of the Board, or someone who is acting in that capacity in the District Manager’s absence.
10. “Farm” means a single parcel of land, or contiguous parcels of land (no part of which is merely cornering another part), or non-contiguous parcels being served through a single District Turnout , the title or the equitable ownership to which is held of record in a single ownership.
11. “Landowner” means a holder of title to land as defined in the California Water Code.³
12. “Meter” means a measuring and recording device for determination by the District of the quantity of water delivered by the District through a Turnout.
13. “Non-Service Area” means those lands within the boundaries of the District which have been designated by the Board as developed for water use, but are not in the Service Area.
14. “Non-Service Area Water” means the water allocated to water users in the Non-Service Area, after the District meets the demands for Service Area Water, deliverable at the Non-Service Area Water Toll rate.
15. “Non-Service Area Water Toll” means the charge per acre foot for Non-Service Area Water.
16. “North Service Area” means lands served by the District’s Pump Station “C.”

²Division 13 of the California Water Code.

³Section 34026 of the California Water Code.

17. “Service Area” means those lands within the boundaries of the District to which surface delivery of water service will be made available pursuant to these rules and regulations, under the plan for water allocation adopted by the Board.⁴
18. “Service Area Water” means the quantity of water allocated to Water Users within the Service Area to satisfy Water User applications and deliverable at the Service Area Water Toll rate.
19. “Service Area Water Toll” means the charge per acre foot for Service Area Water.⁵
20. “South Service Area” means lands served between the District’s Pump Station “B” and the District’s Pump Station “C.”
21. “Standby Charge” means the per acre charge upon land in the Service Area fixed and levied by the Board for making water delivery service available, whether the water is actually used or not.⁶
22. “Supplemental Water” means any water available for delivery to lands within the District boundaries other than the water available annually under the District’s water supply contracts.
23. “Supplemental Water Toll” means the charge per acre foot for Supplemental Water.
24. “Turnout” means a device owned and operated by the District and used to deliver water from a District facility to a Farm.
25. “Water Charges” means Standby Charges, Water Tolls, and Assessments fixed, levied, and collected by the District, which Water Charges can be enforced as liens upon the subject land.⁷
26. “Water Shortage” means a condition where total Water User applications for water use in the Service Area received by March 1st exceed the sum of the water supplies expected as a result of the District’s contractual water supplies.

⁴ Section 35526 of the California Water Code

⁵Section 35470 of the California Water Code.

⁶Section 35470 of the California Water Code

⁷Sections 36726, 36729, 35470, and 35470.5 of the California Water Code

27. "Water User" means a Landowner or Designated Representative who uses water delivered by the District on lands within the District's boundaries.
28. "Year" means calendar year.

II.

SERVICE AREA

From the District's inception, it has not been intended that the District would supply all of the lands within its boundaries with water or to provide a full water supply to the serviced lands. Therefore, in order to provide cost effective service, the Board has designated the District's Service Area.⁸ Only some of the lands in the District are in the Service Area. The Board shall maintain a Service Area designation, which shall be available for inspection at the District office by anyone during regular business hours. Maps of the Service Area are available from the District's office. From time to time, the Board may consider the modification of the boundaries of the Service Area, by either adding lands thereto or removing lands therefrom.

The Service Area has the first priority for delivery of District water and the first priority for the use of District Delivery Capacity as described in Sections IV and V of these Rules and Regulations. The water tolls vary between the Service Area and the Non-service Area as described in Section VI of these Rules and Regulations.

Requests to add lands to or remove lands from the Service Area shall be submitted in writing, signed by the Landowner, to the Board of Directors. The Board may modify the Service Area boundaries independently of Landowner requests. The Board shall have a public hearing before taking such actions. Owners of land affected by the proposed change shall receive written notice of the hearing.

III.

APPLICATIONS FOR WATER

Water Users in the Service Area shall file with the District by February 1st each Year, applications for delivery of Service Area Water, subject to availability, for that Year on forms provided by the District. Water Users should consider possible capacity constraints when submitting applications for water delivery. The Board may determine an allocation for Water Users in the Service Area who do not submit a timely application. Any such determination by the Board shall be final.

Water Users in the Non-Service Area may file with the District, on forms provided by the District, their applications for delivery of Non-Service Area Water. Applications for Non-Service Area Water shall be submitted by February 1st to receive the highest priority for

⁸California Water Code Sections 35525 through 35531.

such water. Such applications shall be accompanied by deposits in an amount fixed by the Board. If the District is unable to acquire all of the water for which a deposit is made, the District will credit or reimburse the Water User for the excess deposit, i.e., that portion of the deposit relating to water that was applied for but is unavailable. The District shall not deliver any Non-Service Area Water to a Landowner unless all of the charges for the such water have been paid in advance.

The Board shall review the applications and the projections of available water supplies after February 1st and determine the allocation on a per-acre basis. Water Users shall be notified of their final allocation no later than April 30th each Year.

If not all Water User applications can be filled from available supplies due to a water shortage, the District will attempt to obtain Supplemental Water. If the District is successful in obtaining Supplemental Water, it will notify Water Users of each block of Supplemental Water as it becomes available. The notification will usually include information on price and limitations on supply, if any. Water Users may opt to purchase Supplemental water by responding by the date indicated on the District's notification of availability. A form will be supplied by the District for making such response.

IV.

PRIORITIES FOR RECEIVING DISTRICT WATER

Priorities for receiving District water each Year are as follows:

1. The first priority is for use within the Service Area, which has been ordered or deemed ordered by February 1st of each year, allocated, if necessary, in proportion to standby acreage.
2. The second priority shall be for use outside the Service Area ordered by February 1st of each year, allocated, if necessary, in proportion to assessed acreage.

If, after the District has notified the Water Users of their final allocation, water supplies to the District are reduced, supplies to the Non-Service area shall be reduced before reducing supplies to the Service Area. Payments made for supplemental Water shall be refunded to Landowners in proportion to the reduction.

If multiple Water Users require additional water, each block of Supplemental Water shall be allocated first to the Service Area and then to the Non-Service Area. Within each priority, Water User applications shall be treated equally if submitted within the response time designated by the District. Absent a known demand by multiple Water users, the priority for Supplemental Water applied for after February 1st shall be on a "first come, first served" basis.

The District Manager's decisions respecting the proper distribution of any water, shall be final and conclusive, and there shall be no liability on the part of the District for any failure or alleged failure to distribute any water in accordance with any of said priorities.

V.

PRIORITIES FOR USE OF DISTRICT DELIVERY CAPACITY

District Landowners shall have the same priorities for the use of related District Delivery Capacity as they have for receiving District water. Except as expressly authorized by the Board, the District shall not wheel another district's water through District distribution facilities during times the District distribution facilities are at capacity transporting District water.

VI.

WATER CHARGES

The Board shall set an assessment levied on a per acre basis on all the lands in the District; a Standby Charge levied on all lands in the Service Area; Service Area Water Tolls levied per acre foot for Service Area Water; and Non-Service Water Tolls levied per acre foot for Non-Service Area Water. Supplemental Water Tolls may be set by the Board from time to time and may vary within a year as additional sources of water become available to meet District demands.

Where a Farm is comprised of both Service Area and Non-Service Area land, deliveries to that Farm exceeding 3.0 acre feet per acre of Service Area Land shall be charged the Non-Service Area Water Toll.

Before the adoption of the District's budget for the subsequent year and before the fixing the Water Charges, the Board shall duly call and notice public hearings at which all interested persons may appear and be heard. Following said hearings, the Board shall adopt its budget and fix the Water Charges.

As a courtesy to Water Users, the District shall collect current Water Charges in accordance with the following procedure:

3. Written notice of Water Charges shall be given sufficiently in advance that the payor has not less than 45 days between the date of notice and the due/delinquency date of the first installment. Bills for Standby Charges should be sent, as near as practical, during the second week of November of each Year.
4. The due/delinquency date for payment of the first installment of Standby Charges should fall, as near as practical, on the first Thursday of January in each Year.

5. If Standby Charges remain unpaid within two days of the delinquency date, the District will attempt to provide a phone call to each Water User; provided, however, (i) the District will make one attempt to reach the Water User; (ii) the District will not be responsible for failure to reach such Water User by telephone; (iii) the District will use the phone number on the Authorized Agent form on file with the District for the purpose of such call; and (iv) telephone notice is a courtesy only and the failure of the District to give or the Water User to receive such notice will not be sufficient grounds, in and of itself, to warrant waiver of delinquency penalties.

In the event of a Water Shortage, the Board may revise the Water Tolls. If the Water Tolls are revised, Landowners shall have the opportunity to revise their applications for Water Delivery.

VII.

CHANGE OF PLACE OF USE OF WATER WITHIN THE DISTRICT

The proposed place of use of any type of water may be changed in whole or in part to another Farm within the District located either within or outside the Service Area with the consent of the District Manager. Requests for change of place of use shall be submitted to the District Manager on a form supplied by the District. Standby Charges shall not be changed or otherwise affected by such change of place of use. The District Manager will not refuse to consent to such change of place of use unless he or she is of the opinion that such change would adversely affect another Water User. (For example, the change in the place of use which results in an increase in acreage served in the North Service Area when it is "on allocation," would normally have adverse impacts to other Water Users.)

Water Toll differentials between the North Service Area, the South Service Area, and the Canal Service Area shall be taken into account where appropriate. Differentials between the Water Toll and the Supplemental Water Toll shall be taken into account when water originally allocated to the Service Area is delivered to the Non-Service Area, unless the Service Area Land is followed.

VIII.

USES OF SURPLUS LANDOWNER WATER

If a Water User has surplus water (water that has been ordered and paid for but not needed in the current Year), the Water User may, after notifying the District in writing:

1. Transfer or sell the surplus water to another Water User within the boundaries of the District.

2. Return the surplus water to the District by August 31st. The District shall pool all such water, attempt to sell all such water inside or outside the District, return any revenues to Water Users in proportion to the quantity of water each Water User returned to the District before August 31st. In no case shall the refund to the Water User exceed the Water Toll, nor shall it be less than the refund calculated below.
3. Return the surplus water to the District after August 31st. The District shall pool all such water, attempt to sell such water inside or outside the District after selling all surplus water described in VIII.2. above, and return any revenues to the Water Users in proportion to the quantity of water each Water user returned to the District after August 31st. In no case shall the refund to the Water User exceed the Water Toll, nor shall it be less than the refund calculated below.
4. Subject to approval by the Board, and other necessary approvals, the Water User may transfer water from the District to land in substantially the same ownership outside the District. Among other concerns, the Board will require that all demands for water inside the District have been met before approving such a transfer and that groundwater conditions will not be adversely impacted.

If a Water User does not sell, exchange, transfer or return surplus water to the District, the Water User shall receive a refund, calculated by the District, equivalent to the variable delivery costs that were avoided by non-delivery. The refunds shall be calculated by service area so that each Landowner in each service area receives the same refund per acre foot.

IX.

AUTHORIZATION TO ACT FOR LANDOWNER

A Designated Representative is a person or entity (e.g., a management company), designated by the Landowner on the Agent Authorization Form supplied by the District, to act for the Landowner in all matters relating to obtaining District water for Agricultural Use on the Landowner's Farm, including applying for water, ordering water, accepting delivery of water, paying District Water Charges, and communicating with the District. The Designated Representative is not authorized to submit requests to bring land into or remove land from the Service Area. The Landowner does not forego its powers or authority by naming a Designated Representative and the designation may be modified or withdrawn at any time by the Landowner upon notice in writing to the District.

Agent Authorization Forms shall be completed and delivered to the District by January 1st of each year. If a new form is not submitted by January 1st of a given year, the District shall rely on the most recently submitted form.

X.

SUBDIVISION OF FARMS IN SERVICE AREA

Problems may arise when a Landowner constructs a facility to distribute water on the Landowner's Farm and the Farm is subsequently subdivided and sold. For example, the facility may have insufficient capacity or the meter may be inaccurate. To help avoid such problems, the District will not recognize a subdivision of a Farm that requires shared use of an existing District turnout until the plans for the delivery facility and the meter have been approved by the District.

For the foregoing reason, if a Farm located within the Service Area is subdivided into different ownerships held by holders of title and equitable owners,⁹ the District will continue to fix, levy and collect Standby Charges with respect to said Farm the same as if such subdivision had not occurred. Also the District will continue to allocate water to the Farm the same as if no subdivision had occurred.

In no event shall the District be held liable for any failure to receive notice of any such subdivision or for any delay in failing to recognize any part of such subdivided land. It shall be the sole responsibility and liability of the subdividing Landowner to make timely notification to the subdivided parcel purchaser of these rules and regulations and the special assessment policies of the District. The District shall seek indemnity from any cost or expense to the District resulting from the failure of a subdividing Landowner to notify the District immediately of any subdivision of land within the Service Area of the District.

XI.

**CONSTRUCTION OF ADDITIONAL
DISTRIBUTION FACILITIES**

Except for a major distribution facility, which in the opinion of the Board will directly benefit a substantial number of Landowners within the District, any addition to the existing District distribution facilities which a Landowner requests in order to obtain delivery of water to his or her land shall be paid for by the requesting Landowner pursuant to terms and conditions set by the Board, whether such request derives from a subdivision of land within the Service Area or otherwise.

⁹Section 34026 of the California Water Code.

XII.

NO WATER IF DELINQUENT WATER CHARGE OR ASSESSMENT

The District will not deliver any water for use upon any Farm as to which there exists any delinquent Water Charge or District special assessment as to any part of said Farm. Any refunds due on a delinquent Farm shall be credited first to the delinquent charges.

XIII.

NO LIABILITY FOR SHORTAGES IN WATER, FAILURE TO DELIVER WATER, OR LACK OF AVAILABLE DELIVERY CAPACITY

In the event of water shortage or a shortage of related capacity in District distribution facilities, the available District water or related capacity shall be prorated proportionately on a per acre basis respectively within each of the two priority categories affected and in the order of priority. In no event shall the District be liable for any damage directly or indirectly caused by any failure of the District to deliver water to anyone for any reason whatsoever, whether or not by alleged failure to observe the water or capacity priorities as herein provided.

The obligation of the District to deliver District water pursuant to the District's rules and regulations shall be limited to the extent that the necessary water and distribution facilities are available, and neither the District nor any of its directors, officers, agents and employees shall be liable for any damage caused by any failure to deliver District water so long as the District and its officers, agents and employees have not acted in an arbitrary, capricious or unreasonable manner with respect to the cause or reason for any such failure to deliver District water.

XIV.

WATER QUALITY, DISCLAIMER AND INDEMNITY

Water shall be delivered by the District for Agricultural Use only. Water supplied by the District is not potable or fit for domestic use, and it may not be fit for stockwatering or mixing with pesticides.

The District makes no warranty or representation whatsoever as to quality or fitness for use or purpose of the water it delivers.

Should a Water User use or permit use of District water for any purpose other than Agricultural Use as defined in Section 1.2, such Water User or Landowner shall be solely responsible for any damage, injury, loss or expense of whatever nature resulting directly or indirectly from the District water being used for such other purpose or use. The District

shall seek indemnity from any cost or expense to the District resulting from the failure of a Water User to adhere to this rule.

XV.

WATER DELIVERY OPERATING RULES

1. No facility of the District, whether a Turnout, a Meter or other facility, may be modified in any manner whatsoever without the prior written consent of the District Manager.
2. To the extent possible, the District will attempt to start and stop delivery of water as requested by Water Users but will not incur unusual costs to do so. To ensure delivery, and to avoid unnecessary expense to the Water User, at least 48 hours advance notice should be given for delivery and shut-off.
3. In the event a Water User requests the District to shut off his or her water because of an emergency, if reasonably possible the District will hold the subject water for a reasonable time, but otherwise the water will be released by District in a spill condition and the Water User must initiate a new order for water if and when desired; however, any water so spilled will be charged against the Water User's Allocated Water or ordered Supplemental Water.
4. If District water is ordered and the ordering Water User for any reason decides not to take the water, the District will attempt to deliver the water elsewhere, but if such is not reasonably possible in the opinion of the District Manager, the original ordering Water User will have to pay for the water even though he or she did not receive it.
5. In an emergency situation the District may shut off Turnouts without notice to Water Users, but in such case the District will make a reasonable effort to notify such affected Water Users in advance.
6. Water Users who connect to a District Turnout are advised to have protective devices on their distribution system so that if the Turnout is shut off without notice it will not cause damage to the Landowner's delivery system. The District shall not be responsible for damage resulting from failure to install such a device.
7. If a Water User hooks up solid to a District Turnout without an air gap, the Water User must install a back flow preventative device sufficient to protect the District's facility.
8. If a Water User is injecting fertilizer into his system which is connected to a District facility, the Water User must have installed an adequate back flow preventative device.

9. If a Water User has a water recovery system, he or she must maintain a back flow preventative device to prevent possible contamination of District water within its system.
10. If a Water User or Landowner operates any equipment or performs any act over, upon, at or near a District facility, in a manner which could cause damage to such District facility, then the Water User or Landowner must notify the District of such intention at least 48 hours in advance of any such act or operation. Irrespective of any such notice, each Water User and Landowner shall indemnify and hold the District harmless from any damage to a District facility resulting from any act, or operation of any equipment, caused by the Water User or Landowner.
11. It is understood that District personnel must from time to time enter upon Water Users' property with respect to the operation of the District's facilities and it is understood that all Landowners shall provide such access to water Meters, Turnouts, and related facilities.
12. Each Water User shall be responsible for controlling and disposing of tail water and filtration flush water on his or her property. Tail water and flush water shall not be allowed to collect upon District right-of-ways nor shall such water be returned to District facilities without written permission from the District being first obtained. Deliveries of District water to Water Users who fail to comply with this provision may be terminated until the problem is corrected.

XVI.

CHANGES IN RULES AND REGULATIONS

These rules and regulations are effective as of the amendment date first above written and may be changed by resolution of the Board of Directors of District duly adopted according to law.

XVII.

ENFORCEMENT OF RULES AND REGULATIONS

In addition to all remedies available pursuant to applicable law, the District reserves the right and privilege to discontinue or refuse to deliver District water for use upon a Farm or part thereof with respect to which place of use the Water User is in violation of any of these rules and regulations, in the good faith opinion of the District Manager, which opinion shall be conclusive and binding with respect to both the existence of any such violation and the duration thereof.

No Water User or Landowner or any other person or entity shall have any claim or cause of action of any nature whatsoever against either the District or the District Manager as a result of any claimed injury or damage caused by, arising out of or related to any such discontinuance of or refusal to deliver District water. Acceptance of water service under these Rules and Regulations shall be conclusive proof of Water User's and/or Landowner's agreement to said Rules and Regulations.