ARVIN-EDISON WATER STORAGE DISTRICT

WATER MANAGEMENT PLAN UPDATE

(PREPARED UNDER THE USBR MID-PACIFIC REGION 2017 STANDARD CRITERIA)

OCTOBER 2018

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Arvin-Edison Water Storage District

Water Management Plan

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SECTION I

Description of District

Section I: Description of the District

District Name: Arvin-Edison Water Storage District

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A. History

1. *Date district formed:* 1942 *Date of first Reclamation contract*: 1962

   Original size (acres): 129,988 *Current year (last complete calendar year)*: 2017

2. *Current size, population, and irrigated acres*

Data Year	2017
Size (acres)	131,660
Population served (urban connections)	0
Irrigated acres	114,185

3. *Water supplies received in current year*

Water Source	*AF*
Federal urban water (Tbl 1)	0
Federal agricultural water (Tbl 1)	203,485
State water (Tbl 1)	0
Other Wholesaler (define) (Tbl 1)	0
Local surface water (Tbl 1)	0
Upslope drain water (Tbl 1)	0
District groundwater (Tbl 2)	50
Banked water (Tbl 1)	0
Transferred water (Tbl 1)	84,869
Recycled water (Tbl 3)	0
Other (define) (Tbl 1)	0
Total	288,404

4. *Annual entitlement under each right and/or contract*

	AF	*Source*	*Contract #*	*Availability period(s)*
Reclamation Urban AF/Y	0			
Reclamation Agriculture AF/Y Class 1	40,000	Friant-CVP	14-06-200-229AD	Jan. – Dec.
Other AF/Y Class 2	311,675	Friant-CVP	14-06-200-229AD	Jan. – Dec.

District's sole water contract is from the CVP Friant Division.

5. *Anticipated land-use changes. For Ag contractors, also include changes in irrigated acres.*

Minor urbanization and conversion to high value (permanent) crops. Also, the District has experienced recent development of solar projects.

6. *Cropping patterns (Agricultural only)*

List of current crops (crops with 5% or less of total acreage) can be combined in the 'Other' category.

Previous Plan (2005)		*Previous Plan (2011)*		*Current Plan (2017)*	
Crop Name	*Acres*	*Crop Name*	*Acres*	*Crop Name*	*Acres*
Grapes	29,315	Grapes	29,239	Grapes	30,505
Potatoes	16,150	Potatoes	13,283	Oranges	15,278
Oranges/Tang	14,042	Oranges	12,758	Potatoes	14,400
Wheat	6,773	Wheat	7,026	Carrots	13,523
Carrots	5,469	Carrots	11,469	Almonds	9,893
		Almonds	6,070		
Other (<5%)	31,206	*Other (<5%)*	32,772	*Other (<5%)*	30,586
Total	102,955	*Total*	112,617	*Total*	114,185

7. *Major irrigation methods (by acreage) (Agricultural only)*

Previous Plan (2005)		*Previous Plan (2011)*		*Current Plan (2017)*	
Irrigation Method	*Acres*	*Irrigation Method*	*Acres*	*Irrigation Method*	*Acres*
Gravity	17,035	Gravity	9,378	Gravity	2,172
Sprinkler	44,241	Sprinkler	48,538	Sprinkler	33,778
Drip	24,674	Drip	34,597	Drip	52,631
Micro	17,005	Micro	20,104	Micro	25,604
Other		*Other*		*Other*	

Total	102,955	*Total*	112,617	*Total*	114,185

Additional District history information can be found in Attachment F (Groundwater Management Plan)

B. Location and Facilities

See Attachment A for maps containing the following: incoming flow locations, turnouts (internal flow), and outflow location, conveyance system (including lift pumps), storage facilities, (including operational spill recovery), and groundwater banking facilities, (District wells and spreading basins).

1. *Incoming flow locations and measurement methods.*

Location Name	*Physical Location*	*Type of Measurement Device*	*Accuracy*
FKC	Friant Kern Canal Turnout	Parshall Flume	± 3-5%
CVC	A-E Turnout	Propeller meters	± 2%
KR	Kern River Carrier Canal	Rated meter gate	± 2-3%
AETO	Intertie Pumping Plant and Pipeline	Acoustic meter	± 0.5%

The above accuracy figures are reported by the manufacturer and/or USBR's Water Measurement Manual. Additional information regarding accuracy is in Attachment C (Measurement Device Documentation).

2. *Current year Agricultural Conveyance System*

Miles Unlined - Canal	*Miles Lined - Canal*	*Miles Piped*	*Miles – Other*
0	45	172	0

Two miles of piping were added in the North In-Lieu Pipelines Project.

3 *Current year Urban Distribution System*

Miles AC Pipe	*Miles Steel Pipe*	*Miles Cast Iron Pipe*	*Miles - Other*
n/a	n/a	n/a	n/a

4. *Storage facilities (tanks, reservoirs, regulating reservoirs)*

Name	*Type*	*Capacity (AF)*	*Distribution or Spill*
Wasteway	Reservoir	1,300	Emergency Storage
Balancing Reservoir	Reservoir	225	Distribution
Spillway	Reservoir	225	Distribution

5. *Description of the agricultural spill recovery system and outflow points*

A 1,300 acre-foot Wasteway Basin for emergency storage in case of extended power outage at Forrest Frick Pumping Plant, allows delivery of 1,000 cfs by gravity into the basin with an inflatable dam, but the recovery system needs to be replaced with new pumping equipment. A 225 acre-foot Balancing Reservoir (also recharge basin) allows for canal mismatches at the canal headworks with a 100 cfs pump-in and nearly 200-250 cfs gravity outflow return capacity into the canal system (depending on head conditions). A 225 acre-foot Spillway Basin allows for canal mismatches at the canal terminus with a 260 cfs gravity spillway into and an 80 cfs pumped return capacity into the canal system.

6. *Agricultural delivery system operation (check all that apply)*

Scheduled	*Rotation*	*Other (describe)*
X		

7. *Restrictions on water source(s)*

Source	*Restriction*	*Cause of Restriction*	*Effect on Operations*
Friant-Kern	Availability of water	Supply, contract	Prorate/limited use
District Wells	Pumping capacity	Equipment, water levels	Prorate/limited use

8. *Proposed changes or additions to facilities and operations for the next five (5) years*

Upgrade and rehabilitation (including Forrest Frick Pumping Plant) of 50 year old distribution system pumps, motors, and plants, District well replacements, temporary/in-lieu water service area expansion, Sycamore and Tejon Check Structure replacements, additional reverse flow capabilities, canal liner raising and/or replacements (as needed), pipeline replacements (as needed) and water order/delivery policy review (increase flexibility for water users). Expansion of power distribution facilities to water related facilities that are integrated with the District infrastructure.

Please see Attachment Q – Major Projects Completed Since 1992

C. Topography and Soils

1. *Topography of the district and its impact on water operations and management*

Most of the District is gently sloping alluvial fans and flood plains with some moderately sloping fans at the East and North ends of the District. Drip or Micro irrigation systems, which are better suited to these sloping areas to reduce runoff, have been instituted by many water users.

Additional topographic and soils information is in Attachment F (Groundwater Management Plan).

2. *District soil association map (Agricultural only)*

Additional information can be found in Attachment A (District Soils Maps).

Soil Association	Estimated Acres	Effect on Water Operations and Management
Hesperia-Arvin-Whitewolf	55,000	Frequent irrigation and flood control
Chanac-Pleito-Badlands	15,000	Runoff from moderately steep slopes
Delano-Chanac	20,000	Leaching fraction from slight salt accumulation
Panoche-Milham-Kimberlina	25,000	Leaching fraction from slight salt accumulation
Calicreek-Whitewolf	5,000	Frequent irrigations and flood control
Delano-Pleito-Hesperia	10,000	None

3. *Agricultural limitations resulting from soil problems (Agricultural only)*

Soil Problem	*Estimated Acres*	*Effect on Water Operations and Management*
Slight salt accumulation	45,000	Increases water requirement
Flooding	60,000	Damage to farmland and equipment
Soil blowing	60,000	Damages pumps and crops, fills canal

D. Climate

1. *General climate of the district service area*

	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Annual*
Avg Precip.	1.47	1.50	1.56	0.88	0.28	0.09	0.02	0.06	0.19	0.45	0.84	1.17	8.51
Avg Temp.	48	53	58	62	70	77	83	82	75	65	54	47	47
Max. Temp.	80	85	92	96	104	107	112	111	109	100	91	83	112
Min. Temp	22	28	31	32	32	45	53	54	45	32	24	19	19
ETo	1.41	2.89	4.07	5.85	7.47	9.05	9.81	8.63	6.13	4.78	2.29	1.98	64.36

Weather Station ID CIMIS 125 *Data period: Year* 1995 *to Year* 2017

ET Station ID CIMIS 125 *Average annual frost-free days:* 337

Average wind velocity *3.8 mph*

Additional climate information can be found in Attachment F (Groundwater Management Plan).

2. *Impact of microclimates on water management within the service area*

Localized freezing temperatures can damage citrus – growers/water users can request water for frost protection, and in addition, on windy days they request additional water to prevent crops from drying out and being sand blasted on an as-needed basis (policy flexibility).

Additional information is in Attachment F (Groundwater Management Plan).

E. Natural and Cultural Resources

1. Natural resource areas within the service area

Name	*Estimated Acres*	*Description*
Sand Ridge Preserve	400	Sandy ridge with Bakersfield Cactus

2. Description of district management of these resources in the past or present

None

3. Recreational and/or cultural resources areas within the service area

None

There are no cultural resources (specifically listed on the National Register of Historic Places) within the District.

F. Operating Rules and Regulations

1. Operating rules and regulations

See Attachment B1, "Rules and Regulations for the Distribution of Water"

2. Water allocation policy (Agricultural only)

See Attachment B1 for additional information. Division III: Distribution of Water - Section 1; Surface Water Service Area (Page 8); Division IV: Ordering, Delivery, and Use of Water - Section 1; Annual Applications (Page 13) Division IV: Ordering, Delivery, and Use of Water – Section 9; Proration of Water Delivery (Page 15).

Summary – water is allocated by contracted acreage via annual applications.

3. Official and actual lead times necessary for water orders and shut-off (Agricultural only)

See Attachment B1 for additional information (Division IV: Ordering, Delivery, and Use of Water - Section 4; Water Service Orders (Page 14); Division IV: Ordering, Delivery, and Use of Water – Section 5; Delivery Change (Page 14); Division IV: Ordering, Delivery, and Use of Water – Section 6; Emergency Turn Offs (Page 14)).

Summary – water orders must be placed before 9:00 a.m. the day before the change is requested; however, exceptions to the rules may be granted.

4. Policies regarding return flows (surface and subsurface drainage from farms) and outflow (Agricultural only)

See Attachment B1 for additional information. Division IV: Ordering, Delivery, and Use of Water - Section 11; Waste of Water (Page 15).

Summary – water is to remain on farm and no surface drainage is allowed. Subsurface drainage is not an issue in the District because the soils are well drained.

5. Policies on water transfers by the district and its customers

Water transfers by the District are consistent with and pursuant to Article 10 (Sales, Transfers, And Exchanges of Water) of the "Contract Between the United States and Arvin-Edison Water Storage District Providing for Project Water Service from Friant Division and for Facilities Repayment."

See Attachment B1 (Rules and Regulations for Distribution of Water) and B2 (Contract for Agricultural Water Service) for additional information on water transfer policy by its customers.

B1: Division IV: Ordering, Delivery, and Use of Water – Section 10, Use of Other Water Supplies (Page 15).

B2: Pursuant to Article 7 (Lien and Assignment) of the District contracts with each landowner. "*….such water and right to water are of direct benefit to said land; the covenants of Landowner to pay for said water and for said right to water, and other obligations of Landowner under this Contract, shall run with and bind said land….*"

Subject to board approval, the landowner is allowed to transfer water title from one parcel to another parcel if the circumstances allow for such (no harm to others).

Summary – water transfers by the District occurs pursuant to its water supply contract and annual water transfer(s) by its customers are not allowed.

G. Water Measurement, Pricing, and Billing

1. Agricultural Customers

See Section III Best Management Practices for additional information on water measurement, pricing, and billing.

Required documentation verifying the accuracy of measurement devices is included as Attachment C (Measurement Device Documentation).

2. Urban Customers

a. *Total number of connections* n/a

b. *Total number of metered connections* n/a

c. *Total number of connections not billed by quantity* n/a

d. *Percentage of water that was measured at delivery point* n/a

e. *Percentage of delivered water that was billed by quantity* n/a

f. *Measurement device table* n/a

3. Agricultural and Urban Rates

a. *Current year agricultural and/or urban water charges - including rate structures and billing frequency*

See Attachment D (Water Rates, District Sample Bills and Historical Rates) for current year rate ordinance, sample bill, and historic rates.

b. *Annual charges collected from agricultural customers*

Fixed Charges			
Charges ($ unit)	*Charge units $/acre*	*Units billed during year (acres)*	*$ collected ($ times units)*
GP	$67.68		
GA	$ 3.48		
GA & GP	$71.16	Total Collected	$10,913,000

Volumetric Charges			
Charges ($ unit)	*Charge units $/AF*	*Units billed during year AF*	*$ collected ($ times units)*
Water	$98.00		
Energy 1st lift	$41.00		
Energy Subsequent lift(s)	$16.00		
	Varies $139-$219/AF	138,412	$22,709,722

a. *Describe the contractor's record management system*

Meters are read at the end of each month, verified by Watermaster(s) with respect to orders for accuracy and forwarded to accounts receivable.

For additional information please refer to Attachment C (Measurement Device Documentation).

H. Water Shortage Allocation Policies

1. *Current year water shortage policies or shortage response plan - specifying how reduced water supplies are allocated*

   See Attachment B1 for additional information. Division IV: Ordering, Delivery, and Use of Water – Section 9; Proration of Water Delivery (Page 15).

   Summary – shortage/reductions are based on prorated share of contracted acreage. However, the District continues to evaluate long-term policies and procedures during deficit periods.

2. *Current year policies that address wasteful use of water and enforcement methods*

   See Attachment B1 for additional information. Division IV: Ordering, Delivery, and Use of Water – Section 11; Waste of Water (Page 15).

I. Evaluate Policies of Regulatory Agencies Affecting the Contractor and Identify Policies that Inhibit Good Water Management.

Discuss possible modifications to policies and solutions for improved water management

1. District will investigate opportunities to mitigate and compensate for San Joaquin River Restoration Program impacts of lost water (approximately 30k to 40k AF/Year) including recirculation plans and Title 3 funds (groundwater recharge/banking projects).

2. District continues to address ongoing water quality issues related to its water supplies.

3. District has also reviewed its temporary water service policies to relax certain requirements so as to increase surface water usage and thus decrease groundwater extractions.

4. District has had discussions with landowners regarding adjusting its water ordering and delivery practices so as to provide more flexibility to the water user (similar to a “faucet” in urban/domestic connections).

5. District has reviewed and is preparing for Sustainable Groundwater Management Act (SGMA) regulations and its required Groundwater Sustainability Plan (GSP).

SECTION II

Inventory of Water Resources

Section II: Inventory of Water Resources

A. Surface Water Supply

1. *Surface water supplies in acre feet, imported and originating within the service area, by month (Table 1).*

   See Section V: Water Inventory Tables - Table 1 (Surface Water Supply)

   The District has only one contract for surface water, which is the CVP Friant Division Contract. All other import sources are affected by exchanges, transfers, and limited ad hoc purchases.

2. *Amount of water delivered to the district by each of the district sources for the last 10 years*

   See Section V: Water Inventory Tables - Table 8 (Annual Water Quantities Delivered).

   Data set used for preparing Plan Tables is included in Section V or referenced in other Attachments.

B. Groundwater Supply

1. *Groundwater extracted by the district and delivered, by month (Table 2)*

   See Section V: Water Inventory Tables - Table 2 (Groundwater Supply)

2. *Groundwater basin(s) that underlies the service area*

Name	*Size (Square Miles)*	*Usable Capacity (AF)*	*Safe Yield (AF/Y)*
Kern Sub-Basin of Tulare Lake	2,834	5.5 million AF	228,000
White Wolf Sub-Basin	168	4.0 million AF	30,500

   See attachment A (District Maps) – Sub-Basins underlying Arvin-Edison Water Storage District.

3. *Map of district-operated wells and managed groundwater recharge areas*

   See Attachment A (District Maps) for additional information

4. *Description of conjunctive use of surface and groundwater*

   The District evaluates surface water use and groundwater use on a daily basis. The District is expanding its temporary water service in areas that currently utilizes groundwater.

5. *Groundwater Management Plan*

See Attachment F (Groundwater Management Plan) for additional information.

Due to SGMA legislation, the District's Groundwater Management Plan is currently being updated.

6. *Groundwater Banking Plan*

See Attachment F (Groundwater Management Plan) for additional information.

C. Other Water Supplies

1. *"Other" water used as part of the water supply*

District has no "other" water supplies other than those acquired by exchanges.

D. Source Water Quality Monitoring Practices

1. *Agricultural Water Quality*

See Attachment H (District Water Quality Information) for additional information.

Water quality testing includes: monthly canal sampling, annual groundwater sampling (summer), Title 22 and Constituent of Concerns (COC) sampling of District wells (and at times canal samples) for the California Department of Water Resources Pump-in Program.

2. *Agricultural water quality concerns*: *Yes* __X__ *No* ______

Boron, Nitrate, Sodium, TDS/EC (salts), pH, and 1,2,3 TCP are concerns to the District.

3. *Description of the agricultural water quality testing program and the role of each participant, including the district, in the program*

District tests for irrigation suitability and COC of source waters and Title 22/COC for District owned wells (and manifolds and canal water) at selected locations.

4. *Current water quality monitoring programs for surface water by source (Agricultural only)*

Analyses Performed	*Frequency*	*Concentration Range*	*Average*
Irrigation analyses	Monthly at selected canal locations		

Current water quality monitoring programs for groundwater by source (Agricultural only)

Analyses Performed	*Frequency*	*Concentration Range*	*Average*
COCs	Annually at well startup for well discharges into the canal		
Title 22	Every 3 years when groundwater is in use		
Irrigation Analyses	A-E wells and selected farm wells annually		

E. Water Uses within the District

1. *Agricultural*

   See Section V: Water Inventory Tables - Table 5 (Crop Water Needs).

2. *Types of irrigation systems used for each crop in current year*

Crop name	*Total Acres*	*Level Basin - acres*	*Furrow - acres*	*Sprinkler – acres*	*Low Volume - acres*	*Multiple methods -acres*
Vineyard	30,505	0	1,050	501	28,954	
Oranges	15,278	0	320	12,743	2,215	
Potatoes	14,400	0	73	14,327	0	
Carrots	13,523	0	0	13,523	0	
Almonds	9,893	0	0	6,338	3,555	
Wheat	4,646	0	418	3,820	408	
Onions	4,235	0	0	4,183	52	
Tomatoes	3,772	0	0	0	3,772	
Other	17,933	0	70	10,235	7,628	
TOTAL	114,185	0	1,931	65,670	46,584	

3. *Urban use by customer type in current year*

Customer Type	*Number of Connections*	*AF*
Single-family	0	0
Multi-family		
Commercial		
Industrial		
Institutional		
Landscape irrigation		
Wholesale		
Recycled		
Golf Course (Irrigation)	0	0
Other (specify)		

Customer Type	*Number of Connections*	*AF*
Unaccounted for		
Total	0	0

4. *Urban Wastewater Collection/Treatment Systems serving the service area*

   Not applicable

5. *Groundwater recharge in current year (Table 6)*

Recharge Area	*Method of Recharge*	*AF*	*Method of Retrieval*
N. Canal and Res.	Infiltration	47,457	Extraction Wells
Sycamore Ponds	Infiltration	58,029	Extraction Wells
Tejon Ponds	Infiltration	42,136	Extraction Wells
Murray Gravity	Infiltration	394	Extraction Wells
	Total	148,016	

6a. *Transfers and exchanges* ***into*** *the service area in current year*

From Whom	*To Whom*	*AF*	*Use*
Terra Bella ID	Arvin-Edison WSD	10,298	Ag demand
Chowchilla WD	Arvin-Edison WSD	3,111	Ag demand
Shafter-Wasco ID	Arvin-Edison WSD	4,633	Ag demand
South San Joaquin ID	Arvin-Edison WSD	19,774	Ag demand
Saucelito ID	Arvin-Edison WSD	1,568	Ag demand
Madera ID	Arvin-Edison WSD	2,800	Ag demand
Exeter ID	Arvin-Edison WSD	700	Ag demand
Orange Cove ID	Arvin-Edison WSD	8,833	Ag demand
Tulare ID	Arvin-Edison WSD	1,118	Ag demand
Kaweah Delta WCD	Arvin-Edison WSD	54	Ag demand
Del Puerto WD	Arvin-Edison WSD	5,552	Ag demand
Metropolitan WD	Arvin-Edison WSD	50,887	Recharge
City of Bakersfield	Arvin-Edison WSD	9,225	Ag demand
North Kern WSD	Arvin-Edison WSD	9,842	Ag demand
Buena Vista WSD	Arvin-Edison WSD	4,840	Ag demand
	Total	133,235	

6b. *Transfers and exchanges* ***out*** *of the service area in current year*

From Whom	*To Whom*	*AF*	*Use (M&I)*
		0	

	Total	0	

No transfers or exchanges out of the service area.

7. *Wheeling, or other transactions in and out of the district boundaries*

From Whom	*To Whom*	*AF*	*Use*
		0	
	Total	0	

No wheeling or other transactions in and out of District boundaries.

8. *Other uses of water*

Other Uses	*AF*
None	0

F. Outflow from the District (Agricultural only)

See Attachment A (District Maps), for the location of the only surface outflow point (Intertie Pumping Plant and Pipeline).

1. *Surface drain/outflow*

Outflow point	*Location description*	*AF*	*Type of measurement*	*Accuracy (%)*	*% of total outflow*	*Acres drained*
AETO	A-E Canal/Intertie Pipeline	0	Acoustic meter	±0.5	100	n/a
(surface)						

Outflow point	*Where the outflow goes (drain, river or other location)*	*Type Reuse (if known)*
AETO	Into the California Aqueduct	M&I

2. *Description of the Outflow (surface and subsurface) water quality testing program and the role of each participant in the program*

COC and Title 22 Analyses completed as needed.

See Attachment H (District Water Quality Information) for additional information. As previously mentioned, no subsurface outflow is occurring.

3. *Outflow (surface drainage & spill) Quality Testing Program*

Analyses Performed	*Frequency*	*Concentration Range*	*Average*	*Reuse limitation?*
COC	Monthly during Pump-in	See Attachment H	-	None

Outflow (subsurface drainage) Quality Testing Program

Analyses Performed	*Frequency*	*Concentration Range*	*Average*	*Reuse limitation?*
N/A				

4. Provide a brief discussion of the District's involvement in Central Valley Regional Water Quality Control Board programs or requirements for remediating or monitoring any contaminants that would significantly degrade water quality in the receiving surface waters

District is involved and monitors both the CVSALTS and Irrigated Lands Regulatory Programs. In addition, the District participates in Water Quality Policy Committee meetings involving the California Aqueduct, Friant-Kern Canal, and the Cross Valley Canal.

G. Water Accounting (Inventory)

See Section V (Water Inventory Tables) for additional information.

Urban Water Accounting Tables are not applicable to the District.

SECTION III

BMP's for AG CONTRACTORS

Section III: Best Management Practices (BMPs) for Agricultural Contractors

A. Critical Agricultural BMPs

1. *Measure the volume of water delivered by the district to each turnout with devices that are operated and maintained to a reasonable degree of accuracy, under most conditions, to +/- 6%*

   a. *Number of delivery points (turnouts and connections)* 477

   b. *Number of delivery points serving more than one farm* 33*

   c. *Number of measured delivery points (meters and measurement devices)* 477

   d. *Percentage of delivered water that was measured at a delivery point* 100

   e. *Total number of delivery points not billed by quantity* 0

   f. *Delivery point measurement device table*

Measurement Type	*Number*	*Accuracy** (+/- %)*	*Reading Frequency (Days)*	*Calibration Frequency (Months)*	*Maintenance Frequency (Months)*
Orifices					
Propeller meter (with totalizer)	477	2%			
Weirs					
Flumes					
Venturi					
Metered gates					
Acoustic doppler					
Other (define)					
Total	477				

**Reflects the total number of farms/parcels under contract for long-term water service that take delivery of water through a single turnout, of which turnout also serves additional farms/parcels. See Attachment R (Combined Turnout Agreement and Consent to Easement) for additional details of administering such delivery of water from a single turnout. The total delivery through a single turnout is the responsibility of a single agent appointed to the District, The appropriate split of monthly water use is then the responsibility of each signatory to the Combined Turnout Agreement (CTA). In the past, signatories have tracked and split the total water usage (and associated payment due to the District) based on various methods including but not limited to acreage, crops, rotation, etc. The parcels/farms under a CTA follow the exact same rules and regulations as other long-term water service parcels/farms with dedicated turnouts.*

****See Attachment C (Measurement Device Documentation) for additional information regarding verifying the accuracy of measurement devices.*

2. *Designate a water conservation coordinator to develop and implement the Plan and develop progress reports*

Name: Fernando Ceja *Title:* Engineering Technician

Address: 20401 Bear Mountain Blvd. Mailing: P.O. Box 175, Arvin, CA 93203-0175

Telephone: (661) 854-5573 *E-mail:* fceja@aewsd.org

Provide the job description and minimum qualifications

See Attachment P (Conservation Coordinator) for additional information.

3. *Provide or support the availability of water management services to water users*

   See Attachment I (Notices of District Education Programs and Services Available to Customers) and Attachment L (Climate Data) for additional information.

   Also the District provided funding to the following: North West Kern Resources Conservation District, Water Education Foundation, Teachers Ag Seminar, Family Farm Alliance, Kern County Farm Bureau, Water Association of Kern County and Association of California Water Agencies.

   a. On-Farm Evaluations

   1) *On farm irrigation and drainage system evaluations using a mobile lab type assessment*

	Total in district	*# surveyed last year*	*# surveyed in current year*	*# projected for next year*	*# projected 2nd yr in future*
Irrigated acres	114,148	586	74	500	500
Number of farms/parcels	711	5	2	6	6

   2) *Timely field and crop-specific water delivery information to the water user*

      Water use information is recorded and billed on a monthly basis. More frequent information can be provided upon request.

   b. Real-time and normal irrigation scheduling and crop ET information

   See Attachment L for examples of the below information:

   CIMIS weather station
   [***http://wwwcimis.water.ca.gov/cimis/myCimis.jsp***](http://wwwcimis.water.ca.gov/cimis/myCimis.jsp)

   Weekly Friant Newsletter
   [***http://friantwater.org/watersupply/07312013/WeeklyWaterReport.pdf***](http://friantwater.org/watersupply/07312013/WeeklyWaterReport.pdf)

   c. Surface, ground, and drainage water quantity and quality data provided to water

users

District manages multiple water sources of varying water quality, which customers are keenly aware of. Some customers will request this information during specific soil and/or water amendments to their farming operations. Surface water quality (see Attachment H) and quantity information is provided to water users upon request.

d. Agricultural water management educational programs and materials for farmers, staff, and the public

Program	*Co-Funders (If Any)*	*Yearly Targets*
Irrigation Evaluations	Other Water Districts	500 acres
Irrigation Education	Other Water Districts	Reach water users

See Attachment I (Notices of District Education Programs and Services Available to Customers) for a sample of materials and notices.

e. Other

The Kern River Watershed Coalition Authority (KRWCA) provides guidance to growers for the Irrigated Lands Regulatory Program (ILRP).

Various Sustainable Groundwater Management Act (SGMA) outreach programs are provided by multiple Groundwater Sustainability Agencies (GSA) such as Kern Groundwater Authority, Kern River GSA, and White Wolf GSA.

4. *Pricing structure - based at least in part on quantity delivered*
   Adopt a water pricing structure based on the measured quantity delivered

Pricing includes “standby” and “water use” (that includes a water and energy lift component) charges (by volume) in addition to a District-wide assessment (by acreage). District prices water use by volume (per acre-foot) and bills on a monthly basis.

See Attachment B1 (Rules and Regulations for Distribution of Water) Division III: Distribution of Water - Section 2.

5. *Evaluate and improve efficiencies of District pumps*

	Total in district	*# surveyed last year*	*# surveyed in current year*	*# projected for next year*
Wells	82	0	0	0
Lift pumps	175	60	150	60

Pumps and motors are checked daily when running and maintenance issues are noted and repairs or replacements are performed on an as needed basis. More efficient wells are started first.

In 2017, 25 pumps and 12 motors were repaired and/or replaced.

B. Exemptible BMPs for Agricultural Contractors

1. Facilitate alternative land use

Drainage Characteristic	*Acreage*	*Potential Alternate Uses*
High water table (<5 feet)	0	
Poor drainage	0	
Groundwater Selenium concentration > 50 ppb	0	
Poor productivity	0	

All District lands suitable for irrigation, and therefore, this program is not applicable in AEWSD.

2. Facilitate use of available recycled urban wastewater

Sources of Recycled Urban Waste Water	*AF/Y Available*	*AF/Y Currently Used in District*
None		

Recycled water in the area (produced carrot water and oilfield water) is of poor quality and not utilized by the District.

3. Facilitate the financing of capital improvements for on-farm irrigation systems.

Program	*Description*
USDA cost share programs	Cost share for approved practices

Customers, upon request, are made aware of EQIP and AWEP programs, which provide financial and technical assistance.
http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/

4. Incentive pricing

The District's 9D Repayment Contract with USBR does not have Tiered Pricing provisions. However, the District has the ability to implement tiered pricing with its customers but it is currently not in effect. District has considered potential surcharges for water use over a certain threshold.

In addition, it shall be noted that yearly pricing of surface water is set equal the estimated cost of groundwater pumping (to encourage conjunctive use of groundwater). The District encourages use of surface water especially during wet hydrologic periods.

5. a) Line or pipe ditches and canals

Canal/Lateral (Reach)	*Type of Improvement*	*Number of Miles in Reach*	*Estimated Seepage (AF/Y)*	*Accomplished/ Planned Date*
All canals are lined, however liner repairs and/or improvements are a continuing O&M project, if necessary.				

Please see Attachment Q – Majors Projects Completed Since 1997

b) Construct/line regulatory reservoirs

Reservoir Name	*Location*	*Describe improved operational flexibility and AF savings*
N/A		

Since the District overlies useable groundwater, it is not desired to line them.

The District tracks infiltration and accounts for the water as recharge after considering evaporation losses. The District continues to evaluate the need to conduct studies for additional storage sites.

Please see Attachment Q – Major Projects Completed Since 1997

6. *Increase flexibility in water ordering by, and delivery to, water users*

District continues to investigate opportunities and improve operational flexibility to its delivery system. District also continues to upgrade and expand on its SCADA automation systems.

District occasionally meets with landowners/water users to discuss District policies to increase flexibility in orders/delivery means (similar to a “faucet” in urban/domestic connections).

District has relaxed its 24-hour mandatory runtime rule, the growers can now order water for any amount of time necessary.

District has also implemented the Drought Allocation Program (DAP) which consists of 53 landowner wells plumbed into the District canal. The program allows landowners to pump into the canal during drought seasons with limited surface water supplies and reallocate their water to another parcel downstream of the canal, or the landowner can sell the water to the District who in turn will deliver to growers in need.

Please see Attachment Q – Major Projects Completed Since 1997

7. *Construct and operate district spill and tailwater recovery systems*

Distribution System Lateral	*Annual Spill (AF/Y)*	*Quantity Recovered and reused (AF/Y)*
None		
Total		

Drainage System Lateral	*Annual Drainage Outflow (AF/Y)*	*Quantity Recovered and reused (AF/Y)*
None		
Total		

Describe facilities that resulted in reduced spill and tailwater

District's Wasteway Basin, Balancing Reservoir and Spillway Basin are all able to regulate canal imbalances (net spill) and thus able to recover and reuse the water.

Please see Attachment Q – Major Projects Completed Since 1997

8. *Plan to measure outflow*

Total # of outflow (surface) locations/points 1

Total # of outflow (subsurface) locations/points 0

Total # of measured outflow points 1

Percentage of total outflow (volume) measured during report year 100

Identify locations, prioritize, determine best measurement method/cost, submit funding proposal

Location & Priority	*Estimated cost (in $1,000s)*				
	Year 1	*Year 2*	*Year 3*	*Year 4*	*Year 5*
AETO already has an acoustic meter	N/A				

9. *Optimize conjunctive use of surface and groundwater*

District has practiced conjunctive activities since 1966 (first year of deliveries) and continues such practices to-date. The District will be expanding its temporary water service area to reduce overall groundwater extractions within its boundaries.

District is currently constructing a new In-Lieu service area pipeline (phase 1) which will serve approximately 650 acres during seasons with surplus surface water supplies. This phase is one of many depending on funds, including grants.

See Attachment T – Contract for Intermittent Water Deliveries In Lieu of Groundwater Pumping

10. *Automate distribution and/or drainage system structures*

District is considering upgrading and/or expanding its automated system and providing additional on-farm flexibility including replacement of original radial check gate structures and additional storage sites/reservoirs. District is continuing to upgrade and expand SCADA automation systems.

11. *Facilitate or promote water customer pump testing and evaluation*

See Attachment I (Notices of District Education Programs and Services Available to Customers) for additional information.

The District provides contact information to landowners for the requested services.

12. *Mapping*

GIS maps	*Estimated cost (in $1,000s)*				
	Year 1	*Year 2*	*Year 3*	*Year 4*	*Year 5*
Layer 1 – Distribution system	1	2	2	1	1
Layer 2 – Drainage system	0	0	0	0	0
Suggested layers :topo map, facilities	1	3	2	1	1
Layer 3 – Groundwater information	2	1	1	1	1
Layer 4 – Soils map	0	0	1	1	1
Layer 5 – Natural & cultural resources	0	0	0	0	0
Layer 6 – Problem areas	1	1	1	1	1

District currently uses GIS mapping for various proposes, some of which are contained in this Plan.

C. Provide a 5-Year Budget for Implementing BMPs

1. Amount actually spent during current year.

Year 2017 or Year 1

BMP #	*BMP Name*	*Actual Expenditure (not including staff time)*	*Staff Hours*
A *1*	*Measurement*	$70,000	80
2	*Conservation staff*	$5,000	160
3	*On-farm evaluation /water delivery info*	$6,000	40
	Irrigation Scheduling	$0	750
	Water quality	$19,000	300
	Agricultural Education Program	$17,250	80
4	*Quantity pricing*	$0	480
5	*Contractor's pumps*	$200,000	500
B *1*	*Alternative land use*	$0	0
2	*Urban recycled water use*	$0	0
3	*Financing of on-farm improvements*	$0	0
4	*Incentive pricing*	$0	0
5	*Line or pipe canals/install reservoirs*	$50,000	120
6	*Increase delivery flexibility*	$50,000	120
7	*District spill/tailwater recovery systems*	$0	0

8	*Measure outflow*	$0	40
9	*Optimize conjunctive use*	$50,000	80
10	*Automate canal structures*	$100,000	40
11	*Customer pump testing*	$0	0
12	*Mapping*	$5,000	100
	Total	$572,250	2,890

2. *Projected budget summary for the next year.*

Year 2018 or Year 2

BMP #		BMP Name	*Budgeted Expenditure (not including staff time)*	*Staff Hours*
A	1	*Measurement*	$70,000	80
	2	*Conservation staff*	$1,000	379
	3	*On-farm evaluations/water delivery info*	$6,000	1
		Irrigation Scheduling	$0	0
		Water quality	$45,000	330
		Agricultural Education Program	$6,000	0
	4	*Quantity pricing*	$0	200
	5	*Contractor's pumps*	$200,000	500
B	1	*Alternative land use*	$0	0
	2	*Urban recycled water use*	$0	0
	3	*Financing of on-farm improvements*	$0	0
	4	*Incentive pricing*	$0	0
	5	*Line or pipe canals/install reservoirs*	$50,000	200
	6	*Increase delivery flexibility*	$50,000	200
	7	*District spill/tailwater recovery systems*	$0	0
	8	*Measure outflow*	$0	0
	9	*Optimize conjunctive use*	$300,000	480
	10	*Automate canal structures*	$50,000	160
	11	*Customer pump testing*	$0	0
	12	*Mapping*	$7,000	140
		Total	$785,000	2670

3. Projected budget summary for 3rd year.

Year 2019 or Year 3

BMP #		BMP Name	Budgeted Expenditure (not including staff time)	Staff Hours
A	1	*Measurement*	$70,000	180
	2	*Conservation staff*	$1,000	180
	3	*On-farm evaluations/water delivery info*	$6,000	1
		Irrigation Scheduling	$0	0
		Water quality	$40,000	350
		Agricultural Education Program	$6,000	0
	4	*Quantity pricing*	$0	200
	5	*Contractor's pumps*	$200,000	500
B	1	*Alternative land use*	$0	0
	2	*Urban recycled water use*	$0	0
	3	*Financing of on-farm improvements*	$0	0
	4	*Incentive pricing*	$0	0
	5	*Line or pipe canals/install reservoirs*	$50,000	200
	6	*Increase delivery flexibility*	$50,000	200
	7	*District spill/tailwater recovery systems*	$0	0
	8	*Measure outflow*	$0	0
	9	*Optimize conjunctive use*	$300,000	480
	10	*Automate canal structures*	$50,000	160
	11	*Customer pump testing*	$0	0
	12	*Mapping*	$7,000	140
		Total	$780,000	2591

4. Projected budget summary for 4th year.

Year 2020 or Year 4

BMP #		BMP Name	Budgeted Expenditure (not including staff time)	Staff Hours
A	1	Measurement	$100,000	200
	2	Conservation staff	$1,000	180
	3	On-farm evaluations/water delivery info	$6,000	1
		Irrigation Scheduling	$0	0
		Water quality	$60,000	350
		Agricultural Education Program	$15,000	0
	4	Quantity pricing	$0	200
	5	Contractor's pumps	$200,000	500
B	1	Alternative land use	$0	0
	2	Urban recycled water use	$0	0
	3	Financing of on-farm improvements	$0	0
	4	Incentive pricing	$0	0
	5	Line or pipe canals/install reservoirs	$50,000	200
	6	Increase delivery flexibility	$50,000	200
	7	District spill/tailwater recovery systems	$0	0
	8	Measure outflow	$0	0
	9	Optimize conjunctive use	$300,000	500
	10	Automate canal structures	$50,000	160
	11	Customer pump testing	$0	0
	12	Mapping	$5,000	100
		Total	$837,000	2571

5. Projected budget summary for 5th year.

Year 2021 or Year 5 BMP #		BMP Name	Budgeted Expenditure (not including staff time)	Staff Hours
A	1	Measurement	$95,000	180
	2	Conservation staff	$1,000	180
	3	On-farm evaluations/water delivery info	$6,000	1
		Irrigation Scheduling	$0	0
		Water quality	$60,000	350
		Agricultural Education Program	$20,000	0
	4	Quantity pricing	$0	200
	5	Contractor's pumps	$200,000	500
B	1	Alternative land use	$0	0
	2	Urban recycled water use	$0	0
	3	Financing of on-farm improvements	$0	0
	4	Incentive pricing	$0	0
	5	Line or pipe canals/install reservoirs	$50,000	200
	6	Increase delivery flexibility	$50,000	200
	7	District spill/tailwater recovery systems	$0	0
	8	Measure outflow	$0	0
	9	Optimize conjunctive use	$300,000	480
	10	Automate canal structures	$100,000	190
	11	Customer pump testing	$0	0
	12	Mapping	$5,000	100
		Total	$887,000	2581

SECTION IV

BMP's for URBAN CONTRACTORS

(Not applicable)

“Arvin-Edison Water Storage District is not an
Urban Contractor and therefore
this Section does not apply”

SECTION V - DISTRICT WATER INVENTORY TABLES

A. Ag Tables

Year of Data	2017	Enter data year here

Table 1

Surface Water Supply

2017 Month	Federal Ag Water (acre-feet)	Federal non-Ag Water. (acre-feet)	State Water (acre-feet)	Local Water (CVC) (acre-feet)	Other (Kern River) (acre-feet)	Transfers into District * (acre-feet)	Upslope Drain Water (acre-feet)	Total (acre-feet)
March	21,602	0	0	0	0	4,840	0	26,442
April	26,592	0	0	0	0	3,876	0	30,468
May	20,993	0	0	0	0	12,205	0	33,198
June	27,608	0	0	0	0	6,268	0	33,876
July	31,617	0	0	0	0	3,166	0	34,783
August	22,508	0	0	0	0	11,528	0	34,036
September	16,584	0	0	0	0	11,486	0	28,070
October	12,575	0	0	0	0	9,152	0	21,727
November	9,362	0	0	0	0	3,937	0	13,299
December	7,460	0	0	0	0	2,798	0	10,258
January 2018	5,229	0	0	0	0	4,108	0	9,337
February	1,355	0	0	0	0	11,505	0	12,860
TOTAL	203,485	0	0	0	0	84,869	0	288,354

District's sole water contract is from the CVP Friant Division

*Transfers also include net exchanges and is a combination of Federal, State, Local, and Other water

Table 2

Ground Water Supply

2017 Month	District Groundwater (acre-feet)	Private Agric Groundwater *(acre-feet)
Method		
March	0	10,212
April	28	21,590
May	0	27,995
June	0	31,389
July	0	30,306
August	0	29,123
September	7	22,993
October	0	18,869
November	15	9,402
December	0	4,413
January 2012	0	2,464
February	0	9,465
TOTAL	50	218,222

*Estimated. Private groundwater use estimated from total crop water use in JM Lord report (Attachment N) minus total surface water deliveries. The difference is then applied to each month according to the percentage of water deliveries in that month in relation to the entire year.

Table 3

Total Water Supply

2017 Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Total District Water Supply (acre-feet)
Method			
March	26,442	0	26,442
April	30,468	28	30,496
May	33,198	0	33,198
June	33,876	0	33,876
July	34,783	0	34,783
August	34,036	0	34,036
September	28,070	7	28,077
October	21,727	0	21,727
November	13,299	15	13,314
December	10,258	0	10,258
January 2012	9,337	0	9,337
February	12,860	0	12,860
TOTAL	288,354	50	288,404

Note: includes water that was spread for groundwater recharge and/or banking.

Table 4

Agricultural Distribution System

2017 Canal, Pipeline, Lateral, Reservoir	Length (feet)	Width (feet)	Surface Area (square feet)	Precipitation (acre-feet)	Evaporation (acre-feet)	Spillage (acre-feet)	Seepage* (acre-feet)	Total (acre-feet)
Intake Canal	76,625	42	3,194,020	18.5	232.1	0	0	(214)
North Canal	66,249	50	3,312,450	19.1	240.7	0	0	(222)
South Canal	89,930	30	2,686,883	15.5	195.2	0	0	(180)
Spreading Basins	varies	varies	58,860,000	340.1	1,702.1	0	0	(1,362)
District Laterals	0	0	0			0	0	0
Arvin	15,800	0	0			0	0	0
Edison	128,900	0	0			0	0	0
Caliente	237,600	0	0			0	0	0
Tejon	116,200	0	0			0	0	0
Whitewolf	111,000	0	0			0	0	0
Mettler	132,000	0	0			0	0	0
TOTAL			68,053,352	393.2	2,370.0	0	0	(1,977)

* Seepage is not lost to Arvin-Edison, it contributes to the groundwater aquifer. Data from as-builts.

2017 Precipitation Worksheet*

	inches precip	ft precip	acres	AF/Year
Mar	0.26	0.02	1,562.29	33.85
Apr	0.18	0.02	1,562.29	23.43
May	0.04	0.00	1,562.29	5.21
Jun	0.00	0.00	1,562.29	0.00
Jul	0.00	0.00	1,562.29	0.00
Aug	0.00	0.00	1,562.29	0.00
Sept	0.33	0.03	1,562.29	42.96
Oct	0.00	0.00	1,562.29	0.00
Nov	0.27	0.02	1,562.29	35.15
Dec	0.06	0.01	1,562.29	7.81
Jan	1.55	0.13	1,562.29	201.80
Feb	0.33	0.03	1,562.29	42.96
TOTAL	**3.02**	**0.25**	1,562.29	**393.2**

* Data recorded at Arvin-Edison WSD office. (See Attachment L).

2017 Evaporation Worksheet

	inches evap	ft evap	acres	AF/YEAR
Mar	2.64	0.22	1,562.29	343.78
Apr	2.90	0.24	1,562.29	377.14
May	2.65	0.22	1,562.29	345.62
Jun	1.98	0.17	1,562.29	258.08
Jul	3.94	0.33	1,105.00	362.46
Aug	5.32	0.44	805.00	356.78
Sept	5.69	0.47	211.00	100.09
Oct	4.51	0.38	211.00	79.37
Nov	2.23	0.19	211.00	39.19
Dec	1.93	0.16	211.00	34.01
Jan	1.39	0.12	211.00	24.39
Feb	2.79	0.23	211.00	49.10
TOTAL	**37.98**	**3.16**	1,562.29	2,370.0

Evaporation acres are less because spreading basins are dry part of the year.

Table 5

Crop Water Needs

2017 Crop Name	Area (crop acres)	Crop ET (AF/Ac)	Leaching Requirement (AF/Ac)	Operational Componet (AF/Ac)	Effective Precipitation (AF/Ac)	Appl. Crop Water Use (acre-feet)
Vineyard (Grapes)	30,505	2.23	0.04	0.65	0.00	89,178
Oranges	15,278	3.46	0.06	0.65	0.00	63,697
Potatoes						
Spring	12,996	1.72	0.03	0.65	0.00	31,182
Fall	1,404	1.44	0.02	0.65	0.00	2,969
Carrots						
Spring	3,652	1.64	0.05	0.65	0.00	8,542
Fall	9,871	1.38	0.04	0.65	0.00	20,444
Wheat	4,647	1.94	0.01	0.65	0.00	12,078
Almonds	9,893	3.52	0.07	0.65	0.00	41,933
Tomatoes	3,772	2.22	0.03	0.65	0.00	10,922
Onions and Garlic	4,234	2.41	0.06	0.65	0.00	13,207
Cherries	2,596	4.18	0.07	0.65	0.00	12,726
Miscellaneous Citrus	1,394	2.86	0.05	0.65	0.00	4,961
Melons	768	1.91	0.02	0.65	0.00	1,981
Peppers	1,728	2.43	0.04	0.65	0.00	5,394
Cotton	79	2.73	0.01	0.65	0.00	268
Peaches/Nectarines	968	3.43	0.06	0.65	0.00	4,006
Other	10,400	2.49	0.05	0.65	0.00	33,144
Crop Acres	114,185					356,633 *

* Crop water use calculations based on JM Lord report (see Attachment N).

Total Irrigated Acres 114,185

Table 6

2017 District Water Inventory

Water Supply	Table 3		288,404
Riparian ET	(Distribution and Drain)	minus	0
Groundwater recharge	(intentional - ponds, injection)	minus	148,016
Seepage	Table 4	minus	0
Evaporation - Precipitation	Table 4	minus	1,977
Spillage	Table 4	minus	0
Transfers out of District		minus	0
Water Available for sale to customers			138,411
Actual Agricultural Water Sales	2017	From District Sales Records	138,411
Private Groundwater	Table 2	plus	218,222
Crop Water Needs	Table 5	minus	356,633
Drainwater outflow	(tail and tile, not recycled)	minus	0
Percolation from Agricultural Land	(calculated)		(0)
Unaccounted for Water	(calculated)		0

Table 7

District Influence on Groundwater and Saline Sink

2017

Agric Land Deep Perc + Seepage + Recharge - Groundwater Pumping = District Influence on Groundwater Storage	147,966
Estimated actual change in ground water storage (including natural recharge)	158,794
Irrigated Acres (from Table 5)	114,185
Irrigated acres over a perched water table	0
Irrigated acres draining to a saline sink	0
Portion of percolation from agri seeping to a perched water table	0
Portion of percolation from agri seeping to a saline sink	0
Portion of On-Farm Drain water flowing to a perched water table/saline sink	0
Portion of Dist. Sys. seep/leaks/spills to perched water table/saline sink	0
Total (AF) flowing to a perched water table and saline sink	0

Table 8

Annual Water Quantities Delivered Under Each Right or Contract

Year	Federal Ag Water (acre-feet)	Federal non-Ag Water. (acre-feet)	State Water (acre-feet)	Local Water (CVC) (acre-feet)	Other (Kern River) (acre-feet)	Transfers into District * (acre-feet)	Upslope Drain Water (acre-feet)	Total (acre-feet)
2008	25,177	0	156	23,629	14,955	0	0	63,917
2009	111,816	0	1,280	980	19,756	0	0	133,832
2010	176,249	0	30,154	73,991	0	0	0	280,394
2011	171,536	0	27,326	36,249	0	0	0	235,111
2012	3,788	0	31,703	64,679	0	0	0	100,170
2013	19,925	0	6,592	15,788	1,451	0	0	43,756
2014	11,918	0	0	16,439	17,599	0	0	45,956
2015	3,174	0	0	9,839	28,366	0	0	41,379
2016	96,429	0	1,011	14,363	15,749	0	0	127,552
2017	203,485	0	24,308	36,654	23,907	0	0	288,354
Total	823,497	0	122,530	292,611	121,783	0	0	1,360,421
Average	82,350	0	12,253	29,261	12,178	0	0	136,042

ARVIN-EDISON WATER STORAGE DISTRICT

IMPORTED SURFACE WATER BY SOURCE - AF

Water	Friant-Kern Canal				Kern	California Aqueduct		Farm	
Year	Class I (1)	Class II (2)	Other (3)	Total	River (4)	CVC	Intertie	Wells (5)	Total
1966	39,008	0	0	39,008	0	0	0	0	39,008
1967	26,884	56,967	0	83,851	0	0	0	0	83,851
1968	37,720	5,417	0	43,137	17,878	0	0	0	61,015
1969	17,884	181,055	0	198,939	1,057	0	0	0	199,996
1970	43,000	86,796	0	129,796	1,968	0	0	0	131,764
1971	43,933	102,820	0	146,753	0	0	0	0	146,753
1972	40,067	12,053	0	52,120	1,300	0	0	0	53,420
1973	46,996	130,609	0	177,605	3,985	0	0	0	181,590
1974	32,732	148,490	0	181,222	18,623	0	0	0	199,845
1975	35,666	146,076	0	181,742	17,325	3,597	0	0	202,664
1976	10,501	1,688	0	12,189	0	96,588	0	0	108,777
1977	2,351	0	0	2,351	400	28,812	0	0	31,563
1978	51,834	109,469	0	161,303	7,688	13,925	0	0	182,916
1979	19,268	82,701	0	101,969	0	123,973	0	0	225,942
1980	61,676	153,088	0	214,764	9,329	0	0	0	224,093
1981	21,607	8,246	0	29,853	696	141,590	0	0	172,139
1982	26,930	207,074	0	234,004	0	0	0	0	234,004
1983	45,818	120,398	0	166,216	16,109	0	0	0	182,325
1984	20,191	20,779	0	40,970	17,621	108,041	0	0	166,632
1985	22,449	0	0	22,449	5,645	130,117	0	0	158,211
1986	13,695	180,968	0	194,663	15,513	3,948	0	0	214,124
1987	11,742	0	0	11,742	0	114,222	0	0	125,964
1988	3,575	0	0	3,575	2,495	108,087	0	0	114,157
1989	920	81	0	1,001	0	118,679	0	0	119,680
1990	4,864	0	0	4,864	0	55,378	0	0	60,242
1991	17,510	0	0	17,510	0	19,285	0	0	36,795
1992	17,106	6,181	0	23,287	2,035	39,436	0	1,284	66,042
1993	40,000	150,734	0	190,734	8,821	61,292	0	0	260,847
1994	18,364	19,275	0	37,639	1,200	50,963	0	0	89,802
1995	1,213	215,171	32,685	249,069	9,802	23,696	0	0	282,567
1996	18,865	103,193	49,969	172,027	47,323	12,481	0	0	231,831
1997	33,265	117,410	25,990	176,665	68,772	12,795	0	0	258,232
1998	22,746	401	96,859	120,006	81,548	11,643	0	0	213,197
1999	9,960	37,473	22,078	69,511	37,588	144,243	0	0	251,342
2000	15,741	77,126	13,978	106,845	1,973	148,389	0	0	257,207
2001	24,028	6,038	2,720	32,786	662	13,602	0	156	47,206
2002	29,335	12,370	856	42,561	2,847	50,821	2,772	0	99,001
2003	33,743	57,788	270	91,801	0	64,018	15,396	0	171,215
2004	33,304	27,541	0	60,845	341	40,714	6,604	0	108,504
2005	46,673	122,927	52,989	222,589	10,148	15,565	5,143	0	253,445
2006	23,381	80,584	42,034	145,999	14,724	49,719	9,151	0	219,593
2007	15,462	0	0	15,462	300	31,937	0	0	47,699
2008	14,906	10,271	0	25,177	14,955	23,629	156	0	63,917
2009	52,727	59,089	0	111,816	19,756	980	1,280	0	133,832
2010	39,436	115,272	21,541	176,249	0	73,991	30,154	0	280,394
2011	45,624	105,674	20,238	171,536	0	36,249	27,326	0	235,111
2012	3,788	0	0	3,788	0	64,679	31,703	0	100,170
2013	19,925	0	0	19,925	1,451	15,788	6,592	0	43,756
2014	2,296	0	9,622	11,918	17,599	16,439	0	4,464	50,420
2015	0	0	3,174	3,174	28,366	9,839	0	7,357	48,736
2016	26,432	13,856	56,141	96,429	15,749	14,363	1,011	385	127,937
2017	72,121	45,932	85,432	203,485	23,907	36,654	24,308	0	288,354
Total	1,359,262	3,139,081	536,576	5,034,919	547,499	2,130,167	161,596	13,646	7,887,827
Avg	26,140	60,367	10,319	96,825	10,529	40,965	3,108	262	151,689
%	64%				7%	27%	2%	0%	100%

Notes: *The Water Year is March through February of the following year*

(1) District's Friant-Kern Class 1 supply (including carryover) plus Class 1 purchases taken in-district

(2) Friant-Kern Class 2 supply including Uncontrolled Season taken in-District

(3) Other Friant-Kern supplies such as 13i, URF, RWA, Section 215, SJREC, H&S, and flood release plus purchases and exchar

(4) Consists primarily of reregulated F-K supplies delivered by exchange, minor quantities of purchases of Kern River and Kern Delta wheeling (including groundwater) and City of Bakersfield exchange (CBK-43)

(5) Result of District's Farm well water purchase program including agreement losses (wheeling not included)

ARVIN-EDISON WATER STORAGE DISTRICT

PROJECT OPERATIONS SUMMARY - 1966 TO 2017

(Values in acre-feet)

Water Year	Water Supply	Deliveries to Water Users	Underground Storage: Gross Spreading	Evaporation	Net Percolation	In-Lieu Percolation	Extractions	Change	Cumulative	Exports	Losses and Metering Inaccuracy
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*
1966	39,008	0	42,137	735	41,402	0	0	41,402	41,402	0	-3,129
1967	83,851	17,867	64,903	1,239	63,664	0	0	63,664	105,066	0	1,081
1968	61,015	63,940	5,550	93	5,457	0	11,374	-5,917	99,149	0	2,899
1969	199,996	95,251	110,844	3,016	107,828	0	447	107,381	206,530	0	-5,652
1970	131,764	104,210	28,565	572	27,993	0	85	27,908	234,438	0	-926
1971	146,753	100,625	45,425	1,208	44,217	0	32	44,185	278,623	0	735
1972	53,420	104,626	309	3	306	0	52,659	-52,353	226,270	0	1,144
1973	181,590	119,128	65,824	2,018	63,806	0	769	63,037	289,307	0	-2,593
1974	199,845	133,996	66,121	1,885	64,236	0	1,725	62,511	351,818	0	1,453
1975	202,664	138,599	69,557	1,928	67,629	0	3,642	63,987	415,805	0	-1,850
1976	108,777	148,374	5,290	45	5,245	0	49,875	-44,630	371,175	0	4,988
1977	31,563	107,067	0	0	0	0	81,979	-81,979	289,196	0	6,475
1978	182,916	123,040	62,603	1,959	60,644	0	2,922	57,722	346,918	0	195
1979	225,942	148,438	74,613	1,815	72,798	0	308	72,490	419,408	0	3,199
1980	224,093	154,104	76,532	2,219	74,313	0	27	74,286	493,694	0	-6,516
1981	172,139	152,673	20,649	432	20,217	0	14,599	5,618	499,312	0	13,416
1982	234,004	137,517	90,150	2,794	87,356	0	12	87,344	586,656	0	6,349
1983	182,325	135,762	50,038	2,154	47,884	0	6,560	41,324	627,980	0	3,085
1984	166,632	148,175	16,428	347	16,081	0	9,321	6,760	634,740	0	11,350
1985	158,211	141,865	10,156	263	9,893	0	11,892	-1,999	632,741	0	18,082
1986	214,124	139,176	73,268	3,174	70,094	0	5,660	64,434	697,175	0	7,340
1987	125,964	140,339	2,156	149	2,007	0	24,332	-22,325	674,850	0	7,801
1988	114,157	139,541	2,907	152	2,755	0	33,742	-30,987	643,863	0	5,451
1989	119,680	148,095	6,066	159	5,907	0	36,278	-30,371	613,492	0	1,797
1990	60,242	149,969	2,403	62	2,341	0	99,152	-96,811	516,681	0	7,022
1991	36,795	113,312	173	3	170	0	80,544	-80,374	436,307	0	3,854
1992	66,042	132,682	9,469	216	9,253	0	84,483	-75,230	361,077	0	8,374
1993	260,847	130,681	122,917	2,516	120,401	0	6,595	113,806	474,883	0	13,844
1994	89,802	137,277	13,031	192	12,839	0	75,279	-62,440	412,443	0	14,773
1995	282,567	135,481	112,971	3,745	109,226	0	1,095	108,131	520,574	0	35,210
1996	231,831	147,303	57,539	3,433	54,106	0	0	54,106	574,680	0	26,989
1997	258,232	149,338	73,403	2,409	70,994	0	0	70,994	645,674	0	35,491
1998	213,197	114,123	82,360	4,904	77,456	0	681	76,775	722,449	0	17,395
1999	251,342	151,376	87,179	6,639	80,540	0	1,049	79,491	801,940	0	13,836
2000	257,207	143,549	101,950	4,552	97,398	0	5,427	91,971	893,911	0	17,135
2001	47,206	153,343	2,737	180	2,557	0	117,608	-115,051	778,860	0	8,734
2002	99,001	148,054	9,090	326	8,764	0	80,519	-71,755	707,105	11,483	10,893
2003	171,215	132,943	43,180	1,408	41,772	0	16,650	25,122	732,227	897	10,845
2004	108,504	143,662	31,669	265	31,404	0	100,125	-68,721	663,506	25,512	7,786
2005	253,445	139,033	105,723	3,917	101,806	0	174	101,632	765,138	0	8,863
2006	219,593	134,226	73,565	1,845	71,720	0	1,287	70,433	835,571	0	13,089
2007	47,699	149,678	4,603	143	4,460	0	152,184	-147,724	687,847	38,698	6,904
2008	63,914	149,182	3,463	163	3,300	0	139,929	-136,629	551,218	40,329	10,869
2009	133,832	135,122	46,945	953	45,992	0	111,878	-65,886	485,332	55,118	8,525
2010	280,394	128,235	133,409	3,127	130,282	331	2,723	127,890	613,222	17,701	3,772
2011	235,111	137,585	79,752	4,896	74,856	6,318	164	81,010	694,232	13,752	4,186
2012	100,170	145,853	2,094	138	1,956	4,216	68,699	-62,527	631,705	16,738	4,184
2013	43,756	161,605	4,010	121	3,889	0	161,352	-157,463	474,242	38,549	944
2014	50,420	126,153	3,507	84	3,423	0	134,717	-131,294	342,948	52,028	3,449
2015	48,736	98,330	273	0	273	0	123,358	-123,085	219,863	69,751	3,740
2016	127,937	107,214	31,880	287	31,593	18	33,010	-1,399	218,464	19,489	2,364
2017	288,404	138,411	148,016	5,096	142,920	15,924	50	158,794	377,258	0	2,027
Totals	8,005,724	6,810,690	2,404,053	80,630	2,323,423	29,972	2,011,369	342,026		415,422	386,928
Avg	151,051	128,504	45,359	1,521	43,838	566	37,950	6,453	495,490	24,437	7,301

Notes:

(1) Water Year - March through February of the following year

(2) Total imported supply - all sources including purchased Farm wells (and losses) and wheeling to District

(3) Metered deliveries to turnouts, includes in-lieu spreading, excludes wheeled Farm wells

(4) Measured deliveries to spreading basins

(5) Calculated from wetted area and measured pan evaporation

(6) Col 4 - Col 5

(7) In-lieu accounting beginning November 2010 (9D contract)

(8) Metered District wellfield production

(9) Col 6 + Col 7 - Col 8

(10) Accumulated Col 9

(11) Exports from District for banking and wheeling programs

(12) Col 2 + Col 7 - Col 3 - Col 4 - Col 10

ARVIN-EDISON WATER STORAGE DISTRICT

2017 WATER YEAR GROSS SPREADING - AF

Month	Bal Res	North Gravity	North Pressure	Sycamore	Tejon Gravity	Tejon Pressure	Murray Gravity	Subtotal	In-Lieu	Total
MAR-17	1,132	3,265	3,204	6,952	2,546	2,574	0	19,673	428	20,101
APR	943	2,884	2,538	6,049	2,193	1,983	0	16,590	1,281	17,871
MAY	555	2,177	1,574	5,391	2,206	1,712	0	13,615	1,605	15,220
JUN	465	2,103	1,624	5,138	2,104	1,544	0	12,978	2,032	15,010
JUL	462	2,841	2,024	5,924	2,301	1,734	0	15,286	2,279	17,565
AUG	384	2,373	1,829	6,125	2,205	2,105	97	15,118	2,462	17,580
SEP	433	2,038	1,599	5,809	1,938	2,090	34	13,941	1,910	15,851
OCT	472	1,146	1,068	5,085	1,759	1,701	57	11,288	1,828	13,116
NOV	263	0	1,197	3,933	1,342	1,158	45	7,938	1,150	9,088
DEC	265	579	1,094	3,022	1,077	1,097	76	7,210	383	7,593
JAN-18	164	1,232	982	2,628	1,312	1,116	46	7,480	101	7,581
FEB	220	1,398	930	1,973	1,027	1,312	39	6,899	465	7,364
Total	5,758	22,036	19,663	58,029	22,010	20,126	394	148,016	15,924	163,940
Ratio	3.5%	13.4%	12.0%	35.4%	13.4%	12.3%	0.2%	90.3%	9.7%	100%
Ratio	28.9%			35.4%	25.7%		0.2%			

Total Pressure	5,758		19,663			20,126		45,547		45,547
	13%		43%			44%		100%		100%

ATTACHMENTS

ATTACHMENT A1 – Board Resolution Adopting the Plan

BEFORE THE BOARD OF DIRECTORS OF THE
ARVIN-EDISON WATER STORAGE DISTRICT

IN THE MATTER OF: RESOLUTION NO. 18-24

APPROVING A WATER MANAGEMENT PLAN

WHEREAS, the District prepared a "Water Management Plan" pursuant to the United States Department of the Interior Bureau of Reclamation (USBR) and the Board has approved such plan on September 10, 2013; and

WHEREAS, the District has a federal water service Contract No. 14-06-200-229AD dated November 1, 2010, and has, therefore, prepared pursuant to Section 27 (Water Conservation) a Water Management Plan, which requires Contractors to re-evaluate and re-submit their plans every five (5) years; and

WHEREAS, District staff and consultants prepared a "Water Management Plan" pursuant to the USBR's 2017 Standard Criteria; and

WHEREAS, said Water Management Plan, upon USBR's acknowledging the adequacy of the Plan, will also satisfy State of California Department of Water Resources (DWR) requirements of the Agricultural Water Management Planning Act (Water Code Section 10800, sometimes referred to as SBx7-7), Agricultural Water Measurement Regulation (Title 23 Code of Regulations) and Executive Order B-29-15 (Drought Management Plan).

NOW, THEREFORE, BE IT RESOLVED that this Board of Directors has approved the "Water Management Plan" and directs that a copy of same, together with this resolution be forwarded to the USBR and DWR.

All the foregoing being on motion of Director, Fanucchi seconded by Director, Moore and authorized by the following vote, to wit:

AYES: Directors' Camp Moore, Yurosek, Fanucchi, Pascoe, Lehr, Johnston, and Martinez.

NOES: None

ABSTAIN: None

ABSENT: Director Giumarra.

I HEREBY CERTIFY that the foregoing resolution is the resolution of said District as duly passed and adopted by said Board of Directors on the 9th day of October 2018.

WITNESS my hand and seal of said Board of Directors this 9th day of October 2018.

John C. Moore, Secretary-Treasurer of the
Board of Directors

ARVIN-EDISON WATER STORAGE DISTRICT

CERTIFICATE OF ASSISTANT SECRETARY-TREASURER

OF THE BOARD OF DIRECTORS

I, DAVID A., NIXON Assistant Secretary-Treasurer of the Board of Directors of Arvin-Edison Water Storage District, hereby certify that the foregoing is a full, true, and correct original copy of Resolution 18-24, APPROVING A WATER MANAGEMENT PLAN. I further certify that the original resolution has not been amended; modified, or rescinded in any manner since the date of its adoption.

In Witness Whereof, I have executed this Certificate and affixed the Seal of Arvin-Edison Water Storage District hereto this 22nd of October 2018.

David A. Nixon, Assistant Secretary-Treasurer
Of the Board of Directors

ATTACHMENT A

District Maps

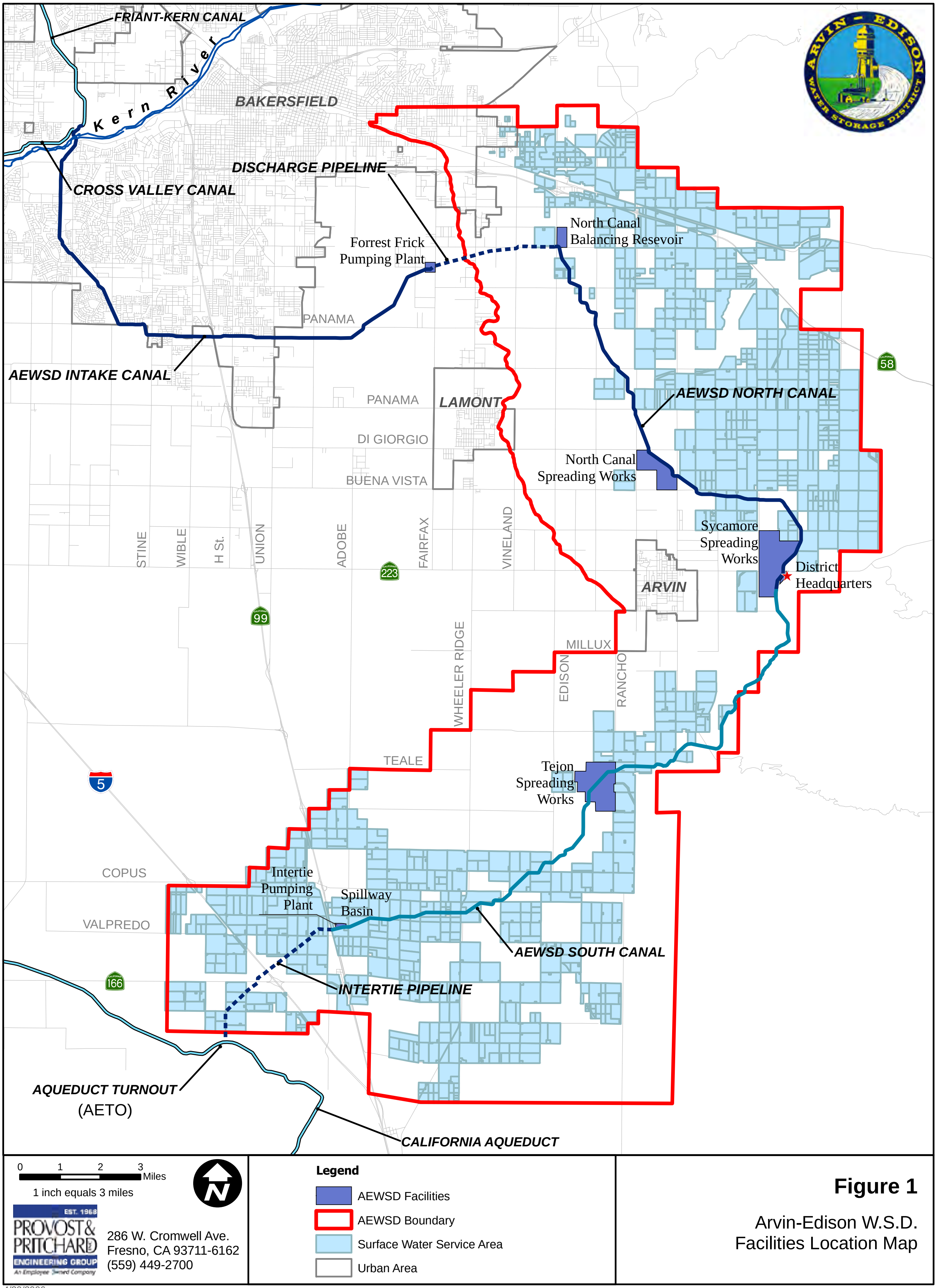

Figure 1

Arvin-Edison W.S.D.
Facilities Location Map

4/20/2006
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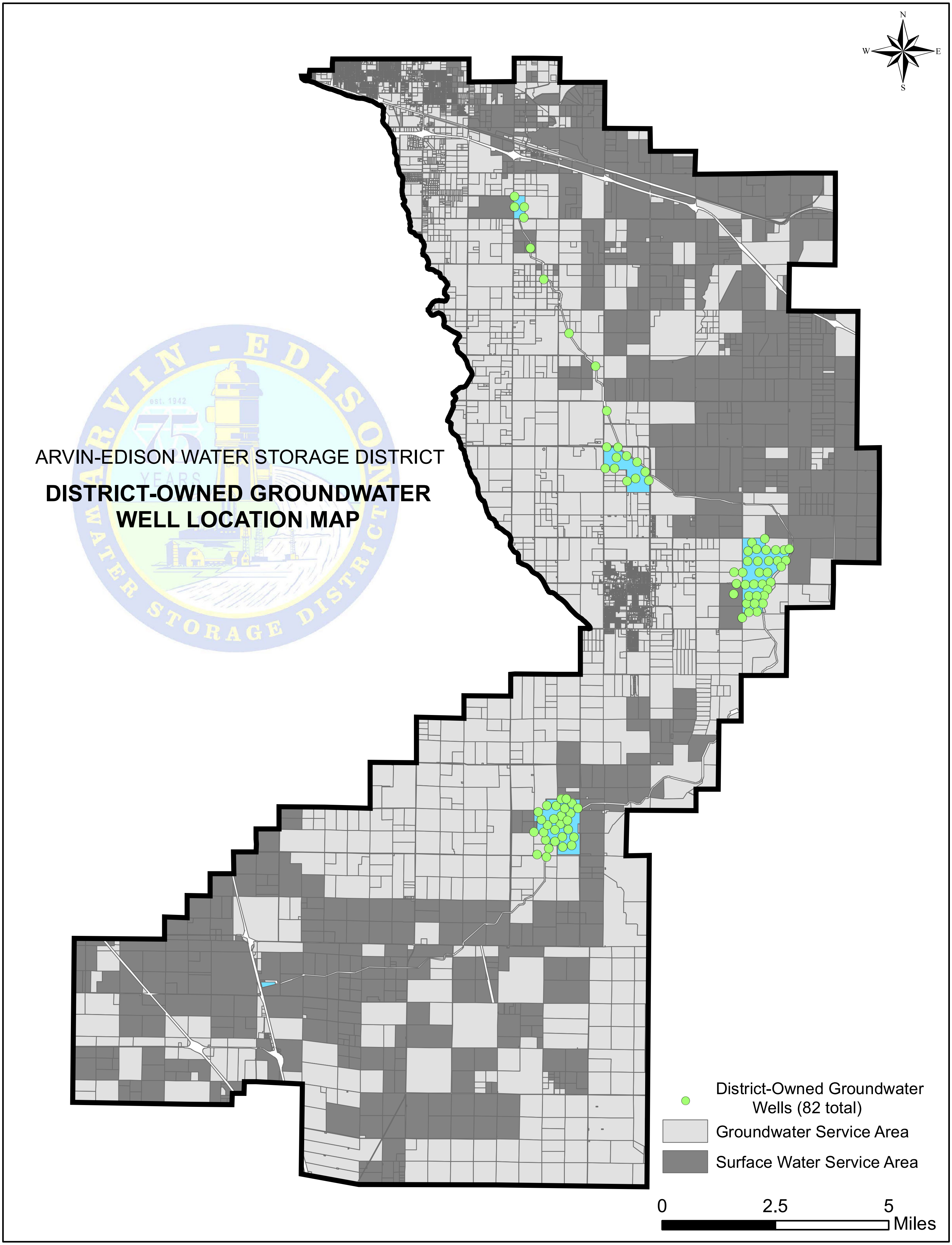
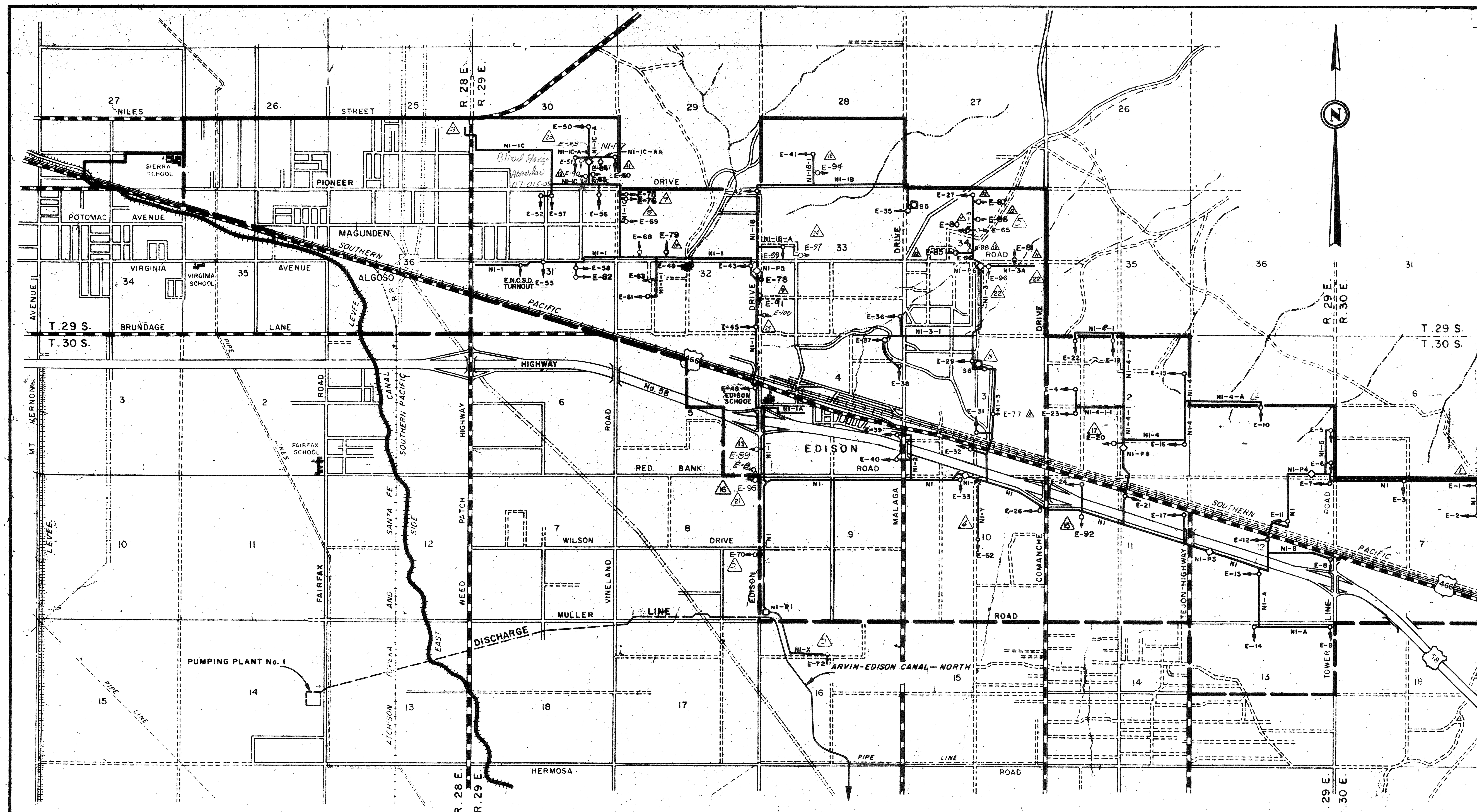
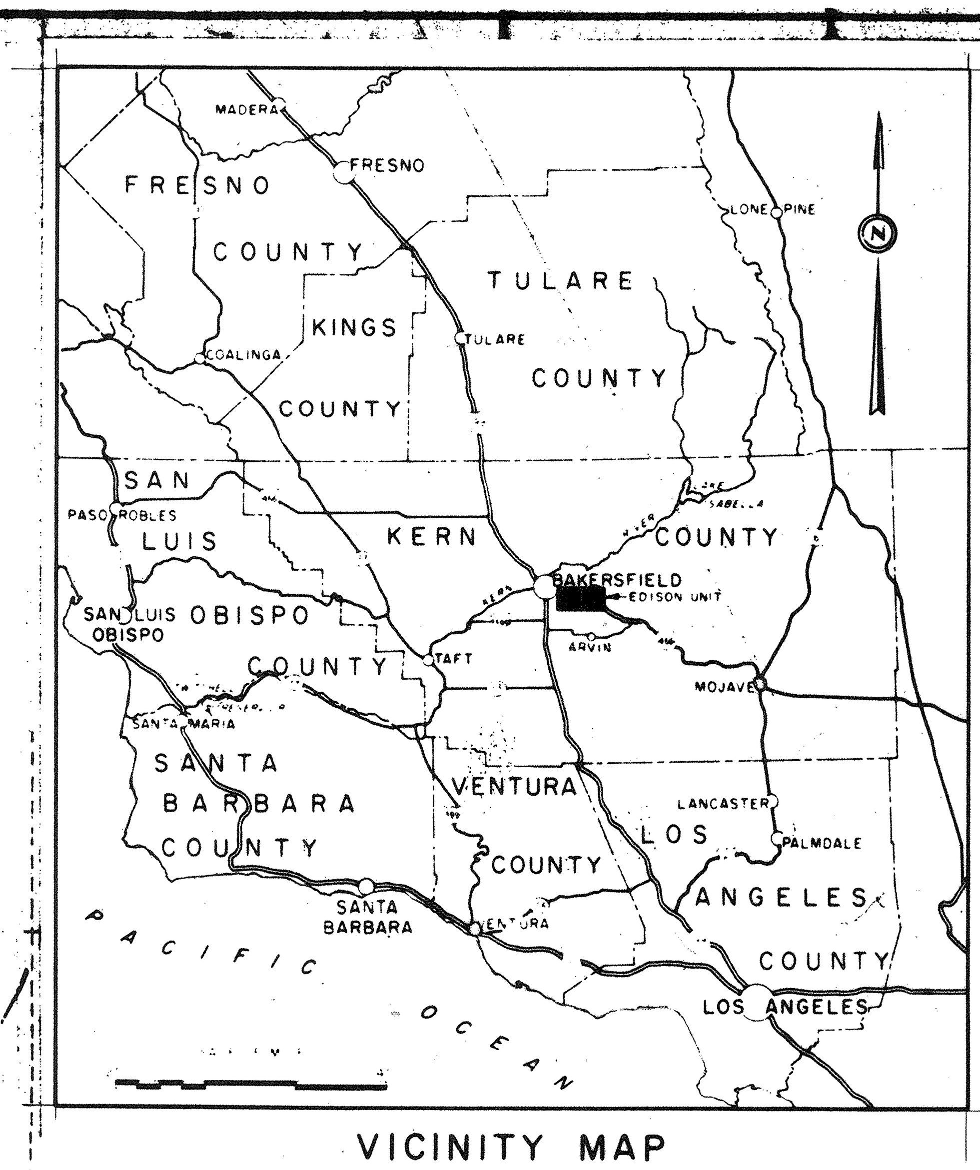


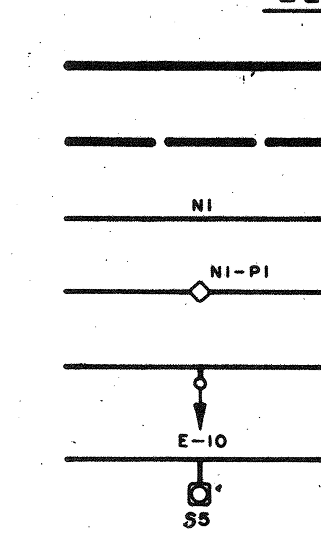
ARVIN-EDISON WATER STORAGE DISTRICT
DISTRICT-OWNED GROUNDWATER
WELL LOCATION MAP
ARVIN - EDISON
WATER STORAGE DISTRICT
est. 1942
75
YEARS
N
S
E
W
District-Owned Groundwater Wells (82 total)
Groundwater Service Area
Surface Water Service Area
0
2.5
5
Miles





VICINITY MAP

LEGEND



DISTRICT BOUNDARY
UNIT BOUNDARY
LATERAL PIPELINE
PUMPING PLANT
FARM DELIVERY
STANDPIPE

PIPE SIZE	PIPE TYPE	MANUFACTURER
6",8",10",12",15",18",21",24"	STEEL	SMITH-SCOTT
10"*,15"	ASBESTOS CEMENT PIPE (ACP)	JOHNS-MANVILLE
27",39",42"	PRETENSIONED CONCRETE CYLINDER PIPE	AMERICAN PIPE AND CONSTRUCTION CO.
30",33"	REINFORCED CONCRETE PIPE	CEN-VI-RO
36",45",54"	PRETENSIONED CONCRETE CYLINDER PIPE	UNITED CONCRETE PIPE CORP.

* Added under Spec. A-E. 710

SCALE OF FEET
2000 0 2000 4000 6000

25	5-8-91	ADDED T.O. E-100	PLH	
24	2-17-88	ADDED T.O. E-97	PLH	[illegible]
23	6-5-87	REMOVED T.O. E-54	PLH	LWB
22	4-6-87	BLIND FLANGED E-25 & ADDED E-96	PLH	LWB
21	7-1-86	CHANGED E-Δ TO E-95	PLH	LWB
20	11-1981	ADDED T.O. E-93	PLH	LWB
19	7-31-86	REMOVED T.O. E-28	PLH	LWB
18	1-10-86	ADDED T.O. E-94	PLH	LWB
17	1-23-85	MOVED E-20 AS SHOWN	PLH	LWB
16	7-2-83	ADDED E-A AS SHOWN	PLH	LWB
15	5-25-82	ADDED E-92 AS SHOWN	PLH	LWB
14	4-17-80	ADDED T.O. E-91 AS SHOWN	CRC	LWB
13	2-11-80	ADDED T.O.'S E-88, E-89, & E-90 AS SHOWN	CRC	[illegible]
12	5-24-78	ADDED T.O.'S E-85 & E-86 & E-87 AS SHOWN	VCS	[illegible]
11	1-14-77	ADDED TURNOUT E-80 & E-81 & E-82 & E-83 E-84 AS SHOWN	VCS	LWB
10	1-8-76	ADDED TURNOUT E-79	VCS	LWB
9	6-9-75	ADDED TURNOUT E-78 & DELEATED E-47	VCS	[illegible]
8	3-12-75	ADDED TURNOUT E-77	VCS	[illegible]
7	12-4-74	ADDED TURNOUT E-75 AS SHOWN	VCS	[illegible]
6	2-15-73	As built and per spec. 710	YF	[illegible]

AS BUILT DWG.
BY JRP
CHECKED G.W. Schmidt
R.E. [illegible]

REV.	DATE	DESCRIPTION	SUB.	APP'D.
5	8-8-72	Added Turnouts and Laterals	[illegible]	[illegible]
4	2-5-68	Per Spec. 707	[illegible]	[illegible]
3	8-21-67	As Built	[illegible]	[illegible]
2	3-13-67	Delete Standpipes S4 & S8	[illegible]	
1	7-27-66	Rev. Location of S4	[illegible]	[illegible]

DRAWN MEHRAFSAR SUBMITTED [illegible]
CHECKED FIELDING APPROVED R. M. Edmonston R.C.E. No. 8008

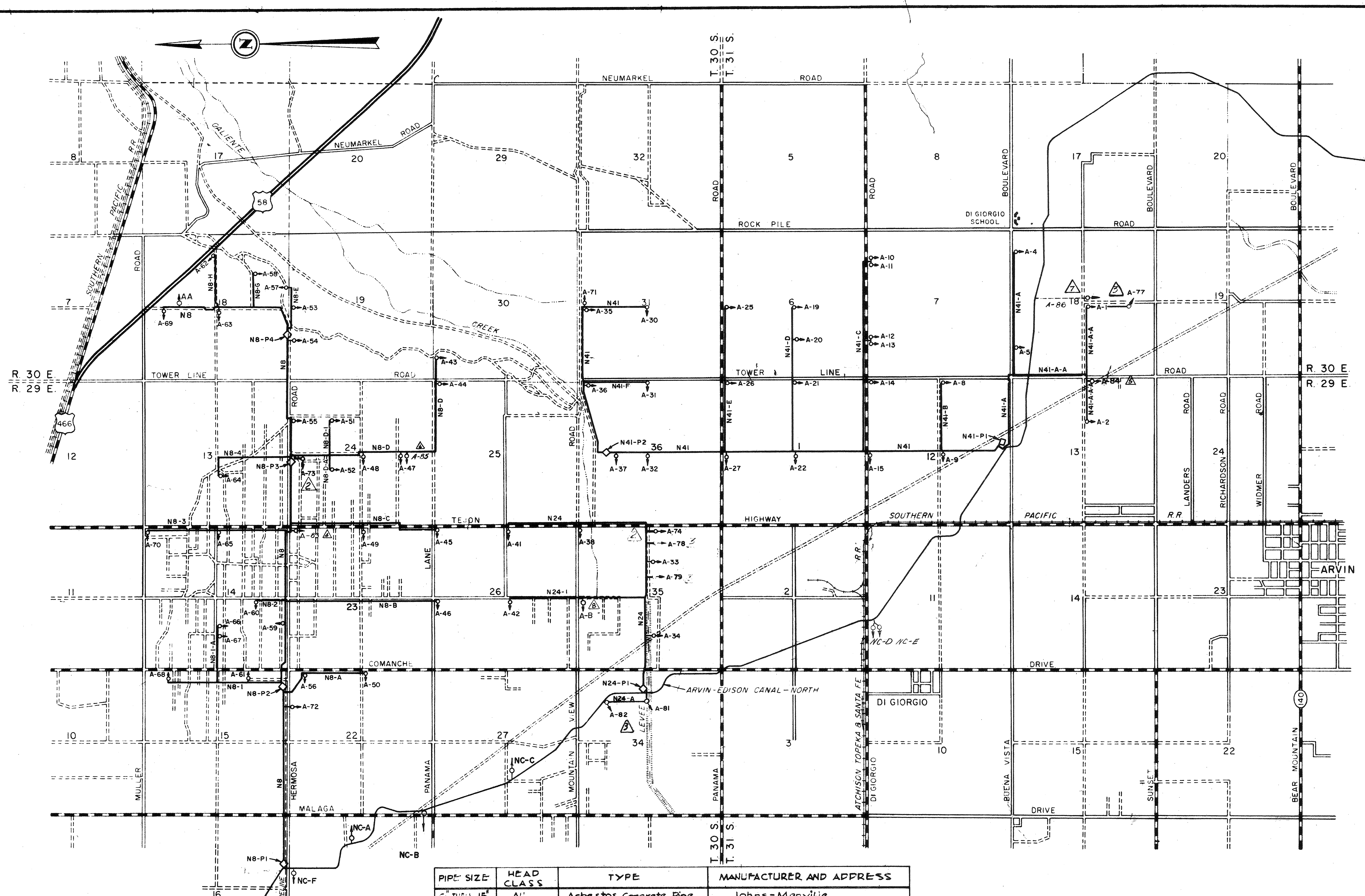
ARVIN-EDISON WATER STORAGE DISTRICT

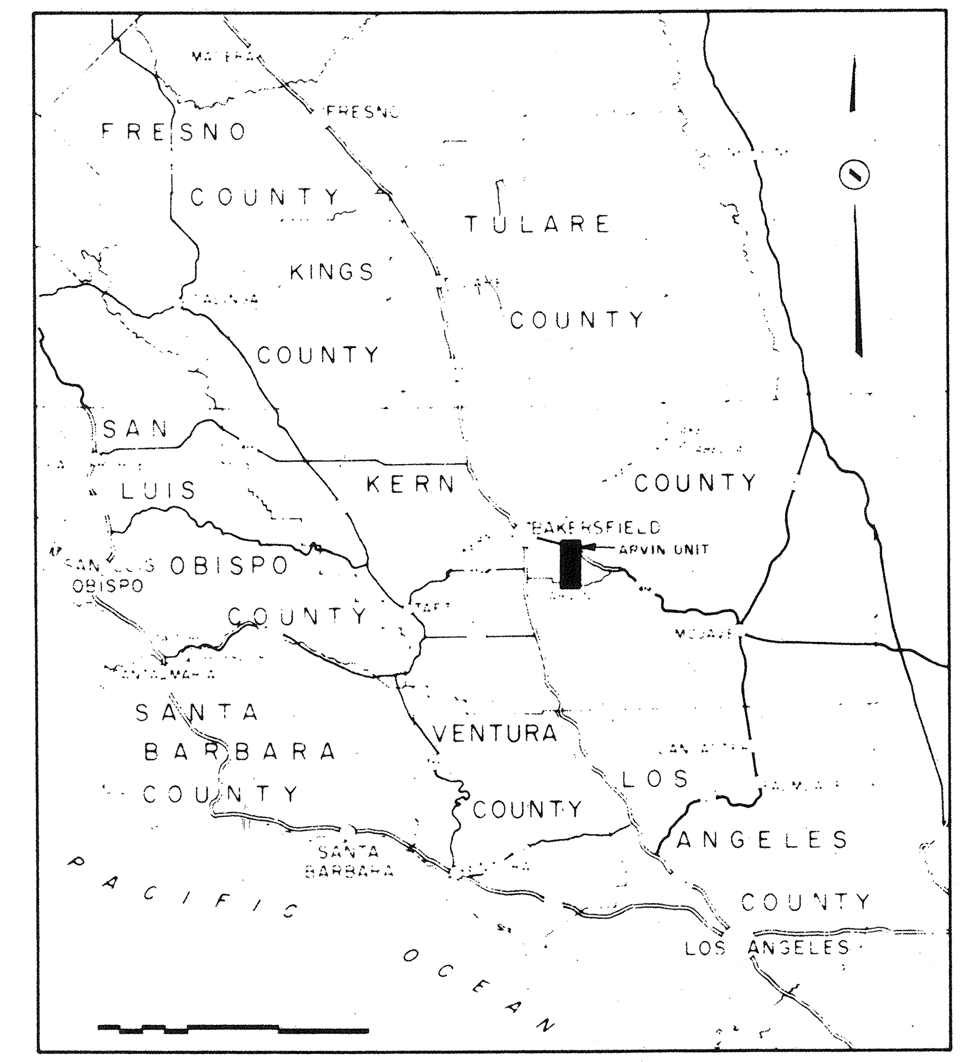
EDISON UNIT

LOCATION MAP

DATE: JUNE 1, 1966

DRAWING NO. EL-1001





VICINITY MAP

PIPE SIZE	HEAD CLASS	TYPE	MANUFACTURER AND ADDRESS
6" THRU 15" 18" 21"	All 150'-225' 150'	Asbestos Concrete Pipe A.C.P.	Johns-Manville P.O. Box "D" Long Beach, Calif.
21" & 24" 30" 33" 36" 39" 42"	50'-125' 75'-150' 75'-125' 125' All 100'	Reinforced Concrete Pipe (Rubber Gasket) R.C.P.	Cen-Vi-Ro Pipe Corp. P.O. Box 1416 Shafter, Calif.
21" 24" 27" 33" 36" 42" 45"	200-225 150-225 200-250 150' 150' 125'-200' 150'-200'	Pretensioned Concrete Cylinder Pipe P.C.C.P.	American Pipe & Construction Co. 4635 Firestone Blvd. South Gate, Calif.
36"	175'-225'	Pretensioned Concrete Cylinder Pipe P.C.C.P.	United Concrete Pipe Corp. P.O. Box 429 Baldwin Park, Calif.

SCALE OF FEET
2000 0 2000 4000 6000

AS BUILT DWG.

REV.	DATE	DESCRIPTION	SUB.	APP'D.
8	2-7-83	ADDED T.O. A-B	PLH	[illegible]
7	12-30-83	ADDED TURNOUT A-86 AS SHOWN	PLH	[illegible]
6	10-4-78	ADDED TURNOUT A-85 AS SHOWN	VES	[illegible]
5	1-14-77	ADDED TURNOUT A-84 AS SHOWN	VES	[illegible]
4	3-12-75	ADDED TURNOUT A-83	VES	[illegible]
3	[illegible]	[illegible]		
2	2-5-68	Per Spec. 707		
1	7-25-67	As built		

DRAWN GUERRERO SUBMITTED [signature]
CHECKED PAYNE APPROVED R. M. Edmonston
R.C.E. No. 8008

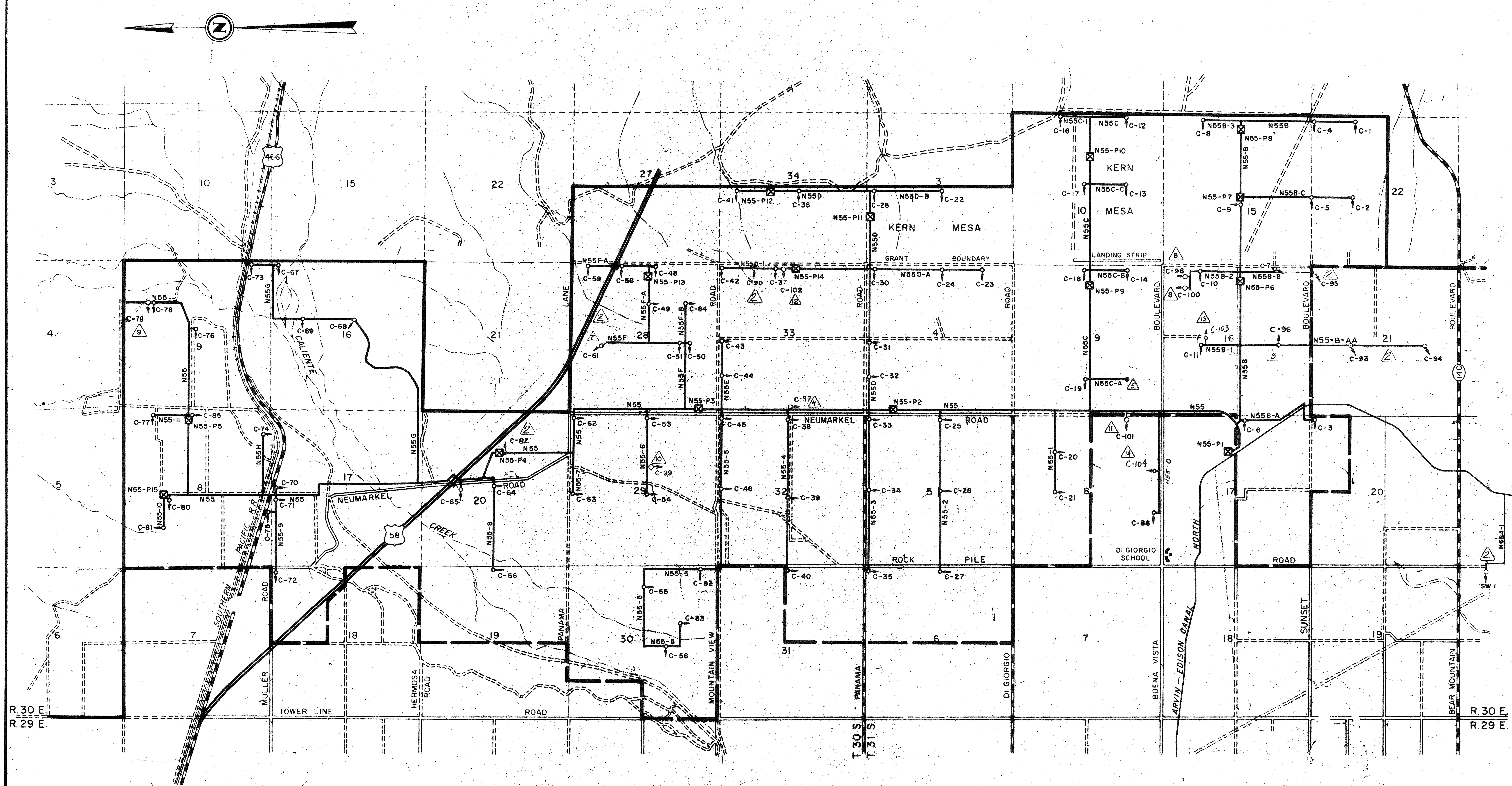
ARVIN-EDISON WATER STORAGE DISTRICT

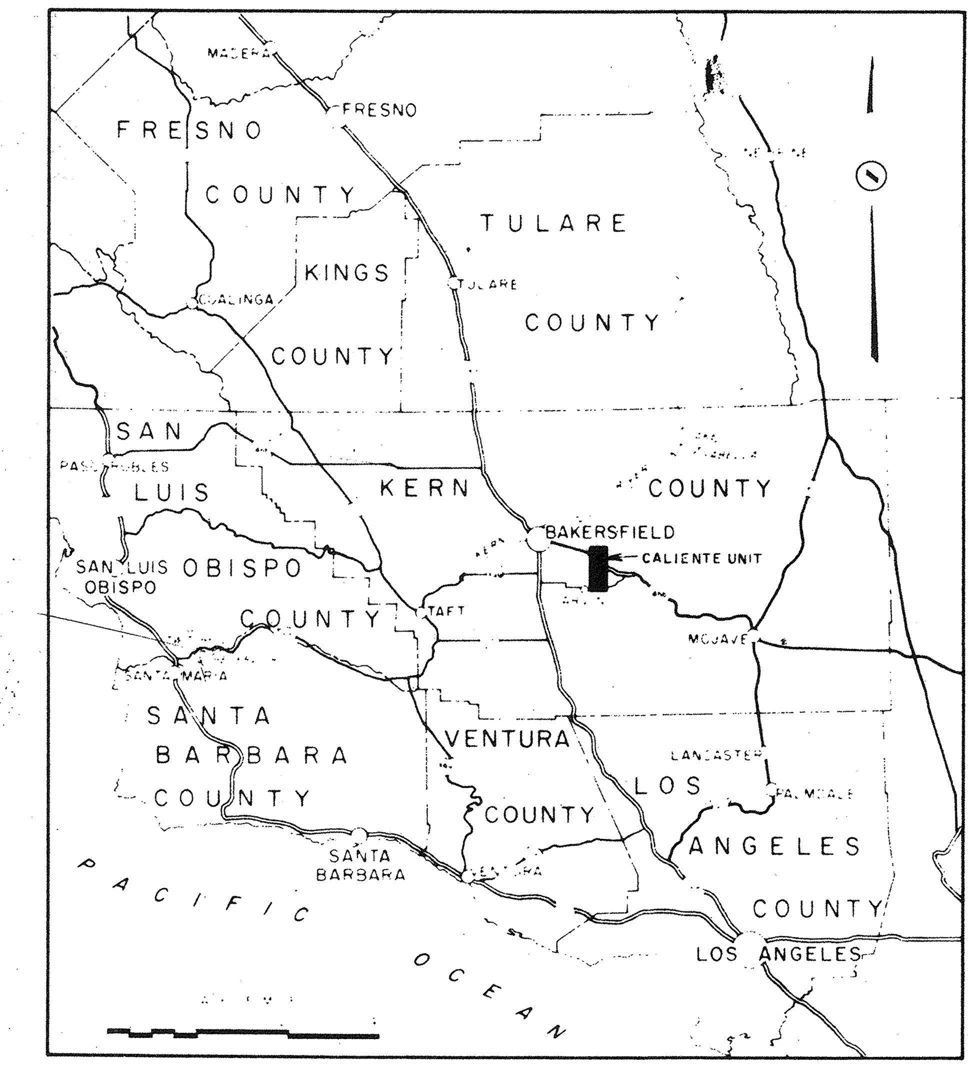
ARVIN UNIT

LOCATION MAP

BOOKMAN-EDMONSTON ENGINEERING, INC.
GLENDALE, CALIFORNIA

DATE: MAR. 9, 1966
DRAWING NO. AL-1001





VICINITY MAP

LEGEND

- DISTRICT BOUNDARY
- UNIT BOUNDARY
- N55-P2 ⊠ PUMPING PLANT
- N55 DISTRIBUTION SYSTEM
- C-3 FARM DELIVERY

CALIENTE UNIT DISTRIBUTION LATERAL PIPELINES

PIPE SIZE	PIPE TYPE	MANUFACTURER
6" through 18" & 24"	A.C.P. (Asbestos Cement Pipe)	Johns-Manville Pipe Division P.O. Box D Long Beach 10, California
21" & 27" through 33" 39" through 45"	P.C.C.P. (Pretentioned Concrete Cylinder Pipe)	American Pipe and Construction Co. Southern California Division 4635 Firestone Boulevard South Gate, California 90280
36" & 48" through 60"	P.C.C.P. (Pretentioned Concrete Cylinder Pipe)	United Concrete Pipe Corporation 14041 East Live Oak Baldwin Park, California 91708

SCALE OF FEET
2000 0 2000 4000 6000

14	5-24-91	ADDED T.O. C-104	PdH	
13	12-1-89	ADDED T.O. C-103	PdH	
12	7-16-88	ADDED T.O. C-102	PLH	
11	10-23-87	ADDED T.O. C-101	PLH	
10	7-17-86	ADDED T.O. C-99	PLH	
9	4-10-85	MOVED C-79	PLH	
8	12-28-84	ADDED C-100, MOVED C-98	PLH	
7	12-10-83	REMOVED C-91, MOVED C-61	PLH	
6	5-25-82	ADDED C-98 AS SHOWN	PLH	
5	2-9-81	REMOVED T.O. C-15 BLIND FLANGE	CRC	
4	4-17-80	ADDED T.O. C-97 AS SHOWN	CRC	

AS BUILT DWG.
BY JRP
CHECKED G.W. Schmidt
A. Hawker

REV.	DATE	DESCRIPTION	SUB.	APP'D.
3	1-14-74	Added Turnout C-96	Y.S.7.	
2				
1	9-5-67	As Built		

DRAWN GUERRERO SUBMITTED
CHECKED FIELDING APPROVED R. M. Edmonston R.C.E. No 8008

ARVIN-EDISON WATER STORAGE DISTRICT

CALIENTE UNIT
LOCATION MAP

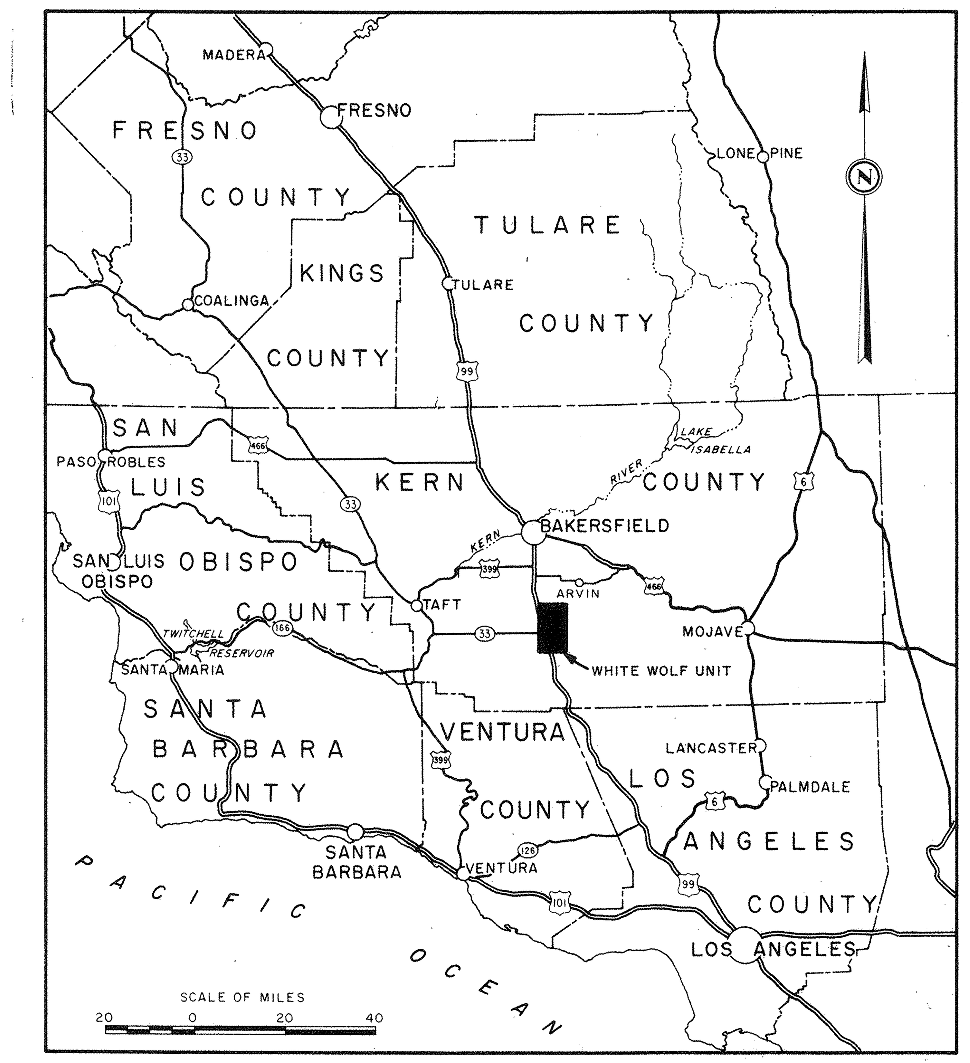
BOOKMAN-EDMONSTON ENGINEERING, INC.
GLENDALE CALIFORNIA

DATE: DEC 17 1965
DRAWING NO. CL-1001

REV.	DATE	DESCRIPTION	SUB.	APP'D
12	8-20-83	ADDED T.O. SC-B	PWH	
	1-22-83	ADDED TURNOUTS SC-C & SC-D	PWH	
	5-25-82	ADDED TURNOUT T-84 AS SHOWN	PWH	
	6-23-80	ADDED TURNOUT T-83 AS SHOWN	CRC	
	1-24-80	ADDED TURNOUT T-82 AS SHOWN	CRC	
7	2-1-79	ADDED TURNOUT T-81 AS SHOWN	KS	
	1-14-77	ADDED TURNOUT T-80 AS SHOWN		
		Added Turnouts And Laterals	YS7	
	2-5-68	Per Spec. 707		
	10-6-67	As built		
	3-9-67	Extend S64 and add S64-G		

PIPE SIZE	PIPE TYPE	MANUFACTURER
6", 8", 10", 12", 15", 18", 21", 24", 27", 30"	ASBESTOS CEMENT PIPE	JOHNS-MANVILLE
33", 36", 39"	PRETENSIONED CONCRETE CYLINDER PIPE	UNITED CONCRETE PIPE CORP.
30"*, 36"*, 45"	REINFORCED CONCRETE PIPE	CEN-VI-RO

* Added under Spec. AE. 710



VICINITY MAP

PIPE SIZE	PIPE TYPE	MANUFACTURER
6", 8", 10", 12", 15", 18", 21", 24"	ASBESTOS CEMENT PIPE (A.C.P.)	JOHNS-MANVILLE
30", 33", 36", 39", 42", 45", 48"	PRETENSIONED CONCRETE CYLINDER PIPE (P.C.C.P.)	AMERICAN PIPE AND CONSTRUCTION CO.

REV.	DATE	DESCRIPTION	SUB.	APP'D.
10	8-20-83	ADDED T.O. W-A		
9	5-25-82	ADDED TO W-79	PLH	
8	1-29-80	REMOVED T.O.'S W-26 & W-69	CRC	
7	2-26-73	Removed T.O.'s W-41 & W43	Y.F.	
6	11-28-72	AS BUILT SPEC. A-E 710	wrc	
5	12-4-68	Delete Rev. 4		
4	9-12-68	Add standpipe - Lat. S73		
3	1-22-68	As built		
2	3-9-67	Add S73-H-A & T.O. 64, 65, 66, 67, 68		
1	11-10-66	Added names to County Roads		

DRAWN GUERRERO SUBMITTED
CHECKED HO-DAVISON APPROVED R. M. Edmonston R.C.E. No. 8008

AS BUILT DWG.
BY
CHECKED
R.E.
AUG 22 1968

ARVIN-EDISON WATER STORAGE DISTRICT

WHITE WOLF UNIT

LOCATION MAP

BOOKMAN-EDMONSTON ENGINEERING, INC.
GLENDALE, CALIFORNIA

DATE: SEPT. 15, 1966 DRAWING NO. WL-1001

ARVIN-EDISON WATER STORAGE DISTRICT
METTLER UNIT
LOCATION MAP
BOOKMAN-EDMONSTON ENGINEERING, INC.
GLENDALE, CALIFORNIA
DATE: NOV. 23, 1966
DRAWING NO. ML-1001
DRAWN GUERRERO
CHECKED PAYNE
SUBMITTED
APPROVED
REV. DATE DESCRIPTION SUB APP'D
9-25-74 ADDED M-51 AS BUILT - MOVED M-28 TO NEW LOCATION AS BUILT
2-5-68 Per Spec. 707
12-16-85 ADDED TURNOUT M-57 AS SHOWN
9-31-75 ADDED TURNOUT M-56 AS SHOWN
LEGEND
DISTRICT BOUNDARY
UNIT BOUNDARY
LATERAL PIPELINE
PUMPING PLANT
FARM DELIVERY
STANDPIPE
VICINITY MAP
PACIFIC OCEAN
SCALE OF MILES
SCALE OF FEET
ARVIN-EDISON CANAL-SOUTH
END CANAL
BEGIN LATERAL S93
GRAVITY TURNOUT STRUCTURE
GOLDEN STATE FREEWAY
METTLER
MARICOPA HIGHWAY
VALPREDO ROAD
COPUS ROAD
DAVID ROAD
ADOBE ROAD
SANDRINI ROAD
SABODAN STREET
TECUYA CREEK
NEW RIM DITCH LEVEE
T.32 S., M.D.B.& M.
T.12 N., S.B.B.& M.
T.12 N.
T.11 N.
R.27 E.
R.28 E.
R.20 W.
R.19 W.

General Soil Map

Soil Survey of Kern County, Northeastern Part and Southeastern Part of Tulare County, California

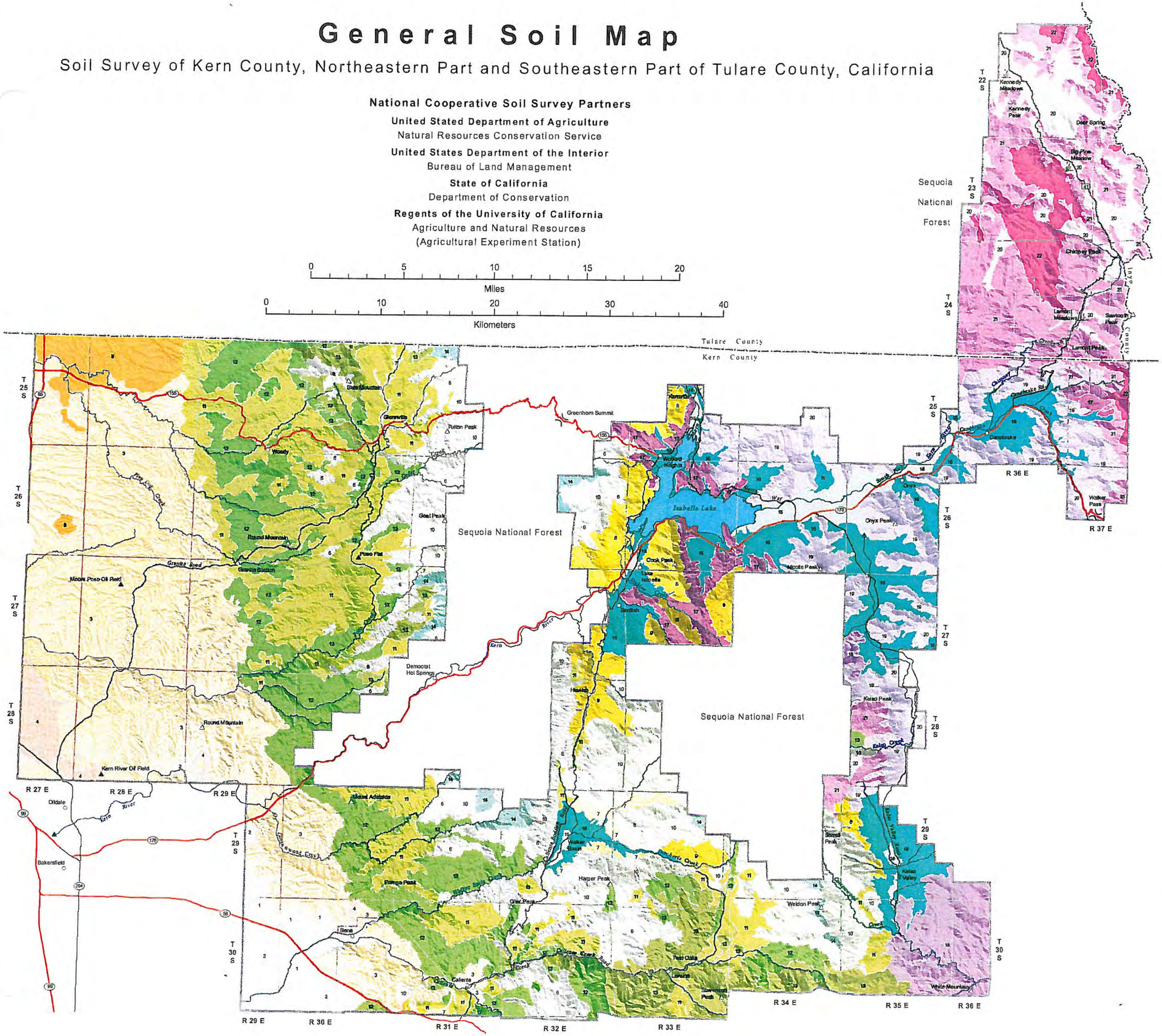
National Cooperative Soil Survey Partners

United Stated Department of Agriculture
Natural Resources Conservation Service

United States Department of the Interior
Bureau of Land Management

State of California
Department of Conservation

Regents of the University of California
Agriculture and Natural Resources
(Agricultural Experiment Station)



Soil Legend *

SOILS ON FLOOD PLAINS, ALLUVIAL FANS, STREAM TERRACES AND FAN REMNANTS OF THE SOUTHEASTERN SAN JOAQUIN VALLEY

1 Calicreek-Whitewolf
2 Delano-Pleito-Hesperia

SOILS ON ALLUVIAL FANS, STREAM TERRACES AND FAN REMNANTS OF THE SOUTHEASTERN SAN JOAQUIN VALLEY

3 Chanac-Pleito
4 Premier-Haplodurids-Delano
5 Delvar-Pleito-Centerville

SOILS ON HILLSLOPES, MOUNTAIN SLOPES, FLOOD PLAINS, STREAM TERRACES, ALLUVIAL FANS AND FAN REMNANTS ON THE WESTERN AND CENTRAL SLOPES OF THE SOUTHERN SIERRA NEVADA AND GREENHORN RANGES

6 Tweedy-Tunis
7 Havala-Steuber
8 Kernville-Faycreek-Rock outcrop
9 Hyte-Erskine-Sorrell
10 Tollhouse-Sorrell-Rock outcrop
11 Arujo-Walong
12 Walong-Vista
13 Strahle-Tweedy-Sesame
14 Edmundston-Tollhouse-Sorrell

SOILS ON MOUNTAIN VALLEYS, FLOOD PLAINS, DEPRESSIONS, STREAM TERRACES, INSET FANS, FAN APRONS, ALLUVIAL FANS, FAN PIEDMONTS AND FAN REMNANTS OF THE EASTERN SLOPES OF THE SOUTHERN SIERRA NEVADA RANGE PRIMARILY NEAR ISABELLA LAKE IN SOUTH FORK VALLEY

15 Kernfork-Kelval
16 Inyo-Chollawell

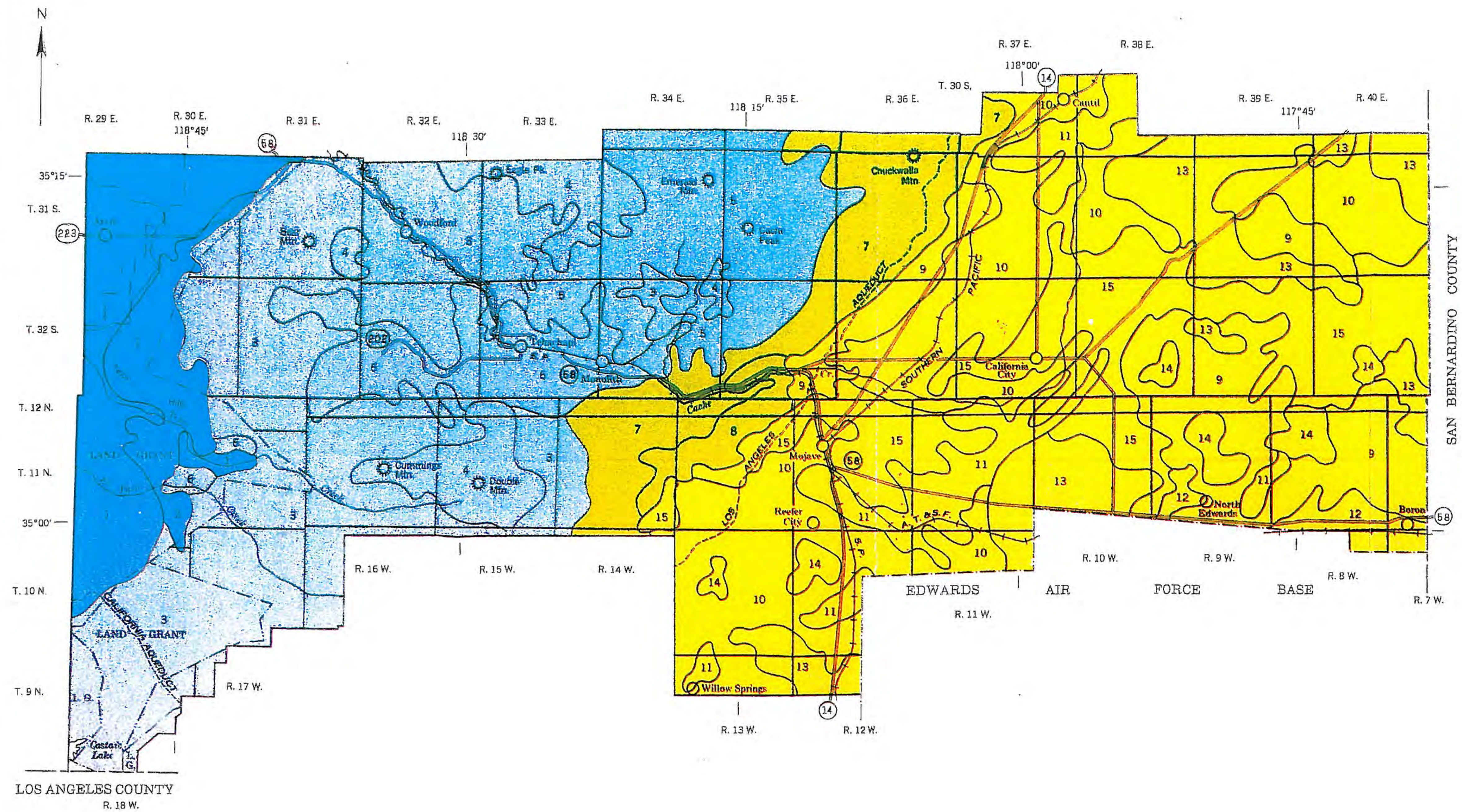
SOILS ON HILLSLOPES AND MOUNTAIN SLOPES OF THE EASTERN SLOPES OF THE SOUTHERN SIERRA NEVADA RANGE

17 Stineway-Kiscove
18 Hoffman-Tips
19 Xyno-Canebrake
20 Sacatar-Wortley
21 Canebrake-Scodie-Deadfoot
22 Tunawee-Kenypeak

* The units on this legend are described in the text under the heading "General Soil Map Units."

N W E S

Scale: 1:170,000



MAP UNITS

SOILS ON ALLUVIAL FANS, FLOOD PLAINS, AND TERRACES ON THE EASTERN EDGE OF THE SAN JOAQUIN VALLEY

1 — Hesperia-Arvin-Whitewolf: Very deep, nearly level to moderately sloping, well drained and somewhat excessively drained soils; on alluvial fans, flood plains, and stream terraces

2 — Chanac-Pleito-Badlands: Very deep, gently sloping to steep, well drained soils on old dissected terraces; and Badlands

SOILS ON UPLANDS AND IN VALLEYS OF THE SIERRA NEVADA AND TEHACHAPI MOUNTAINS

3 — Walong-Anaverde-Edmundston: Very deep to moderately deep, hilly to very steep, well drained soils underlain by weathered granite or schist; on mountainous uplands

4 — Edmundston-Tollhouse-Godde: Deep and shallow, steep to very steep, well drained and somewhat excessively drained soils underlain by weathered granite; on mountainous uplands

5 — Tweedy-Rock outcrop-Edmundston: Rock outcrop and deep and moderately deep, steep and very steep, well drained soils underlain by weathered granite or schist; on mountainous uplands

6 — Steuber-Tehachapi-Havala: Very deep, nearly level to hilly, well drained soils; on alluvial fans, stream flood plains, and terraces of the mountain valleys

SOILS ON THE EASTERN FOOT SLOPES OF THE SIERRA NEVADA AND TEHACHAPI MOUNTAINS

7 — Rock outcrop-Jawbone-Xeric Torriorthents: Rock outcrop and shallow, hilly to very steep, well drained and somewhat excessively drained soils; on mountainous uplands

8 — Pajuela-Whitewolf: Very deep, nearly level to steep, somewhat excessively drained soils; on old stream terraces, alluvial fans, and flood plains

SOILS OF THE MOJAVE DESERT

9 — Cajon-Arizo-Alko: Very deep and shallow, nearly level to strongly sloping, well drained and excessively drained soils; on alluvial fans, alluvial plains, and old terraces

10 — Cajon: Very deep, nearly level to strongly sloping, somewhat excessively drained soils; on alluvial fans and plains

11 — Rosamond-DeStazo: Very deep, nearly level to moderately sloping, well drained soils; on flood plains and in basins

12 — Norob-Neuralia: Very deep and deep, nearly level and gently sloping, well drained soils; on alluvial fans and plains

13 — Randsburg-Muroc: Shallow, gently sloping to strongly sloping, well drained soils; on low pediments

14 — Torriorthents-Rock outcrop: Shallow and very shallow, very steep, well drained soils and Rock outcrop; on mountainous ridges

15 — Garlock-Neuralia: Very deep and deep, nearly level to moderately sloping, well drained soils; on old stream terraces, alluvial fans, and alluvial plains

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
UNIVERSITY OF CALIFORNIA AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

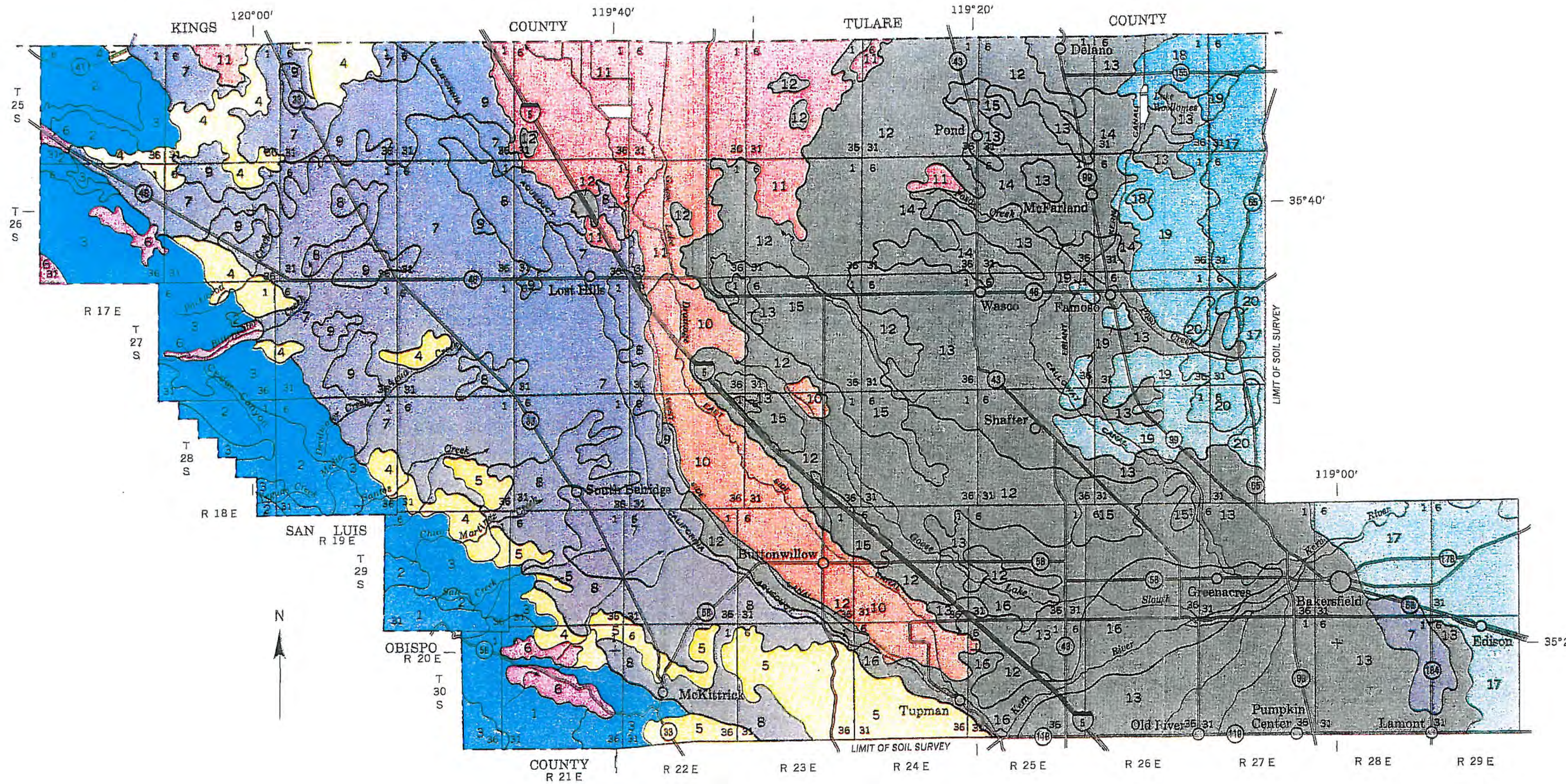
KERN COUNTY, CALIFORNIA, SOUTHEASTERN PART

Scale 1: 380,160

1 0 1 2 3 4 5 Miles

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

Compiled 1979



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
UNIVERSITY OF CALIFORNIA
CALIFORNIA AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

KERN COUNTY, CALIFORNIA NORTHWESTERN PART

Scale 1:380,160

1 0 1 2 3 4 5 6 Miles

1 0 6 12 Km

LEGEND

SOILS ON HILLS AND MOUNTAINS OF THE TEMBLOR AND DIABLO RANGES

1 Aramburu-Reward: Moderately deep and deep, hilly to very steep, well drained shaly loam and very shaly clay loam

Aido-Ayar-Hillbrick: Shallow to deep, rolling to very steep, well drained clay, silty clay, and sandy loam

Hillbrick-Kilmer-Mendi: Shallow to deep, gently rolling to very steep, well drained sandy loam and loam

SOILS ON THE FOOTHILLS OF THE TEMBLOR AND DIABLO RANGES

4 Kettleman-Bitterwater-Delgado: Shallow to deep, rolling to very steep, somewhat excessively drained and well drained soils underlain by weathered sandstone or shale

5 Elkhills: Deep, rolling to steep, well drained soils that formed in mixed, stratified alluvium

SOILS IN THE MOUNTAIN VALLEYS OF THE TEMBLOR RANGE

Pottinger-Polonio: Deep, undulating to rolling, well drained soils; on alluvial fans and terraces

SOILS MAINLY ON ALLUVIAL FANS, ALLUVIAL PLAINS, AND TERRACES IN THE WESTERN PART OF THE SAN JOAQUIN VALLEY

7 Panoche-Milham-Kimberlina: Deep, nearly level to moderately sloping, well drained clay loam, sandy loam, and fine sandy loam; on alluvial fans, alluvial plains, and terraces

Kimberlina: Deep, nearly level to moderately sloping, well drained fine sandy loam; on recent alluvial fans and alluvial plains

9 Twisselman-Yribarren-Panoche: Deep, nearly level to gently rolling, well drained clay, loam, and clay loam; on alluvial fans

SOILS MAINLY IN BASINS OF THE SAN JOAQUIN VALLEY

10 Lokern-Buttonwillow: Deep, nearly level, somewhat poorly drained clay

Nahrub-Lethent-Twisselman: Deep, nearly level, well drained to somewhat poorly drained clay and silt loam

SOILS MAINLY ON ALLUVIAL FANS, ALLUVIAL PLAINS, BASIN RIMS, AND FLOOD PLAINS IN THE EASTERN PART OF THE SAN JOAQUIN VALLEY

12 Garces-Panoche: Deep, nearly level, saline-alkali, well drained silt loam and clay loam; on basin rims, alluvial fans, and alluvial plains

Kimberlina-Wasco: Deep, nearly level, well drained fine sandy loam and sandy loam; on alluvial fans and alluvial plains

14 McFarland: Deep, nearly level, well drained loam; on alluvial fans and flood plains

Milham: Deep, nearly level, well drained sandy loam; on old alluvial fans and alluvial plains

Cajon-Westhaven: Deep, nearly level and gently sloping, well drained and somewhat excessively drained loamy sand and fine sandy loam; on flood plains and alluvial fans

SOILS ON TERRACES IN THE EASTERN PART OF THE SAN JOAQUIN VALLEY

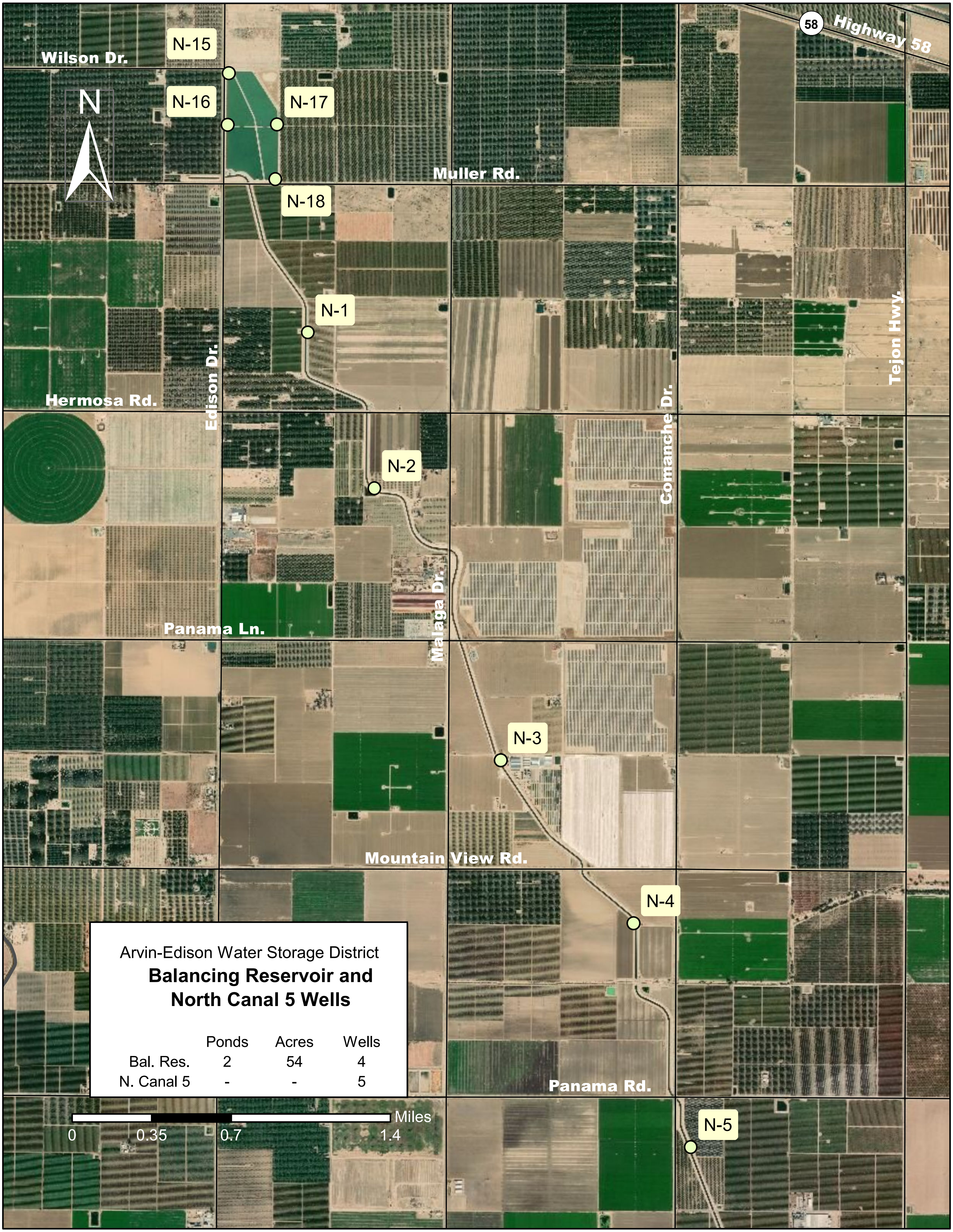
Delano-Chanac: Deep, nearly level to hilly, well drained sandy loam and clay loam

Exeter: Moderately deep, nearly level to gently rolling, well drained sandy loam that has a cemented layer

Delano-Lewkalb-Driver: Deep, nearly level to moderately sloping, well drained sandy loam and coarse sandy loam

Premier: Deep, undulating to hilly, well drained coarse sandy loam

COMPILED 1985



Arvin-Edison Water Storage District
Balancing Reservoir and
North Canal 5 Wells
Ponds Acres Wells
Bal. Res. 2 54 4
N. Canal 5 - - 5
Miles
0 0.35 0.7 1.4
N
Wilson Dr.
Muller Rd.
Hermosa Rd.
Panama Ln.
Mountain View Rd.
Panama Rd.
Edison Dr.
Malaga Dr.
Comanche Dr.
Tejon Hwy.
58
Highway 58
N-15
N-16
N-17
N-18
N-1
N-2
N-3
N-4
N-5


DiGiorgio Rd.
Tejon Hwy.
Comanche Dr.
Buena Vista Blvd.
N
N-14
N-6
N-8
N-7
N-19
N-9
N-10
N-20
N-11
N-12
N-13
R1P1
R1P2
R1P3
R1P4
R1P5
R1P6
R2P1
R2P2
R2P3
R2P4
R2P5
R2P6
Arvin-Edison Water Storage District
North Canal Spreading Basin and Well Field
Ponds Acres Wells
Gravity 6 186 7
Pressure 6 114 4
Total 12 300 11
Miles
0 0.125 0.25 0.5


Arvin-Edison Water Storage District
Sycamore Spreading Basin and Well Field
Ponds Acres Wells
Gravity 75 551 34
0 0.125 0.25 0.5 Miles
N
Bear Mountain Blvd.
223
ROW 1
ROW 2
ROW 3
ROW 4
ROW 5
ROW 6
W1
W2
W4
W5
W6
W7
W8
W9
W10
W11
W12
W13
W14
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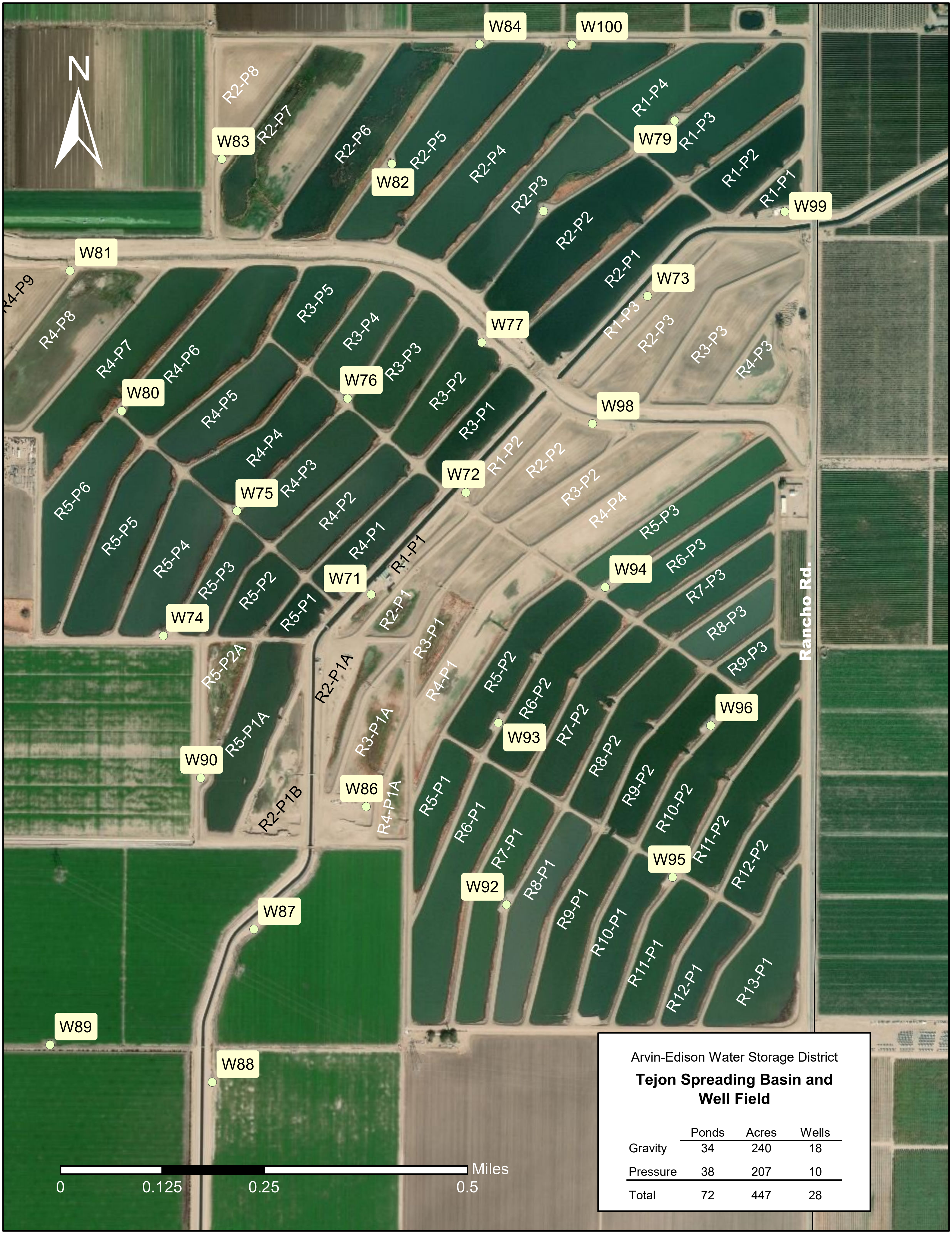


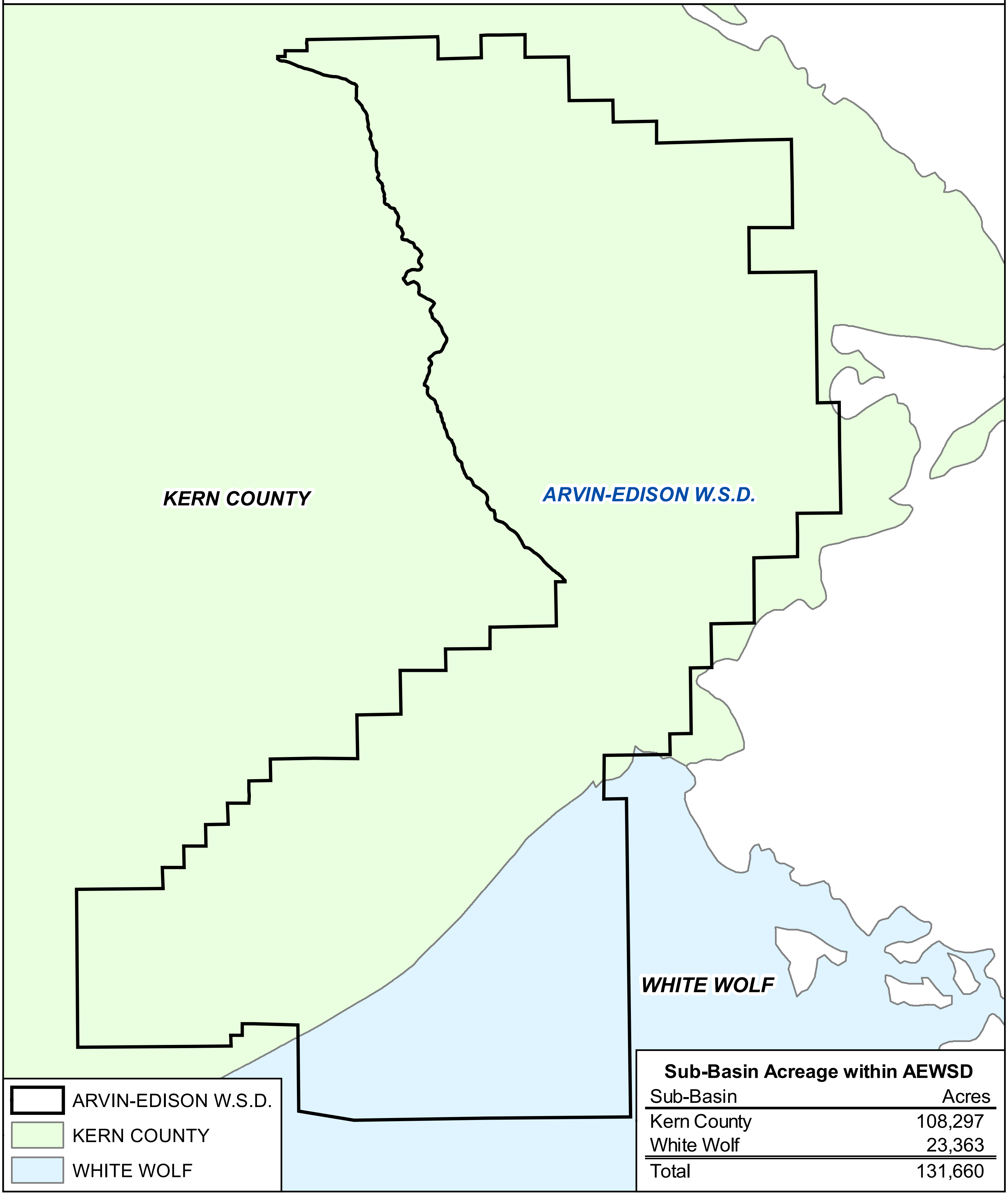
Arvin-Edison Water Storage District

Tejon Spreading Basin and Well Field

	Ponds	Acres	Wells
Gravity	34	240	18
Pressure	38	207	10
Total	72	447	28

ARVIN-EDISON WATER STORAGE DISTRICT

SUB-BASINS UNDERLYING ARVIN-EDISON WATER STORAGE DISTRICT



Sub-Basin Acreage within AEWSD

Sub-Basin	Acres
Kern County	108,297
White Wolf	23,363
Total	131,660

ATTACHMENT B1

Rules & Regulations for Distribution of Water

RULES AND REGULATIONS

FOR DISTRIBUTION OF WATER

ARVIN-EDISON WATER STORAGE DISTRICT

AS ORIGINALLY ADOPTED BY RESOLUTION NO. 68-16, January 2, 1968

AS AMENDED AND RESTATED BY RESOLUTION NO. 11-17, June 14, 2011

20401 Bear Mountain Boulevard

Mailing Address: P.O. Box 175
Arvin, California 93203-0175
arvined@aewsd.org

Telephone Numbers:

District Office ....(661) 854-5573
District Fax ....(661) 854-5213
Watermaster/Dispatcher .... (661) 854-4433
Forrest Frick Pumping Plant ....(661) 366-7721
Tejon Pumping Plant ....(661) 854-2378
North Canal Spreading Works ....(661) 854-5579
Intertie Pump Plant ....(661) 858-2348
CIMIS..(661) 634-3404

ARVIN-EDISON WATER STORAGE DISTRICT

OFFICERS AND DIRECTORS

Director, Division 1.. Ronald R. Lehr
Director, Division 2.. Vice President, Jeffrey G. Giumarra
Director, Division 3..Derek J. Yurosek
Director, Division 4...Dennis B. Johnston
Director, Division 5.. Secretary-Treasurer, John C. Moore
Director, Division 6...President, Edwin A. Camp
Director, Division 7.. Charles Fanucchi
Director, Division 8...Catalino M. Martinez
Director, Division 9.. Kevin E. Pascoe

STAFF

Engineer-Manager.. Jeevan S. Muhar
Deputy General Manager...David A. Nixon
Director of Water Resources..Steven C. Collup
General Superintendent..Christopher P. Krauter
Watermaster...Christopher A. Hogue
Watermaster..Sonny A. Aleman

TABLE OF CONTENTS

DIVISION I: GENERAL

DIVISION II: GENERAL PROJECT ADMINISTRATION

DIVISION III: DISTRIBUTION OF WATER

Section **Page**

DIVISION IV: ORDERING, DELIVERY, AND USE OF WATER

Section

DIVISION V: POLICIES AND PROCEDURES FOR ESTABLISHING, FIXING AND COLLECTION OF CHARGES AUTHORIZED BY SECTIONS 43006 AND 47180 OF THE WATER CODE FOR GENERAL ADMINISTRATION AND GENERAL PROJECT SERVICES RENDERED BY THE ARVIN-EDISON WATER STORAGE DISTRICT

Section **Page**

ARVIN-EDISON WATER STORAGE DISTRICT

RULES AND REGULATIONS
FOR DISTRIBUTION OF WATER

EFFECTIVE JUNE 14, 2011

DIVISION I: GENERAL

1. Purpose: These Rules and Regulations are established by the Board of Directors of the Arvin-Edison Water Storage District pursuant to the requirements of Division 14 of the California Water Code, specifically section 43003 of said Water Code, and, in furtherance of District's Adopted Project, in order to provide for the most economical and efficient distribution and use of water within the District and establish procedures for fixing tolls and charges authorized by sections 43006 and 47180 et seq., of the California Water Code. These Rules and Regulations are the Rules and Regulations mentioned in the Water Service Contracts between the District and various landowners within District's Surface Water Service Area.

2. Definitions: Terms and expressions employed in these Rules and Regulations are as defined in the Water Service Contracts executed by the District and its landowners with the exception of certain terms or expressions used herein which do not appear in said Contracts, but which terms or expressions are defined or explained at the point where they are introduced into these Rules and Regulations.

3. Interpretation - Federal Contracts: These Rules and Regulations are in implementation of the contract effective November 1, 2010 between Arvin-Edison Water Storage District and the United States of America regarding water delivery, and any other contracts which may be entered into between Arvin-Edison Water Storage District and Water Users for water service; and any amendment to the foregoing.

4. Enforcement of Rules and Regulations: The Engineer-Manager of the District is authorized to perform all acts necessary and proper to enforce these Rules and Regulations. **Failure of a Water User to comply with any of the Rules and Regulations shall be sufficient cause for the termination of water service, and water service will not again be furnished to such Water User until full compliance has been made with all requirements as herein set forth;** PROVIDED, HOWEVER, that Water User shall in no way be relieved of any responsibility for payment of any charges or obligations by reason of such termination of water service. When it is practicable to do so, advance notice of any such termination of water service will be furnished to Water User. In no event shall any liability accrue against District or any of its officers, agents, or employees for damage, direct or indirect, arising from such terminations of water service. Non-enforcement of any provision of these Rules and Regulations does not constitute a waiver of the District's right of enforcement at any time.

5. Effective Date and Changes: These Rules and Regulations, as amended, shall become effective June 14, 2011 and may be added to, amended, or repealed at any time by resolution of the Board of Directors of the District and such additions, amendments, or repeals shall become effective upon adoption or as otherwise specified by the Board of Directors.

6. Severability of Provisions - Captions: If any provisions of these Rules and Regulations, or the application thereof to any person or circumstances are held invalid, the remainder of these Rules and Regulations and the application of their provisions to other persons or circumstances shall not be affected thereby.

Captions accompanying these Rules and Regulations are for convenience or reference and do not form a part thereof.

DIVISION II: GENERAL PROJECT ADMINISTRATION

1. Engineer-Manager and District Employees:

a. Engineer-Manager: The Engineer-Manager is the person appointed by the Board of Directors to manage, pursuant to the Board's direction, the affairs of the District. The District's distribution system is under the exclusive management and control of the Engineer-Manager. Except as provided in Division IV, Section 6 hereof (relating to emergency turn-offs), no person other than the Engineer-Manager or District employees designated by him shall turn on, turn off, or otherwise adjust, manipulate, or use any of the District's facilities; provided, however, the Engineer-Manager may provide written authority for water users to turn on, turn off or otherwise adjust facilities under specified conditions, which authority may be withdrawn at any time.

b. District Employees: The Engineer-Manager shall supervise the activities of all District employees in connection with the operation and maintenance of the Distribution System and all other activities of the District. The Engineer-Manager shall designate the authority of each of the employees of the District. Any controversy between a Water User and a District employee that cannot be settled directly shall be appealed to the Engineer-Manager.

c. Appeal of Decision of Engineer-Manager: In event the Water User disagrees with a decision made by the Engineer-Manager in administering these Rules and Regulations, said Water User shall have the right to appeal to the Board of Directors within ten (10) days after notice of such decision. Appeals shall be submitted in writing to the Board and shall specifically set forth the decision being appealed and shall give reasons for said appeal. Appeals shall be considered at the next regularly scheduled meeting of the Board.

d. Right of Access: Persons employed by the District and/or authorized by the Engineer-Manager shall have access at all times to all lands and District water distribution facilities within the District for the purpose of conducting District business. Except in cases of emergency or where otherwise considered impractical by the Engineer-Manager, the person in possession of the land shall first be contacted before entering landowner's property. Nothing herein contained shall affect any District easement or right-of-way.

2. Equipment and Records:

a. Equipment: No property of the District, including tools, machinery, equipment, vehicles, and the like shall be used for purposes other than District business. No property of the District, including tools, machinery, equipment, vehicles, and the like shall be borrowed or loaned for any purpose without the expressed authorization of the Engineer-Manager.

b. Records: All records of the District that are retained consistent with its policies shall be maintained at the District office or an offsite storage location. Such records are for the exclusive use of the District and shall be made available for use for other purposes only as provided in the provisions of Chapter 3.5, Division 7, Title 1 (commencing with Section 6250, of the California Government Code), subject to policies of the District adopted from time to time.

3. Ownership, Notices, Representatives, and Appointment of Agents: For administration of these Rules and Regulations and District's Water Service Contracts, it is necessary that certain matters (including, but not limited to, matters regarding applications for water service; ordering, delivery, and use of water; and giving notice to Water Users) shall be authorized in writing by the Water User. For convenience of Water Users and District and without releasing a Water User's land from any obligations under their Water Service Contract or these Rules and Regulations, District will provide water service pursuant to the following determinations and authorizations:

a. Land Ownership - Address of Landowners: In all respects where materially relevant to the administration of these Rules and Regulations, except as provided in Division II, Section 4a(1) hereof (relating to transfer of title and District records), owner of land means the person(s) or entity shown on the Kern County Assessment Roll, last equalized, at the time in question and as determined in accordance with the Water Code, sections 39051 through 39054, inclusive. Addresses of landowners will be determined in a like manner.

Except as provided in Division II, Section 4a(1), if title to land has been transferred and the change of interest does not appear on said Assessment Roll, it is the duty of the Transferee to present proper proof of title to the District.

b. Representatives: Anyone acting in any representative capacity for a Water User shall furnish evidence to the satisfaction of the District of his/her authority to so act and bind the lands of Water User. Such representatives include guardians; conservators; administrators; executors; trustees; partnerships, including limited partnerships; attorneys-in-fact; and the like.

c. Appointment of General Agent: Where Water User consists of more than one owner (undivided ownership), except a husband and wife living at the same address, or when Water User is an entity (e.g., partnership, limited liability company, corporation, public agency, etc.) Water User shall, by written instrument, file with the District and appoint a general agent for the purpose of performing any and all acts to be done by Water User (except permanent assignment of rights) and for receiving all notices, billings, and refunds from District for charges incurred by reason thereof. In case of husband and wife living at the same address, in absence of written notification to the contrary it is to be presumed that either has such authority to act for the other. Appointment of such agent shall be made on forms furnished by District and executed and filed in a manner satisfactory to District. Forms will stay in force until revoked or superseded. Failure to appoint such an agent may result in discontinuance of water service delivery until an agent has been appointed.

d. Eligibility Under Reclamation Law: As a result of the Distirct entering into a "Contract Between the United States and Arvin-Edison Water Storage District Providing for Project Water Service From Friant Division and for Facilities Repayment," dated November 1, 2010, and repaying in full the Repayment Obligation thereunder, the Distirct is no longer subject to the acreage limitation, reporting, and full cost pricing provisons of the Reclamation Reform Act of 1982, and accordingly Article 8 of the Water Service Contract is moot and no longer applicable.

4. Transfers of Land - Assumptions and Encumbrances:

a. Transfer of Title to Land:

(1) District Records: Notwithstanding any transfer or change of ownership, District shall be entitled to administer these Rules and Regulations and Water Service Contracts in reliance upon and in accordance with matters on file at the District office only (regardless of the knowledge of any agent, servant, or employee to the District acquired in any other manner) including such matters as determining landownership, addresses, authorizations, appointments, designations, refunds, and the like. Such matters are continuing representations upon which the District is entitled to rely unless and until the District has received actual written notice of a change or revocation.

(2) Transfers Affecting Water Service Contract - Assumption Agreements: Without limiting the provisions of Article 7 of the Water Service Contracts, when title to land affected by a Water Service Contract is transferred or such lands are the subject of a contract of sale, District will be under no obligation to deliver water to such lands until the new landower has provided satisfactory evidence of transfer of title or the contract of sale and thereafter promptly executes an Assumption Agreement; provided, however, service will continue to be made to any Operating Agent that has been previously appointed as provided in Division III, Section 2b hereof, until said appointment is otherwise revoked. Such Assumption Agreements shall be on forms provided by the District, executed and completed in a manner satisfactory to the District. In the event of such transfer of ownership as to a portion of the lands described in an Exhibit "A" to a Water Service Contract, and in the absence of written instructions from the affected landowners, agreements will be prepared so as to allocate the rights and obligations under said Water Service Contract on an acreage basis. (See Division IV, Section 13 hereof for Combined Turnouts). The District may decline to approve such Assumption Agreement and discontinue water service if such conveyance of a portion of the lands described in Exhibit "A" results in a parcel in separate ownership of less than five (5) acres.

b. Warranty of Title: The execution by the District of any Assumption Agreement shall be without any warranty of title on the part of the District and shall not be interpreted as any representation, expressed or implied, by or on behalf of District, that such assignment, transfer, or disposal is free and clear of outstanding encumbrances.

c. Request for Notice: Without attempting to establish or in any manner affect the rights of any person arising from a deed of trust, any person or entity having any interest in a deed of trust on property subject to a Water Service Contract may file with the District a written request for notice of failure to make the payments required by such Water Service Contract or a request for notice of any specified act that the District may be requested to undertake or to consent to under the Water Service Contract or these Rules and Regulations that such person alleges will detrimentally affect his/her interest, including, but not limited to, a request for exclusion from the Surface Water Service Area, a request for assignment of rights under Water Service Contract, or a request for permission to utilize water on lands other than those described in Exhibit "A" to a Water Service Contract.

Upon receipt of such notice, District shall give such person or entity written notice of default or of any request that it take such action as is set forth in the request for notice at least fifteen (15) days prior to foreclosure proceedings or prior to such other specified act by the District, unless such person or entity has given written consent to the requested action. In addition to setting forth the matter as to which notice by the District is requested, the request for notice shall set forth a legal description of the land affected, the name of the current owner of the fee, the name and address where the requested notice is to be sent, and a copy of the deed of trust showing the recording information.

Any notice from the District shall be effective when deposited in the mail, postage prepaid, directed to the address shown in the notice. Provided, however, District may disregard any request for notice which has not been re-filed within fifteen (15) days of a written demand; therefore, by the District mailed in the same manner and with the same effect as hereinabove provided for the notice by the District. Provided further; however, nothing herein provided shall render District liable to any person or entity under any circumstances.

5. Segregation of Lien for Delinquent Toll or Charge - Partial Redemption:

a. For purposes of payment of delinquent tolls and charges, including Water Service Contract charges, the owner(s) (excluding owners of undivided interests) of any separately described portion of a tract of land subject to a lien established pursuant to Section 47183 of the Water Code, other than the owner(s) named in the delinquent list recorded pursuant to Section 47183 of the Water Code, may, with the consent of all the owners of said tract of land, request the Board to direct the District Treasurer, or the County Treasurer, as the case may be, to segregate said lien ratably in accordance with the acreage of the respective tracts; to accept payment of said segregated amounts in satisfaction of said respective segregated liens; and, upon receipt of payment, to issue a recordable satisfaction of such lien or to delete said parcel from the notice of sale provided for in Section 46730 et seq., of the Water Code, or to cancel the sale as to said parcel, as the case may be.

If the Board finds that the respective tracts are adequate security for the segregated amounts and that such segregation is not detrimental to the best interest of the District, it shall enter such order which shall become effective upon payment of the sum due.

b. For like purposes, any Transferee (excluding undivided owners) of any separately described portion of a tract of land for which the District holds a certificate of sale issued pursuant to Section 46759.5 et seq., of the Water Code, other than the owner named in the delinquent list recorded pursuant to Section 47183 of the Water Code by reason of which said certificate or deed was issued, may, with the consent of all of the owners of said tract of land, request the Board to direct the District Treasurer or County Treasurer, as the case may be, to segregate the amount for which the property was sold to District ratably in accordance with the acreage of the respective tracts, to compute the amount required for redemption pursuant to Section 46786 of the Water Code on the basis of said segregated sale price, to accept such sum found to be due, and to issue a certificate of partial redemption describing the portion redeemed. If the Board finds that the respective tracts are adequate security for the segregated amounts and that such segregation is not detrimental to the best interests of the District, it shall enter such order which shall become effective upon payment of the sum due.

6. Liability of District: As provided in Article 2 Section (g) of the Water Service Contracts and in connection with all water service provided pursuant to these Rules and Regulations, District will not be responsible for the control, carriage, handling, use, disposal, or distribution of water delivered to Water Users or Contractors hereunder outside the facilities then being operated and maintained by District.

As provided in Article 2 Section (j) of the Water Service Contract, and in connection with all water service provided pursuant to these Rules and Regulations, in no event shall any liability accrue against District or any of its officers, agents, or employees for any damage, direct or indirect, arising from temporary discontinuance or reduction of water deliveries.

As further provided in Article 2 Section (k) of the Water Service Contract, and in connection with all water service provided pursuant to these Rules and Regulations, in no event shall any liability accrue against the District or any of its officers, agents, or employees, for any damage, direct or indirect, arising from a shortage on account of problems in deliveries, drought, or any other cause whatsoever.

7. Actions Against District: Nothing contained in these Rules and Regulations constitute any waiver by District or estop it from asserting any defenses or immunities from liability as provided in Division 3.6 of Title 1 of the Government Code. In connection with any such matters, one may wish to seek the advice of an attorney of their choice.

8. Liability of Water User: As provided in Article 2 Section (g) of the Water Service Contract and by acceptance of surface water service provided pursuant to these Rules and Regulations, Water User and/or Contractor does thereby agree to indemnify and to assume the defense of and hold harmless the District and its officers, agents, and employees from any loss, damage, liability, claims, or causes of action of every nature whatsoever, for damage to or destruction of property, including the District's property, or for injury to or death of persons, in any manner arising out of or incidental to the control, carriage, handling, use, disposal, or distribution of water outside District's Distribution System. No persons will be allowed to drain irrigation water or tail water upon or permit water to drain upon District-owned property except as authorized in writing by the District Engineer-Manager and any person doing so will be subject to fine and damages; will be in violation of these Rules and Regulations; and water service may be terminated until such violation ceases.

It is the duty of the Water User to furnish sufficient protection for the individual farm turnout or any other District facility to prevent damage. In the event that damage occurs, the expense of District personnel and/or contractors for the repair of such damage will be borne by Water User and no water will be furnished through the affected turnout until such repairs are made and the charges therefore are paid to the District.

Consistent with the provisions of Article 2 of the Water Service Contract, water delivery may be discontinued by the District for any Water User who permits water delivered by District to escape beyond the boundary of the lands described in said contract whether willfully, carelessly, or on account of defective or inadequate ditches, pipelines, or other facilities, or inadequate tail water facilities, or inadequately prepared land or improper management, and said water delivery will not be resumed until such conditions are corrected.

9. Groundwater Storage and Preservation of Pumping Rights: In order that no Water User be prejudiced by utilizing Project Water in lieu of exercising whatever rights he or she may have to pump groundwater, and in recognition of the anticipated benefit to the District's underground water supply arising from the implementation of the District's project, the Board of Directors has adopted the following policies:

a. All Water Service Contracts with the District for water service include a paragraph (Article 2 Section (e)) which is quoted following:

> "In the interest of preserving to Landowner[1] his rights to pump groundwater for use on his lands which will be served with water under this Contract, it is agreed that, during all years that District delivers water to Landowner, to the extent that Landowner shall reduce his pumping of groundwater and shall make use of water so delivered to him by District, Landowner's said use of water so delivered to him by the District shall be deemed the same as if he had pumped from the underground a quantity of water equal to the quantity of water so delivered to him by District. Landowner also agrees to recognize and be bound by the pumping rights similarly preserved to other Landowners in District pursuant to water service contracts heretofore and hereafter executed. It is further agreed that, as a result of District's spreading of water and percolation thereof to underground storage, either by direct recharge ponds or through deliveries in lieu of Landowners pumping groundwater, District shall have the exclusive right to use of the underground storage for (i) spreading and recovery of water in connection with supplying water to Landowner and to all other Landowners who shall heretofore or hereafter execute contracts with District for water service; (ii) providing stored water to third parties which have contracted with the District or (iii) for any other lawful purpose."

b. That, to the extent District may pump water from underground supplies for furnishing to Water Users, District shall be deemed to be exercising said Water Users' rights to pump water from underground water supplies; PROVIDED, HOWEVER, that nothing herein contained shall prevent or hinder any Water User from exercising their rights to pump groundwater.

c. Consistent with Article 2 Section (d) of the Water Service Contract it is declared that without obligating District to assume any responsibility therefore and without limiting or detracting from the obligations assumed by Water Users in this regard, District shall have the right to the use of all seepage and return flow resulting from Project Water which escapes, percolates, or is discharged beyond Water User's recovery facilities, if any, and nothing contained in said Water Service Contract or contained herein shall be

[1] In municipal and industrial contracts, Landowners are sometimes called "Contractors."

construed as an abandonment or relinquishment by District of the right to the recapture, use, and benefit of all such water and any use made of any resultant benefit to groundwater conditions is made with its consent, which consent is revocable at any time, and such use is not to be considered a use adverse to such right to the continued exercise of right to pump and utilize groundwater, nor shall any such use under any circumstances create an estoppel in asserting any such right at any time.

10. Encroachment on District Right-of-Way: Without limiting rights otherwise reserved, a permit for encroachment shall be required before any fences, pipelines, or other encroachments will be permitted upon District's property. An encroachment permit form approved by the Board of Directors will be furnished by District and must first be approved by the Engineer-Manager before any construction begins. The work shall be constructed to the District's specifications at the sole expense of the applicant and maintained under supervision of, and to the satisfaction of, the District. Under no circumstance shall any facilities be constructed or permanent crops be planted which prevent access to District facilities for repair of such facilities.

11. Modification of the System: If a modification to District's Distribution System is made at the request of a Water User, and for his/her benefit, including, but not limited to, construction of a turnout, the costs thereof, including reasonable charges for engineering performed by District and overhead, shall be paid in advance by such Water User. The advance payment shall be determined by the estimate of the Engineer-Manager. Within thirty (30) days after submittal of final accounting, Water User shall pay or District will refund the difference between said estimated costs and the actual costs of the modification. All modifications to the Distribution System shall be made in accordance with District specifications and subject to District's approval. The construction of such facilities shall be done by or at the direction of District and shall become the property of District.

DIVISION III: DISTRIBUTION OF WATER

1. Surface Water Service Area: Surface Water Service Area means that certain area of land within the District to which surface water service is available pursuant to an Water Service Contract with the District, said area having been selected pursuant to criteria adopted by the Board. Said area of land consists of all those parcels of real property described in Exhibit "A" to said Water Service Contracts. Lands within the Surface Water Service Area are shown on a map on file at the District office designated as "Surface Water Service Area" as amended from time to time. In the case of a conflict between the lands described in Exhibit "A" to said Water Service Contracts and said map, the description contained in said Exhibits shall govern. The originals of said contracts are on file at the District office and recorded in the Official Records of Kern County. Said contracts are uniform in nature differing as to whether the service to be provided is for agricultural or municipal, industrial and domestic purposes.

a. Addition of lands to Surface Water Service Area: Lands may be added to the Surface Water Service Area only if the following conditions are met:

(1) An application for addition to the Surface Water Service Area is filed with the Board by the owner or owners of the lands described in said application;

(2) The Board determines that water service is available for said lands and such addition is feasible and in the best interest of, or not detrimental to, District and its landowners;

(3) The owner or owners of said lands execute a Water Service Contract with the District in the form established by the Board including such special conditions as it may reasonably require, and pay such charges as the Board finds equitable and just.

b. Exclusion of Lands from Surface Water Service Area: Lands may be excluded from the Surface Water Service Area only if the following conditions are met:

(1) An application for exclusion is filed with the Board by the owner or owners of the lands described in said application. Such application shall state that the applicant understands that if exclusion is granted, he/she must waive any right(s) the lands may have had to surface water service under existing policies. .

(2) The Board determines that water service for said lands has been requested by other lands in the District, subject to such conditions of service as the Board may reasonably require, and that the exclusion is feasible and in the best interest of, or not detrimental to, the District and its landowners.

(3) All documents necessary to effect the transfer have been properly executed and that payment of such charges as the Board finds equitable and just has been made or provided for.

2. Water Service: Contract Water Service is water service available only to lands within District's Surface Water Service Area pursuant to District's form of Water Service Contract and only to lands described at Exhibit "A" of said contract; provided, however, a Water User may deliver water from a particular turnout to other lands in the Surface Water Service Area which are designated in the annual application filed pursuant to Division IV, Section 1 as part of Water Users Farming Unit Operations. A Farming Unit Operation shall consist of lands owned, leased or managed, or a combination thereof, by a common Water User, for which the Water User is otherwise authorized to act pursuant to these Rules and Regulations.

a. Water User means the owner of land described in Exhibit "A" of a fully executed Water Service Contract or their representative or agent as appointed pursuant to Division II, Section 3c (relating to General Agents) or Division III, Section 2b (relates to Operating Agents) hereof.

b. Operating Agent:

(1) Appointment: Water User may by written instrument filed with the District, appoint an Operating Agent, and authorize said Agent to apply for such water service as is or may be available for the turnout(s) designated in the appointment, order such water, and Water User may designate the Operating Agent as the person to receive the billings, notices, and refunds due in connection with service to such turnout(s). Such authorization must be made on forms provided by the District, and executed and completed in a manner satisfactory to the District. The authorization shall remain in effect, and District may rely thereon until the same is revoked as provided for below or superseded by subsequent filing of a like document.

(2) Term of Agency - Revocation: The appointment of such agent shall be binding upon and shall inure to the benefit of Water User, their respective heirs, executors, administrators, successors, and assigns, and each and every one of them, or any person or entity claiming any interest in the lands affected by said Water Service Contract by, through, or under any Water User and to the District and its successors and assigns. The power and authority of such agent shall continue until Water User or, in the case of undivided ownership, a majority of Water Users (determined on an acreage basis, or ownership interest in the case of an undivided interest), shall have filed with the District a written revocation of said agency executed in the same form as the appointment, or a superseding appointment is filed with the District. Said agency is revoked by death of the agent, or his/her incapacity to act, or by his/her renunciation by written notice of resignation filed with the District.

c. Payment for Water Service: Under conditions of Contract Water Service, Water User shall pay the "Standby" Charge and the "Water Use" Charge as provided in the Water Service Contract. These charges shall be annually fixed by the Board and shall be due by and delinquent as shown on the following schedule:

Standby Charge and Water Use Charge Payment Schedule

Payments	**Month**	**Billed**	**Due**	**Delinquent**
1	March	04/05	04/10	05/10
2	April	05/05	05/10	06/10
3	May	06/05	06/10	07/10
4	June	07/05	07/10	08/10
5	July	08/05	08/10	09/10
6	August	09/05	09/10	10/10
7	September	10/05	10/10	11/10
8	October	11/05	11/10	12/10
9	November	12/05	12/10	01/10
10	December	01/05	01/10	02/10
11	January	02/05	02/10	03/10
12	February	03/05	03/10	04/10

Note: The Standby Charge may be prorated over the first nine (9) payments; or provided the Board may annually determine that it be paid with the 12th payment and the "Standby" Charge be waived to the extent Water User has paid "Water Use" Charges totaling for the Water Year an amount at least equal to the "Standby" Charge.

A statement indicating the balance of Water User's account for both the Standby Charge and the Water Use Charges will be mailed approximately the fifth day of each month and shall be due and payable by the tenth day of the month, and delinquent one month thereafter. A penalty of ten percent (10%) and interest at the rate of one percent (1%) per month will be assessed on the delinquent date.

The **Standby Charge** may be paid in full at the beginning of the water year or paid in nine (9) installments as defined above in the Standby Charge payment schedule; provided the Board may annually determine that it be paid with the 12th payment, and the Standby Charge be waived to the extent Water User has paid Water Use Charges totaling for the Water Year an amount at least equal to the Standby Charge. The Standby Charge provided in the Water Service Contract is a per acre charge and is due the District regardless of the quantity of water used under a Water Service Contract. Water User will be notified prior to the beginning of a Water Year as to the amount of the Standby Charge as provided in the Water Service Contract.

The **Water Use Charge(s)** as provided in the Water Service Contract shall be billed based on the quantity of water used the previous month. The amount of the Water Use Charge shall consist of a **water component** plus an **energy component** for the District's energy cost for each pump lift, including Forrest Frick Pumping Plant and groundwater pumping, there being one to six pumping lifts as identified in Exhibit “A” of each Water User's contract by turnout. Water User will be notified prior to the beginning of a Water Year as to the amount of the Water Use Charge as provided in the Water Service Contract.

d. Determination of Charges: The amount of the per acre **Standby Charge** and the amount of the per acre-foot **Water Use Charge** shall be fixed each year by the Board of Directors and determined as follows:

The sum of the **Water Use Charge** and to the extent applicable the **Standby Charge** shall approximate the average total per acre-foot cost of producing groundwater within the District (including capital recovery, operations, maintenance, repair, standby power, and energy costs).

The per acre-foot **Water Use Charge** further consists of a **Water Component** and an **Energy Component**. The **Energy Component** is a variable charge and shall approximate the average energy cost to the District of each additional pump plant lift required for the delivery of water including Forrest Frick Pumping Plant and Groundwater Pumping. The Water Component shall provide for all or a portion of the cost of the water.

e. Tiered Water Pricing: Tiered water pricing charges will be determined and fixed by the Board and may be imposed in addition to the Water Use Charge in any year the Board determines that in order to meet the demands of the Water Users in the Surface Water Service Area the District will be pumping significant quantities of water from its well fields or in lieu thereof will be purchasing additional quantities of water from sources other than its contract with the United States. During such a year, notice of the applicability of tiered water pricing will be mailed to each water user, which notice may not be given until after March 1 because of uncertain water supplies.

f. Delinquencies:

(1) No water order or application for water for any person or entity who is delinquent in payment of District charges or District assessments, will be honored until such delinquent charges, or assessments, or sums are paid in full.

(2) If the installment or payment is not received in the **District office** by 5:00 p.m. on the date in which it becomes delinquent (or when the delinquent date falls on a weekend or District-observed holiday, by 5:00 p.m., the next regularly scheduled workday) as defined in Division III, Section 2c, hereof, delivery of water service shall be discontinued without notice and no further water service deliveries will be made until all delinquencies, including penalties, and interest, have been paid.

(3) Thirty (30) days after each installment or payment becomes due it shall become delinquent and a penalty of ten percent (10%) of the amount of the installment or payment will be assessed. In addition, said delinquent installment or payment shall be subject to interest at the rate of twelve percent (12%) per annum from the date of the delinquency until all installment or payments are current as defined in Division III, Section 2c.

(4) In the event a Water User is delinquent on any Standby or Water Use Charges as of April 10 of each calendar year, for the prior Water Year, action will be commenced by the District to collect all charges due in accordance with the provisions of the Water Service Contract and Sections 47181 to 47185, inclusive, of the Water Code. Provided, however, the District may initiate such action prior to such date as to any delinquency.

(5) A trustee or beneficiary under deed of trust that has recorded a notice of default of land that is delinquent in payment of water service tolls and charges may deposit the amount of such tolls and charges with the District as are necessary to keep the lands current.

g. Carry Over Prohibited: Water made available in a particular year may not be carried over for use in the following Water Year, regardless of the reason why the water was not used or available for use during that Water Year.

3. Temporary Water Service for Special Purposes: Temporary Water Service for Special Purposes is water service made available on an interruptible and non-dependable basis for uses not directed to agricultural uses, within or outside of the Surface Water Service Area. Such water may be made available at the discretion of the Engineer-Manager on a short-term basis only, and District reserves the right to discontinue such service at any time. Persons wishing such service must either make arrangements with a Water User for use of turnout facilities or with District if water is to be taken directly from District's canal or other facility; file with District a form of contract entitled "Arvin-Edison Water Storage District Contract for Temporary Water Service for Special Purposes"; and make such payments or deposit such funds as are set forth in said form of contract pursuant to policy established by the Board from time to time.

4. Temporary Water Service For Agricultural Uses: Temporary Water Service for Agricultural Uses is water service made available for agricultural use on an interruptible and non-dependable basis to lands outside the Surface Water Service Area. In the event that the Board determines that temporary water service for a given period or water year is in the best interest of the District, the Board may authorize such service and set charges. Such temporary water service shall be made available only to lands having an independent alternative source of water and no crop is to be planted which will be dependent upon the continued delivery of the temporary water. In order that land located outside the Surface Water Service Area is to be eligible for temporary water service, the landowner shall have executed an agreement establishing a covenant running with the land, in a form provided by the District, wherein the landowner expressly acknowledged that the affected lands have no right to Contract Water Service from the District. Provisions for payment of charges resulting from the sale of such temporary water service shall be the same as the "Water Use" Charge(s) as described in Division III Section 2 hereof. Such temporary water service may be made available to eligible land through an existing farm turnout or through a temporary farm turnout to be installed by the District at landowner's expense and used to serve temporary water or directly from District's Distribution Facilities canals through pumps and metering devices installed to District's specifications and at landowner's expense, which facilities shall be operated solely by District personnel; provided that District facilities are able to deliver the extra water and the delivery of such water does not interfere with water service deliveries to Water Users within the Surface Water Service Area. It is the responsibility of the party requesting such temporary water service, if a facility to deliver water to his/her lands is not in place, to make arrangements with a Water User for the use of an existing farm turnout or to pay, in advance, the cost of installing a connection from a District facility to the desired point of delivery. The District is under no obligation to continue such temporary water service and delivery of temporary water may be terminated by District at any time. An annual agreement setting forth the conditions contained herein must be entered into by and between District and Temporary Water User prior to commencement of the delivery of such temporary water service. Such agreement shall be in a form furnished by the District, and executed and filed in a manner satisfactory to District.

DIVISION IV: ORDERING, DELIVERY, AND USE OF WATER

1. Annual Application(s) for Contract Water Service: In order to obtain delivery of Contract Water Service each year, Water User must complete, sign, and file with the District no later than February 1 of each year, an "Annual Application for Contract Water Service" covering lands described in Exhibit "A" of the Water Service Contract and designating any Farming Unit Operation for the following year. **Water service will not be made available to any such land until this document necessary to meet eligibility requirements is filed**. As provided in Section 3(b) of the Water Service Contract and Division IV, Section 9 of these Rules and Regulations, the District will schedule water deliveries and deliver water to Water Users as nearly in accordance with their requests as is practicable and District's determinations with regard to scheduling of water deliveries shall be conclusive.

The application will be sent to Water Users on or about December 1st of the preceding year. Water User shall include the following information:

- **a.** Landowner's name and address.
- **b.** Turnout Number(s).
- **c.** The name of the person or persons who have the authority to place water orders throughout the year.
- **d.** The total estimated water requirement for the Water Year.

2. Revised Annual Applications for Contract Water Service: Revised Annual Applications for Contract Water Service may be filed at any time, but water will be delivered pursuant to such revised applications only if the Engineer-Manager determines that it is practicable and feasible to do so and District does not assume any obligations for the delivery of water according to such revised applications.

3. Continuous Delivery: Water delivered shall be initiated at approximately 8:00 a.m., and will run continuously day and night until the amount of water ordered for the period has been delivered and no water order will be accepted for less than a 24-hour period.

4. Water Service Orders: Orders to turn on or to turn off water or orders to increase or decrease the rate of water delivery shall be made at the District office in person or by telephone by Water User or the person he/she designates in writing in accordance with Division IV, Section 1c hereof. Such orders shall be made in accordance with the following schedule:

Orders Received Prior to 9:00 a.m.	**Orders Received After 9:00 a.m.**
on Monday shall be for Tuesday;	on Monday shall be for Wednesday;
on Tuesday shall be for Wednesday;	on Tuesday shall be for Thursday;
on Wednesday shall be for Thursday;	on Wednesday shall be for Friday;
on Thursday shall be for Friday;	on Thursday shall be for Saturday;
on Friday shall be for Saturday;	on Friday shall be for Sunday;
on Saturday shall be for Sunday;	on Saturday shall be for Monday;

Futhermore, water orders placed after 5:00 p.m. on Saturday, or on Sunday, will be for Tuesday.

Except in emergencies, water flow shall not be turned on, turned off, increased, or decreased after 9:00 a.m., on the day scheduled.

For the purpose of properly scheduling District's activities, it is desirable that Water User give the District a turn off order at the same time that a turn on order is given.

5. Delivery Change Within the Same Lateral: Once water is ordered changes of delivery point within the service area of the same lateral may be made on a less than 24-hour notice, but the Engineer-Manager, as communicated through the Watermaster, will make the decision as whether or not to waive the 24-hour notice.

6. Emergency Turn Offs: Water User or the District may in an emergency turn off the supply of water at Water User's turnout. If Water User effects such emergency turn off, he must notify the District office immediately. Water User and anyone effecting such an emergency turn off does thereby agree to assume the defense of and hold harmless the District and its officers, agents, and employees from any and all loss, damage, liability, claims, or causes of action of every nature whatsoever for damage to or destruction of property, including District's property, or for injury to or death of persons, in any manner arising out of or incidental to such emergency turn off. If District effects such emergency turn off, the Water User will be notified as soon as possible as provided in Section 2(j) of the Water Service Contract. In no event shall any liability accrue against District or any of its officers, agents, or employees for any damage, direct or indirect, arising from such temporary discontinuance or reduction of water deliveries.

7. Unauthorized Adjustments of Flow: When District meter readings show substantial variation from the ordered flow indicating that the flow has been altered by a Water User, a warning shall be sent to the Water User and if the variations continue, the turnout may be locked by District personnel or service otherwise discontinued until the matter is satisfactorily resolved.

8. Interruptions in Service: Consistent with Article 2 Section (i) of the Water Service Contract, temporary shutdowns may be made by District to make improvements and repairs. Except in an emergency, all affected Water Users will be notified prior to making such temporary shutdowns. District shall not be liable for damage, which may result from interruptions in service.

9. Proration of Water Delivery:

a. System Deficiency: Consistent with the design and operational objectives of District's distribution facilities and giving consideration to requests for water service from all Water Users, as provided in Section 3(b) of the Water Service Contracts and Division IV, Section 1 of these Rules and Regulations, the District will schedule water deliveries and deliver water to Water User as nearly in accord with Water User's requests as is practicable, and District's determinations with regard to such scheduling of water deliveries shall be final and conclusive; however, when total daily orders exceed the delivery capacity of a lateral, water orders will be taken and water delivered on a basis as determined by the Engineer-Manager on a day-to-day basis by dividing the available lateral or system capacity by the total Water Service Contract acreage served by that lateral or system and ordering water that day.

b. Water Shortage: Pursuant to powers granted by Section 43004 of the California Water Code and Article 2(l) of the Water Service Contracts, water will be apportioned within the District, in the event of a shortage, to each Water User upon the basis of the ratio of each Water User's acreage as listed in Exhibit "A" of each contract to the total acreage subject to the District's contracts for agricultural water service.

10. Use of Other Water Supplies: Subject to approval by the Engineer-Manager, a Water User may use water furnished by District concurrently with water from other sources, provided that Water User can demonstrate that the delivery of water furnished by District is less than or equal to the amount of water applied on land eligible for water service within the same period, less the reasonable incidental losses.

11. Waste of Water: Water service delivery will be discontinued to any Water User found to be wasting water, either willfully or carelessly, due to defective or inadequate ditches, pipelines or other facilities, inadequately prepared land, improper management, or for any other reason. Water service delivery will not be resumed until the conditions causing the waste have been corrected.

12. Farm Turnouts - Connections: Except as provided in Division II, Section 11 (relating to modification of the system), water delivery will be made only through a District-owned and operated turnout, and the connection from said turnout to the individual Water User's system shall be subject to approval by the Engineer-Manager or his designee. Plans for any subsequent revisions to said connection shall be submitted to the District for approval, in writing, by the Engineer-Manager or his designee. Failure to obtain such approval in the manner provided may result in discontinuance of delivery of water service to the turnout until such approval is obtained.

All deliveries from District's facilities shall be made in a manner so as to prevent water from Water User's system from entering the District's facilities and all normal precautions shall be taken to prevent damage to District's facilities resulting from operation of the Water User's system. District will not install any additional turnouts in its distribution system except as provided in Division II, Section 11 hereof.

13. Combined Turnouts: Combined turnout means any farm turnout serving more than one Water User. If for any reason (including matters resulting from a transfer into separate ownership of a portion of the lands described in Exhibit "A" to an Water Service Contract as being served by a particular farm turnout and where all the affected land will continue to be served by the designated turnout), the lands of two or more Water Users are to be served by a single turnout, such turnout is a combined turnout and the following rules shall apply:

a. Combined Turnout Agreement and Consent to Easement: Water service will be furnished through a combined turnout only upon execution of a "Combined Turnout Agreement and Consent to Easement" by each Water User to be served through the combined turnout. Such agreement shall be on forms provided by the District and executed and completed in a manner satisfactory to District. District shall be under no obligation to deliver water to a Water User through a combined turnout until such agreement has been executed and filed with the District. Combined turnout agreements remain in effect unless terminated by all affected parties.

b. Rate of Delivery: The "Rate of Delivery" for a combined turnout as shown in Exhibit "A" of Water Service Contract(s) and/or Assumption Agreement(s) is a combined rate of delivery for the turnout. Therefore, when the combined water service delivery requests of Water Users exceed the delivery capacity of the turnout, the Engineer-Manager may prorate water service delivery to conform to such delivery capacity.

14. Delivery of Municipal, Industrial, and Domestic Water: No deliveries of water for municipal, industrial, and domestic uses will be made except pursuant to a Water Service Contract between District and a public entity or other entity having necessary legal and financial capability to furnish such service.

The basic rules and regulations governing the delivery of irrigation water shall apply also to the delivery by the District of municipal, industrial, and domestic water, and the term "Water User" as used herein shall also refer to users of said municipal, industrial, and domestic water. Since water shortages and interruptions in delivery may occur, the users of municipal, industrial, and domestic water must have secondary sources of supply or adequate storage for temporary use.

15. Condition of Water: Water furnished by the District is in a raw, untreated condition, and, as a result, is considered to be unfit for human consumption without treatment.

16. Section 592 of the Penal Code of the State of California: Attention is directed to the provisions of Section 592 of the California Penal Code as follows:

"Canals, ditches, flumes or reservoirs

a) Every person who shall, without authority of the owner or managing agent, and with intent to defraud, take water from any canal, ditch, flume, or reservoir used for the purpose of holding or conveying water for manufacturing, agricultural, mining, irrigating, generation of power, or domestic uses is guilty of a misdemeanor.

b) If the total retail value of all the water taken is more than nine hundred fifty dollars ($950), or if the defendant has previously been convicted of an offense under this section or any former section that would be an offense under this section, or of an offense under the laws of another state or of the United States that would have been an offense under this section if committed in this state, then the violation is punishable by imprisonment in the county jail for not more than one year, or in the state prison."

DIVISION V: POLICIES AND PROCEDURES FOR ESTABLISHING, FIXING AND COLLECTION OF CHARGES AUTHORIZED BY SECTIONS 43006 AND 47180 OF THE WATER CODE FOR GENERAL ADMINISTRATION AND GENERAL PROJECT SERVICES RENDERED BY THE ARVIN-EDISON WATER STORAGE DISTRICT

1. Policies: Under present Project conditions and as declared by Board Resolution Nos. 73-15 and 73-23, it is necessary that the following charges be established, namely;

a. General Administrative Service Charge: Being the amount of money necessary to be raised by District to provide for and to recover such of District's costs of salaries, services, supplies, and other expenses as are applicable to the general administration of the affairs of District, plus a reasonable percentage not to exceed fifteen (15) percent for delinquency and the percentage necessary to cover cost of collection.

Said charge shall be fixed annually in such amount as to reflect that portion of the costs of such District services as reflect the benefits to lands within District by reason of being in an organized District, which is operating the Project and importing supplemental water.

In order that such charges be collected from all persons receiving the benefit thereof and that such charges be collected in proportion, as nearly as practicable, to such services rendered, said charge shall be fixed at an equal rate per acre upon each acre of assessable land within the District; EXCEPTING, that a minimum rate per parcel shall be established for tracts of land less than one acre in area and further EXCEPTING those lands within both this District and the Wheeler Ridge-Maricopa Water Storage District, which are receiving contract water service from said latter District, as provided in Board Resolution No. 73-4.

b. General Project Service Charge: Being the amount of money necessary to be raised by District to provide for and to recover such of District's costs, plus a reasonable percentage not to exceed fifteen (15) percent for delinquencies and the percentage necessary to cover costs of collection, incurred by reason of federal contracts and operation of District's Adopted Project, in excess of the General Administrative Service Charge and such tolls and charges as are to be collected for surface water service as provided in District's Water Service Contracts.

Said charge shall be fixed annually in such amount as to reftect that portion of the costs of such District services as reflect that portion of Project services and benefits arising to certain lands within District as a consequence of the federal contracts and operation of District's Adopted Project, designed to provide an assured water supply on a long-term basis by the importation of supplemental water. Such general Project services and benefits accrue to all lands using or having the potential to use surface water service by reason of a Water Service Contract with the District and to all other lands relying upon groundwater in connection with the development thereof, which lands, as a consequence of District's operation will be in a long-term stabilized water basin.

In order that such charges be collected from all persons receiving the benefit thereof, and that such charges be collected in proportion, as nearly as practicable to the services rendered, the charges shall be fixed at an equal rate per acre upon each acre of such assessable land; EXCEPTING, that a minimum rate per parcel shall be established for tracts of land less than one acre in area and further EXCEPTING lands within both this District and the Wheeler Ridge-Maricopa Water Storage District which are receiving contract water service from said latter District and further EXCEPTING that the charge for other lands located within the boundaries of both Districts shall not exceed the higher of a charge established by either said District reflecting similar benefits and services reflected in this charge as provided in Board Resolution No. 73-4.

2. Procedures: The following procedures are established for fixing and collecting the foregoing charges, namely:

a. Until such time as these Rules and Regulations are changed as provided in Subparagraph **e** hereof, at the regular meeting in April or at such other time as may be announced at said meeting, the Board shall consider, determine, and by resolution fix the amount of such charges for the current Water Year. In compliance with Section 47980 of the Water Code, said resolution shall fix the total amount of each such charge; the total amount to be collected by reason of such charges, the percentage for delinquency and cost of collection attributable to such charges; the minimum charge for parcels less than one acre in area; declare the facts necessary to compute the charges to be applied to the lands within both this District and the Wheeler Ridge-Maricopa Water Storage District as required by the provisions of Board Resolution No. 73-4 or any amendments thereto; set the time and place of hearing of objections to the roll as provided in Subparagraph **c** hereof, and determine the newspaper or papers in which notice shall be published.

b. In accordance with the provisions of Section 47980(b) of the Water Code, the District Treasurer shall prepare a roll setting forth the assessee parcels and assessee names for each parcel of assessable land in the District, determined in accordance with the provisions of Chapter 3, Part 1, Division 14 (Commencing with Section 39050) of the Water Code and matters on file in District's records; the acreage assessed to each such assessee according to District's records; the classification of each such tract of land and prepare plat maps in accordance with said roll.

The Treasurer shall determine the preliminary rates per acre for said charges, which rates shall be based upon the matters set forth in said roll and the determinations of the Board and shall be separately stated as a rate per acre for parcels receiving only an Administrative Service Charge and a composite rate for those lands receiving the General Administrative and Project Service Charges.

c. Said roll, plat maps, and preliminary rates shall be filed with the District Secretary and be available for public inspection at the District office. The District Secretary shall forthwith give notice of filing of said roll, which notice shall set forth the preliminary rates per acre, the minimum charge for parcels less than one acre and the charge applicable to those lands in both said Districts and declare the time and place set by the Board when the Board will meet and hear any objections to the charges established for said respective tracts of land in accordance with the matters set forth in said roll. Said notice shall be published once a week for two successive weeks, as provided in Section 39057 of the Water Code and by depositing in the mail a copy of said notice directed to each holder of title to lands within the District at their last known address as set forth in said roll. The first publication shall be at least three weeks (21 days) prior to the date of said hearing, and mailing shall be completed at least 10 days prior to said hearing date.

d. At the time and place for hearing of objections the Board shall consider such objections and make such corrections to the roll as are necessary and proper. Upon conclusion of the hearing, the Board shall adopt said roll as finally fixed and determined; make such changes in the preliminary rates per acre necessitated thereby; order the Treasurer to certify said roll; declare that said charges be collected by the County of Kern pursuant to the provisions of Article 4, Part 9, Chapter 13, Division 14 (commencing with Section 47980) of the Water Code and determine the District account at the county to which said funds shall be deposited when collected.

On or before July 15 and no later than August 10, the Secretary shall file with the County Auditor certified copies of said final roll, the resolution fixing charges, and the resolution adopting said roll, fixing the rates per acre, and ordering collection by the County. Said Secretary shall notify the County Tax Collector of said filing of the roll, and furnish them certified copies of said resolution.

e. These Rules and Regulations in **Division V** shall continue until such time as the Board determines, pursuant to noticed public hearing, that said charges, or either of them, are to be fixed on some basis other than that herein provided or until such time as there has been a reassessment of Project costs as provided in Section 46355 of the Water Code; PROVIDED, HOWEVER, pursuant to petition of the holders of title to ten (10) percent of the land to receive such charge or charges filed with the Board not later than five (5) days preceding the regular meeting date in February, the Board shall set a noticed public hearing to consider whether such policy should be continued or the amount of such charge or charges or all of such matters, as may be specified in said petition.

Notice of time and place of such public hearing, specifying the matters to be considered, shall be published once a week for two successive weeks, as provided in Section 39057 of the Water Code, and by depositing in the mail, at least three weeks before said hearing date, a copy of the notice directed to each holder of title to lands within the District at their last known address as determined in accordance with Chapter 3, Part 1, Division 14 (commencing with Section 39050) of the Water Code. Said date of hearing shall not be less than thirty (30) days after the first date of publication.

ATTACHMENT B2

Contract for Agricultural Water Service

<u>FOR THE BENEFIT OF THE DISTRICT</u>
RECORDING REQUESTED BY:

ARVIN EDISON WATER STORAGE DISTRICT,
AS OFFICIAL BUSINESS

WHEN RECORDED MAIL TO:

ARVIN EDISON WATER STORAGE DISTRICT
Post Office 175
Arvin, California 93203-0175

CONTRACT BETWEEN
ARVIN-EDISON WATER STORAGE DISTRICT
AND

FOR AGRICULTURAL WATER SERVICE

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THIS CONTRACT, is entered into on the date appearing at page 8 hereof, in pursuance of powers granted by Division 14 of the California Water Code, between ARVIN-EDISON WATER STORAGE DISTRICT, hereinafter referred to as "District", a California water storage district organized under provisions of said Division 14 of the California Water Code, and the undersigned Landowner(s), hereinafter referred to as “Landowner”.

WITNESSETH, that:

EXPLANATORY RECITALS

WHEREAS, District has constructed and operated the Arvin-Edison Water Storage District Distribution System and related facilities to deliver water from the Federal Central Valley Project and other sources to Landowners within the District; and

WHEREAS, District has executed a contract with the United States dated August 30, 1962, pursuant to the Act of Congress of June 17, 1902, (32 Stat.388) and acts amendatory thereof or supplementary thereto, all collectively referred to as the Federal Reclamation laws, providing for water service to District from said Central Valley Project, which contract expired on February 28, 1995. The District subsequently entered interim renewal contracts providing for continuation of such water service through February 28, 2001**,** and the District expects to renew such contracts effective March 1, 2001 for a term of twenty-five years pursuant to Federal Reclamation laws, and as otherwise provided by law; and

WHEREAS, engineering and geologic studies of District resulted in the development of plans for the aforesaid Distribution System and related facilities as reported upon in "Arvin-Edison Water Storage District, Kern County, California, Engineering Report in Support of Application for Federal Loan under Public Law 130 for Construction of an Irrigation Distribution System," dated April 1962; and

WHEREAS, District's voters, at an election held on July 17, 1962, adopted the distribution system plan generally as set forth in said April 1962, Engineering Report and authorized the aforesaid contract with the United States for water service and for a federal loan; and

WHEREAS, District's Board of Directors first adopted "Rules and Regulations for Distribution of Water," dated 1965, which have been amended from time to time; and

WHEREAS, District has adopted procedures for renewal of Agricultural Water Service contracts with Landowners, which will result in a Surface Water Service Area for delivery of water, and which area comprises lands whose owners have applied to District for surface water service and will have executed individual contracts similar in form to this contract; and

WHEREAS, Landowner is an owner of land within the aforesaid Surface Water Service Area and desires to contract for a surface water supply from District under the terms and conditions hereinafter set forth.

NOW, THEREFORE, it is agreed between the parties to this Contract as follows:

1. DEFINITIONS

Agricultural Use means use of water primarily in the production of agricultural crops or livestock, including uses incidental to agricultural. Water for agricultural use **shall not** be used for municipal, industrial or domestic uses, including watering landscaping, or for pasture for animals kept for personal enjoyment (e.g. horses), or for delivery to parcels of less than five acres in size, unless it is established to the satisfaction of the United States Bureau of Reclamation that use of water delivered to such parcel is for agricultural purposes.

Board of Directors means the body of members duly elected as the Board of Directors of the Arvin-Edison Water Storage District.

District means Arvin-Edison Water Storage District.

Landowner means that person or entity owning land within the Surface Water Service Area that has executed a Water Service Contract similar in form to this Contract.

Municipal, Industrial, and Domestic Use means use of water other than for agricultural use made available pursuant to a separate contract entered into pursuant to 2(i) hereof.

Project means District's distribution system and related facilities including installations owned, controlled and operated by District having the purpose of diversion, conveyance, control, measurement, pumping, spreading, and delivery of water.

Standby Charge means the charge in dollars per acre, which Landowner shall pay in each year for the availability of water under conditions of this Contract, regardless of whether or not deliveries are made in any year.

Surface Water Service Area means that area which receives water through District turnouts, the owners of which have executed Water Service Contracts similar in form to this Contract.

Turnout means any facilities constructed for the purpose of delivering water to Landowner from any of the District-owned facilities.

Water Service Contract means this agreement for water service between District and Landowner.

Water Use Charge means the charge in dollars per acre-foot which Landowner shall pay in addition to the Standby Charge for each acre-foot of water delivered to Landowner under conditions of this Contract.

Year means the twelve-month period from and including March 1 of each year through the last day of February of the following year.

2. DELIVERY OF WATER

(a) District will deliver water to Landowner through District's distribution system at locations listed in Exhibit A of this Contract and Landowner shall utilize said surface water for irrigation of only those lands described in said Exhibit A, unless a transfer from said lands is authorized under the District's "Rules and Regulations for Distribution of Water."

(b) Unless otherwise agreed to between the District and Landowner or otherwise provided for at Exhibit A hereof, Water will be delivered at each turnout with sufficient pressure to provide a residual pressure head of not less than five (5) feet of water above maximum elevation of the parcel to be served therefrom providing for turnout head losses and friction head losses of up to four (4) feet per 1,000 feet of distance between the turnout and the location of the maximum elevation of the parcel.

(c) The water supply, which District will deliver to Landowner, may include water received directly from Central Valley Project, water acquired from other sources, or water pumped from District wells. The District may also provide, under separate arrangement, water service to lands outside the Surface Water Service Area, provided that lands within the Surface Water Service Area shall have priority to receive supplies now available to the District.

(d) The District shall have the right to the use of all subsurface seepage and return flow, if any, and nothing contained in this Contract shall be construed as an abandonment or relinquishment by District of the right to the use of any such water. Landowner shall not have a right to discharge tail water or other runoff into the District's distribution system and shall control such water upon Landowner's property.

(e) In the interest of preserving to Landowner his rights to pump groundwater for use on his lands which will be served with water under this Contract, it is agreed that, during all years that District delivers water to Landowner, to the extent that Landowner shall reduce his pumping of groundwater and shall make use of water so delivered to him by District, Landowner's said use of water so delivered to him by District shall be deemed the same as if he had pumped from the underground a quantity of water equal to the quantity of water so delivered to him by District. Landowner also agrees to recognize and be bound by the pumping rights similarly preserved to other Landowners in District pursuant to water service contracts heretofore and hereafter executed. It is further agreed that, as a result of District's spreading of water and percolation thereof to underground storage, either by direct recharge ponds or through deliveries in lieu of Landowners pumping groundwater, District shall have the exclusive right to use of the underground storage for (i) spreading and recovery of water in connection with supplying water to Landowner and to all other Landowners who shall heretofore or hereafter execute contracts with District for water service; (ii) providing stored water to third parties which have contracted with the District or (iii) for any other lawful purpose.

(f) District will deliver water to Landowner through a metered turnout only, which meter will be owned and maintained by District. Only District employees shall operate turnout valves and other diversion mechanisms except as otherwise provided in the Rules and Regulations for Distribution of Water, and said employees shall have authority to stop water delivery to Landowner when Landowner is in violation of this contract and/or the Rules and Regulations for Distribution of Water.

(g) District will not be responsible for the control, carriage, handling, use, disposal, or distribution of water delivered to Landowner outside the facilities then being operated and maintained by District. Landowner does hereby indemnify and shall assume the defense of and hold harmless the District and its officers, agents and employees from any and all loss, damage, liability, claims, or causes of action of every nature whatsoever, for damage to or destruction of property, including the District's property, or for injury to or death of persons, in any manner arising out of or incidental to the control, carriage, handling, use, disposal, or distribution of water outside such District facilities.

(h) The character and quality of water furnished hereunder may vary from time to time, and District does not guarantee in any respect the character or quality of the water delivered pursuant to this Contract. If at any time during the term hereof District determines that such water as is available is not of a quality suitable for irrigation, then during such time the obligations of District to deliver and of Landowner to pay under this Contract may be suspended, such obligations to resume when District determines that it is once again able to deliver water of suitable quality. Any determination by district as to the suitability of the water for irrigation purposes shall be final and conclusive.

(i) Water is furnished under this Contract for agricultural purposes. Said water is in a raw, untreated condition, and as a result is considered to be unfit for human consumption. Water supplied to lands obligated by this Contract, or any portion of said lands, may be used for municipal, industrial and domestic purposes, only if prior to delivery of water to said lands for said purposes, Landowner executes on behalf of said lands a contract with District for municipal, industrial and domestic water service by an agency having the necessary legal and financial capability.

(j) District may temporarily discontinue or reduce the amount of water to be furnished to Landowner as herein provided for the purpose of such investigation, inspection, maintenance, repair or replacement as may be reasonably necessary, of any of the Project facilities for the furnishing of water to Landowner, but, so far as feasible, District will give Landowner due notice in advance of such temporary discontinuance or reduction, except in case of emergency, in which case no notice need be given. In no event shall any liability accrue against District or any of its officers, agents or employees, for any damage, direct or indirect, arising from such temporary discontinuance or reduction of water deliveries. Landowner shall provide access for operation and maintenance of District facilities by District personnel.

(k) There may at times occur a shortage during any years in the quantity of water available for furnishing to Landowner by District pursuant to this Contract and/or water is not available at the time and in such quantities as requested pursuant to 3(a) hereof. In no event shall any liability accrue against District or any of its officers, agents, or employees, for any damage, direct or indirect, arising from such a shortage on account of problems in delivery, drought, or any other cause whatsoever.

(l) Pursuant to powers granted by Section 43004 of the California Water Code, water will be apportioned within the District, in the event of shortage, to each Landowner upon the basis of the ratio of each Landowner's acreage as listed in Exhibit A of each contract to the total acreage subject to the District's contracts for water service.

3. <u>TIME OF DELIVERY OF WATER</u>

(a) Landowner shall make application for water deliveries and for shutoffs under "Rules and Regulations for Distribution of Water," as they may be amended from time to time.

(b) Consistent with the design and operational objectives of District's distribution facilities and giving consideration to requests for water service from all Landowners, District will schedule water deliveries and deliver water to Landowners as nearly in accord with Landowner's requests as is practicable, and District's determinations with regard to such scheduling of water deliveries shall be final and conclusive.

4. <u>PAYMENT FOR WATER</u>

(a) Landowner shall pay for water delivered under the provisions of this Contract as provided following:

Landowner shall pay the <u>Standby Charge</u> for each acre of lands designated in Exhibit A hereof, and said charge shall be paid regardless of whether or not Landowner takes delivery of any water hereunder and regardless of the occurrence of any of the events or contingencies provided for in this Contract. In addition, Landowner shall pay <u>Water Use Charge(s)</u> for water delivered to Landowner, said charge(s) to be at rate(s) per acre-foot for water delivered through Landowner's turnout(s) listed in Exhibit A of this Contract.

The Water Use Charge(s) shall be fixed at an amount of variable energy costs for delivery of water and for all or a portion of the cost of water purchased from the United States or others, all as determined by the Board. The Standby Charge shall be fixed in an amount to cover all other District costs for which revenues are not otherwise available, including revenues from the General Administrative and General Project Service Charges. Said Standby Charge and Water Use Charge shall be annually fixed by the Board of Directors.

(b) The Board may implement a tiered block pricing structure in order to recover additional costs associated with pumping groundwater or acquiring alternative supplies and to encourage conservation of energy and water, particularly during years of short supply.

(c) Payment of the foregoing charges shall be made at such manner as provided in the aforementioned "Rules and Regulations of Distribution of Water," as they may be amended from time to time.

(d) The charges provided for herein are authorized by Sections 43006 and 47180 of the California Water Code and are intended to be provisionally in lieu of assessments authorized under said Code. Nothing contained herein shall limit the power of District to levy assessments from time to time, in accordance with benefits as provided in said Water Code and to collect such amounts as may be found necessary by District to meet its financial requirements.

(e) No water will be delivered to land subject to this Contract if Landowner is delinquent in the payment of any charges under this Contract and/or assessments or charges levied under said Code. If this Contract provides for service to multiple turnouts or parcels, a delinquency of any turnout or parcel subject to this Contract will result in water service ceasing to all lands subject to this Contract, unless otherwise provided for by the Rules and Regulations.

(f) In the event that any charge hereunder or any obligation of Landowner arising from this Contract becomes delinquent as described in the District's "Rules and Regulations for Distribution of Water", it shall bear interest, be subject to penalty, shall become a lien on the land and shall be collectible, all as provided in Section 47181 to 47185, inclusive, of the said California Water Code.

5. NOTICE

Any notice or announcement which the provisions hereof contemplate shall be given to one of the parties hereto by the other, shall be deemed to have been given if deposited in the United States Post Office, on the part of District in a postage-prepaid envelope addressed to Landowner at the address shown in Exhibit A hereof, and on the part of Landowner in a postage-prepaid envelope addressed to District at Arvin, California, or such other address as from time to time may be designated by written notice from one party to the other, Provided, However, That this article shall not preclude the effective service of any such notice or announcement by other means.

6. TERM OF CONTRACT

This Contract shall be effective on March 1, 2001, (or such later date as the District's long-term renewal Contract with the United States becomes effective), and shall thereafter be effective for a twenty-five year term. This Contract may be renewed on terms and conditions mutually agreeable to the parties.

7. LIEN AND ASSIGNMENT

(a) The parties of this Contract do hereby declare that: the water to be furnished under this Contract, and the right to such water, are intended to form a part of the appurtenances to the land described in Exhibit A of this Contract; such water and right to water are of direct benefit to said land; the covenants of Landowner to pay for said water and for said right to water, and other obligations of Landowner under this Contract, shall run with and bind said land. Landowner does hereby expressly create a lien upon said land to secure the obligations of Landowner under this Contract, which lien shall bind said land despite any transfer, hypothecation, or alienation thereof.

Provided, However, That said lien created upon said land shall in no manner affect interests in minerals, oil, gas or other hydrocarbon substances underlying said land.

(b) The Provisions of this Contract shall apply to and bind the successors and assigns of the parties hereto; but nothing in this Contract shall be construed as affecting in any manner Landowner's right to transfer or assign ownership of his said lands, subject, however, to the lien and obligations herein established. Provided, However, That, Landowner may assign his rights and obligations hereunder or any part thereof, only to another Landowner in District's organized area and only after written permission of District, including terms and conditions of the assignment acceptable to District, is first had and obtained; provided, further, that in event of such requested assignment, the District reserves the right to cancel or assume the Contract for the general benefit of remaining Landowners.

8. COMPLIANCE WITH LAWS, CONTRACTS AND REGULATIONS

Landowner shall comply with the aforementioned "Rules and Regulations for Distribution of Water, " as they may be amended from time to time; Provided that if Landowner, at any time during the term of this Contract, does not so comply, District's obligations to deliver water to Landowner under this Contract shall be suspended for as long a period of time as Landowner remains in noncompliance, but all other provisions of this Contract, including the obligation Landowner to pay the Standby Charge and other charges, shall continue in full force and effect.

9. GENERAL

(a) Any waiver or claim of waiver at any time by either party to this Contract of its rights with respect to a default, or any other matter arising in connection with this Contract, shall not be deemed to be a waiver with respect to any subsequent default or matter.

(b) Nothing contained in this Contract shall be construed as in any manner abridging, limiting or depriving District of any means of enforcing any remedy, either at law or in equity, for the breach of any of the provisions hereof which it would otherwise have.

(c) Where the terms of this Contract provide for action to be based upon the opinion or determination of either party to this Contract, whether or not stated to be conclusive, said terms shall not be construed as permitting such action to be predicated upon arbitrary, capricious or unreasonable opinions or determinations.

(d) Captions accompanying sections of this Contract are for convenience of reference and do not form a part of this Contract.

(e) Where appropriate in this Contract, words used in the singular shall include the plural and words used in the masculine shall include the feminine or any entity. The laws of the State of California shall govern this Contract and it shall be deemed to have been executed in Kern County.

(f) This Contract contains the entire understanding between the parties hereto and supersedes any prior oral or written agreement between the parties regarding matters which are the subject hereof.

(g) Other Contracts executed by District for agricultural water service shall be substantially uniform with respect to basic terms and conditions.

(h) This Contract supersedes that certain Interim Contract with the District for Agricultural Water Service and any amendments thereto which was previously executed affecting the lands described in Exhibit A hereto, and after the effective date of this Contract such previously executed Interim Contract will have no force and effect, except as to any outstanding delinquent charges.

Date of Execution: ____________________, 20___.

DISTRICT

ARVIN-EDISON WATER STORAGE DISTRICT

BY: ______________________________________
DAVID A. NIXON,
Assistant Secretary-Treasurer

(DISTRICT SEAL)

LANDOWNER

____

By: ______________________________________

ATTACHMENT C

Measurement Device Documentation

ARVIN-EDISON WATER STORAGE DISTRICT

ENGINEER REPORT ON EXISTING MEASUREMENT DEVICES

The District owns and operates approximately 477 measurement devices (turnout with meter) to record volumetric deliveries to its customers. There are four (4) typical measurement devices, each containing a propeller flow meter (Exhibit A). From time to time, water users may request additional measurement devices and accordingly the list of turnouts expands accordingly. There are also times when measurement devices are removed for a variety of reasons. Currently, there are approximately 381 active measurement devices/turnouts that take delivery of water on a routine basis.

DESIGN CONSIDERATIONS

All measurement devices were recently visited to ensure they were correctly installed (Exhibit B).

	MODEL TYPE			
UNITUNIT	VF	ML	OF	LP
EDISON	66	6	0	0
ARVIN	67	1	0	1
CALIENTE	98	0	0	0
TEJON	78	0	1	0
WHITE WOLF	70	0	0	0
METTLER	56	1	0	0
GRAVITY	7	17	3	5
TOTAL	442	25	4	6
% OF EACH	93%	5%	1%	1%

VF - Vertical Flow Tube
ML - Mainline Tube (horizontal)
OF - Open Flow (vertical)
LP - Saddle (horizontal)

The VF measurement devices, which accounts for 93% of devices in the District, has built-in minimum upstream and downstream “straight-pipe” diameters (within the meter tube) and thus it is inherit with the stated manufacturer accuracy (±2%).

It shall also be noted that the all of the District measurement devices are either connected to a pressurized pipeline system or have a minimum head pressure from the canal water surface elevation and thus each pipeline/device maintains a full pipe to ensure metering accuracy. All District turnouts, pursuant to its water service contract, must have a minimum outlet pressure. The remaining “gravity” deliveries (or from canal/open channel), which also incorporate water user facilities (a lift pump and discharge piping) were originally designed and installed to District standards that ensure a full pipe at measurement device locations (Exhibit C).

Of the remaining non-VF devices installations, the upstream and downstream “straight-pipe” diameters were verified to be sufficient to meet manufacturer recommendations for accurate metering. In addition it has always been District policy to ensure that installation of any new measurement device meet manufacturer recommendations regarding minimum upstream and downstream “straight-pipe” diameters. Given such, upon recent inspections it was no surprise that the non-VF devices exhibited sound engineering design and were properly installed.

OPERATIONS AND MAINTENANCE PROTOCOL

The District, since inception and first deliveries in 1967, has implemented Operations and Maintenance (O&M) procedures to ensure the measurement devices are maintained, operated, inspected, and monitored on a routine basis.

The Unit Chief (Operations staff) will read and inspect each measurement device *daily* when in use (change in flow or an on/off request) onto a “Daily Water Order Change Sheet” (Exhibit D). Upon taking the field totalizer reading, the Unit Chief will then input the totalizer reading onto the turnout’s “Meter Readings Spreadsheet” (Exhibit E), which is located at Headquarters/Dispatch Office.

In addition to the daily protocol, the Unit Chief will also read each and every measurement device *monthly*, regardless of water use on a “Monthly Turnout Meter Readings Sheet” (Exhibit F). Upon taking the field totalizer reading at months’ end, the Unit Chief will then input the totalizer reading onto the turnouts “Meter Reading Spreadsheet”. At this time, the “Meter Reading Spreadsheet” is also reviewed with respect to past (daily) readings as well as cross referenced to water orders placed with the Watermaster (quality control).

Once the “Meter Readings Spreadsheet” has been summarized by the Watermaster, they are turned into the Accounts Receivable staff, which then generates an “Invoice” (Exhibit G) based on actual volumetric water delivered during the previous month.

As a quality control and quality assurance protocol, multiple actions may be taken to verify the metering accuracy and associated water usage. The “Invoice” includes a unit rate (acre-feet per acre), which can be referenced to the cropped acreage and subsequently estimated based on typical industry standards/requirements for similar crops. Periodically, the District may also consider a water use review for customers based on high usage and/or by random selection. At times, water users/customers may also prompt a review of measurement devices due to various issues.

If a Unit Chief or water user suspects that there is a problem with a measurement device, the Operations Foreman is notified and the device is investigated. The Operations Foreman inspects the device to determine whether repair or replacement is needed. When warranted the device will be replaced and it is subsequently tracked to document the change including notifications to appropriate staff (Exhibit H).

Upon device inspection, various issues could be the cause for metering device inaccuracy and/or difficulty reading, including but not limited, to the below checklist:

- Plastic bag around impeller
- Tumbleweed around impeller
- Wood in impeller
- Bearing failure (sand)
- Impeller “O” ring failure
- Sensor failure
- Foggy lens due to head “O” ring failure
- Burnt digit(s)
- Battery failure
- Totalizer indicator failure
- Gear failure on mechanical meters
- Lens replacement – keep moisture out
- Reprogram for calibration

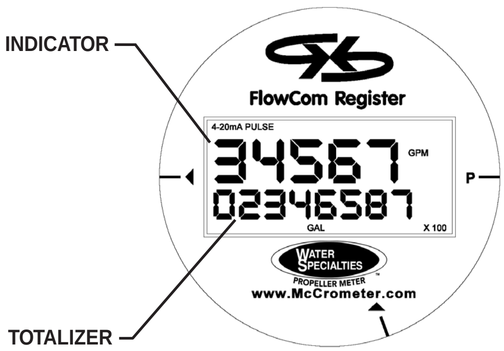
ARVIN-EDISON WATER STORAGE DISTRICT
EXHIBIT A

TYPICAL MEASUREMENT DEVICES

WATER SPECIALTIES
PROPELLER METER ™

MODEL VF30-D

VERTICAL UPFLOW TEE TUBE METER
SOLID STATE ELECTRONIC PROPELLER METER
DIGITAL INDICATOR - TOTALIZER
SIZES 4" thru 20"



TYPICAL
DIGITAL INDICATOR-TOTALIZER

DESCRIPTION

MODEL VF30-D VERTICAL UPFLOW TEE TUBE METERS are designed to meet AWWA specifications. The flanged end tee design permits use in a wide range of applications with up to 150 psi working pressure. The base and side outlets are 150 lb. AWWA class "D" flat face steel flanges. Fabricated steel meter tubes have straightening vanes and are protected internally and externally with 12-15 mils of fusion epoxy resin.

INSTALLATION is made to any vertical discharge line with the proper size flange connection or to vertical discharge concrete turnouts with the proper anchor bolts. The meter must be installed upright for a full flow of liquid through the pipe to assure proper accuracy. Fully opened gate valves, fittings, or other obstructions that tend to set up flow disturbances should be a minimum of five pipe diameters upstream from the meter and one pipe diameter downstream from the meter. An optional kit of adapters with up to 100 feet of cable is available to locate the indicator-totalizer at remote locations.

PROPELLER is magnetically coupled with the electronic sensor through the sealed separator assembly. This completely eliminates water entering the meter assembly, and eliminates all moving parts except for the propeller. The propeller is a conical shaped three bladed propeller, injection molded of thermoplastic material resistant to normal water corrosion and deformity due to high flow velocities.

BEARING in propeller is a water lubricated ceramic sleeve bearing that rides on a ceramic coated stainless steel spindle. Dual ceramic thrust bearings, standard on all meters, handle flows in both forward and reverse directions. The bearing design promotes extended periods of maintenance free propeller operation.

DIGITAL INDICATOR-TOTALIZER has a non-volatile EEPROM memory to store totalizer count (updated hourly while running). Features a large two line display. Five digit top line indicates flow rate, and eight digit bottom line provides volumetric flow data. Indicator is available in 22 different units, including GPM, CFS, MGD. Totalizer is available in 20 different units, including Gallons, AF, CF. Units of measurement are user-selectable. Battery life is 6 -10 years. Housing is NEMA 4X rated.

Available with optional 4-20mA and/or pulse output.

SPECIFICATIONS

ACCURACY Plus or minus 2% of actual flow within the range specified for each meter size.

PRESSURE RANGE Up to 150 PSI maximum working pressure.

TEMPERATURE RANGE 140° F Maximum. Consult factory for special construction for higher temperatures.

MINIMUM FLOWS As shown for each meter size and construction are required for accurate registration. See flow chart. NOTE: Minimum flow will be higher when auxiliary equipment is added.

MAXIMUM FLOWS As shown for each meter size and construction are rated for continuous operation. See flow chart.

INTERMITTENT FLOWS As shown for each meter size are rated for 10% to 15% of the total time the meter is operating. Consult factory for High Velocity construction when intermittent flows are higher than shown on flow chart and/or when longer operating periods are required.

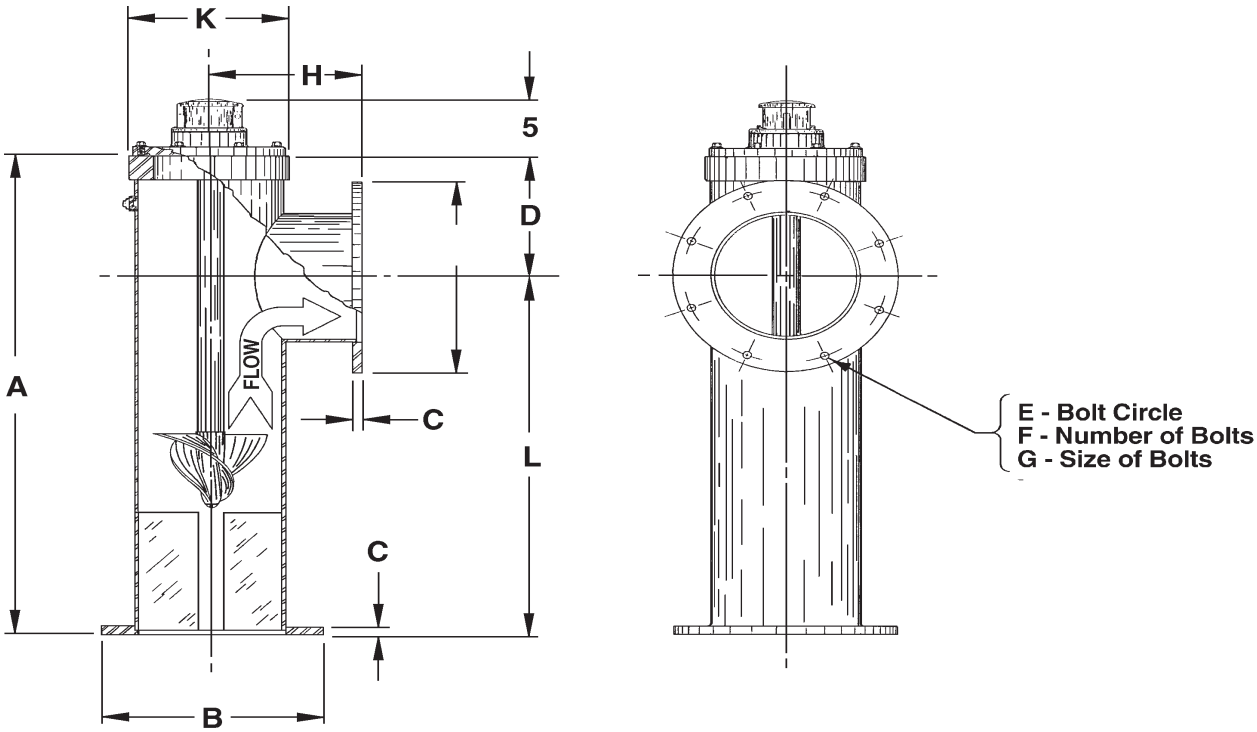
MATERIALS Used in construction are chosen to minimize the corrosive effects of the liquids measured by the meter assembly.
PROPELLER MAGNET - permanent ceramic type
PROPELLER BEARING - ceramic sleeve type
PROPELLER SPINDLE - ceramic coated stainless steel
PROPELLER - injection molded thermoplastic
DROP-PIPE - stainless steel
SEPARATOR - stainless steel
SHAFTS AND BOLTS - stainless steel
METER HEAD - cast iron , NSF approved fusion epoxy coated.
METER TUBE - fabricated steel with 12-15 mils of NSF approved fusion epoxy resin.

OPTIONAL EQUIPMENT Remote mounting kit, with up to 100 feet of cable, and a wide range of controls and instruments for indicating, totalizing, and recording flow data for each meter. Special constructions and materials are available upon request.

ORDERING INFO Must be specified by the customer and includes: minimum & maximum flow ranges, temperature of meter environment, indicator scale and units, totalizer dial units, type of materials and construction, and optional equipment desired.

MODEL VF30-D

VERTICAL UPFLOW TEE TUBE METER
SOLID STATE ELECTRONIC PROPELLER METER
DIGITAL INDICATOR - TOTALIZER
SIZES 4" thru 20"



METER & PIPE SIZE	FLOW RANGES, GPM			DIMENSIONS										SHIPPING WEIGHT POUNDS
	MIN.	MAX.	INT.	A	B	C	D	E	F	G	H	K	L	
4	55	500	700	18	9	5/8	4½	7½	8	5/8	5	6	13½	180
6	130	1200	1500	40	11	11/16	10	9½	8	3/4	9	11	30	190
8	170	1500	2000	40	13½	11/16	10	11¾	8	3/4	10	11	30	240
10	200	2000	3000	40	16	11/16	10	14¼	12	7/8	11	11	30	330
12	220	3000	3500	40	19	13/16	10	17	12	7/8	12	11	30	440
14	320	4000	4500	40	21	15/16	10	18¾	12	1	14	11	36	520
16	420	5000	6000	54	23½	1	11½	21¼	16	1	15	11	42½	620
18	720	6000	7500	60	25	1 1/16	12	22¾	16	1 1/8	18	11	48	720
20	870	8000	9000	66	27½	1 1/8	14	25	20	1 1/8	20	11	52	820

McCROMETER
www.mccrometer.com

3255 WEST STETSON AVENUE • HEMET, CALIFORNIA 92545-7799 USA
TEL: 951-652-6811 • FAX: 951-652-3078

CERTIFIED TEST REPORT

CUSTOMER: ARVIN-EDISON WTR STORAGE

MODEL NO: VF30D-12

METER SERIAL NO: 20112335

CONFIGURATION

METER INSIDE DIAMETER: 12.2

DIAL: AFT X 0.01 6 CFS

INDEX: 0.8761

TEST FACILITY: Volumetric

CALIBRATION DATA

	FLOW RATE GPM	% ACCURACY
1	3896.50	100.29
2	1626.33	100.29
3	358.00	99.07

TEST DATE: 12/22/2011

CERTIFIED BY: Paul Hobbs **PRINT DATE:** 12/3/2012

This calibration was performed on a primary or secondary test facility, traceable to the National Institute of Standards and Technology, USA. The estimated flow measurement uncertainty of the calibration facilities are:
Primary +/- 0.15% Secondary +/- 0.5%

McCROMETER
3255 WEST STETSON AVENUE
HEMET, CA 92545 USA
PHONE (951) 652-6811 / FAX (951) 652-3078
WEB SITE: http://www.mccrometer.com E-MAIL: info@mccrometer.com

20112335

WATER SPECIALTIES™
PROPELLER METER

4"-20"
ELECTRONIC
VERTICAL FLOW METERS
MODELS VF28D, VF30D, and VF32D

OPERATION AND MAINTENANCE MANUAL
PARTS LIST

FEATURING:
*MODEL FC101 FLOWCOM REGISTER INDICATOR-TOTALIZER
*CERAMIC BEARING CARTRIDGE PROPELLER
* ONE PIECE SEPARATOR/SPINDLE AND THREADED REVERSE THRUST BEARING CARTRIDGE

McCROMETER
3255 WEST STETSON AVENUE
HEMET, CALIFORNIA 92545 U.S.A.

PHONE: 951-652-6811
FAX: 951-652-3078
VISIT OUR WEBSITE: www.mccrometer.com
E-MAIL: info@mccrometer.com

WARRANTY

This Warranty shall apply to and be limited to the original purchaser consumer of any McCrometer product. Meters or instruments defective because of faulty material or workmanship will be repaired or replaced, at the option of McCrometer, free of charge, FOB the factory in Hemet, California, within a period of one (1) year from the date of delivery.

Repairs or modifications by others than McCrometer or their authorized representatives shall render this Warranty null and void in the event that factory examination reveals that such repair or modification was detrimental to the meter or instrument. Any deviations from the factory calibration require notification in writing to McCrometer of such recalibrations or this Warranty shall be voided.

In case of a claim under this Warranty, the claimant is instructed to contact McCrometer, 3255 W. Stetson Ave., Hemet, California 92545, and to provide an identification or description of the meter or instrument, the date of delivery, and the nature of the problem.

The Warranty provided above is the only Warranty made by McCrometer with respect to its products or any parts thereof and is made expressly in lieu of any other warranties, by course of dealing, usages of trade or otherwise, expressed or implied, including but not limited to any implied warranties of fitness for any particular purpose or of merchantability under the uniform commercial code. It is agreed this Warranty is in lieu of and buyer hereby waives all other warranties, guarantees or liabilities arising by law or otherwise. Seller shall not incur any other obligations or liabilities or be liable to buyer, or any customer of buyer for any anticipated or lost profits, incidental or consequential damages, or any other losses or expenses incurred by reason of the purchase, installation, repair, use or misuse by buyer or third parties of its products (including any parts repaired or replaced); and seller does not authorize any person to assume for seller any other liability in connection with the products or parts thereof. This Warranty cannot be extended, altered or varied except by a written instrument signed by seller and buyer.

This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

McCrometer reserves the right to make improvements and repairs on product components which are beyond the Warranty period at the manufacturer's option and expense, without obligation to renew the expired Warranty on the components or on the entire unit. Due to the rapid advancement of meter design technology, McCrometer reserves the right to make improvements in design and material without prior notice to the trade.

All sales and all agreements in relation to sales shall be deemed made at the manufacturer's place of business in Hemet, California and any dispute arising from any sale or agreement shall be interpreted under the laws of the State of California.

ELECTRONIC VERTICAL FLOW METER
INDEX

ELECTRONIC VERTICAL FLOW METER
INSTALLATION

I.UNCRATING. When uncrating the meter, any damage due to rough or improper handling should be reported to the transportation firm and McCrometer. If for any reason it is determined that the unit or parts of the unit should be returned to the factory, please contact McCrometer for clearance prior to shipment. Each unit must be properly crated to prevent any further damage. The factory assumes no responsibility for equipment damage in return shipment due to improper packaging. The shipping crate contains the following items:

Vertical Flow Meter with
FC101 (VF28D, VF30D or VF32D)........................1
Mounting Equipment as required............................-
Operation and Maintenance Manual......................1
Tool T-2402X-1..1

II. INSTALLATION of McCrometer Electronic Vertical Flow Meters varies depending upon the type and model of meter selected for each application. The meter must have a full flow of liquid for proper accuracy. The meter installations fall into two basic categories:

1. MODEL VF28D and VF32D are designed to allow installation to an appropriate cast iron or fabricated steel tee. These tees usually replace an elbow in existing systems. Fully opened gate valves, fittings, or other obstructions that tend to set up flow disturbances should be a minimum of five pipe diameters upstream from meter location.

2. MODEL VF30D TEE can be installed similar to placing a flanged elbow or tee in the line. Installation can be made to any vertical discharge concrete turnouts with proper anchor bolts. The meter must be installed upright for a full flow of liquid through the pipe to ensure proper accuracy. Fully opened gate valves, fittings, or other obstructions that tend to set up flow disturbances should be a minimum of five pipe diameters upstream from the meter location.

VERTICAL FLOW METERS
OPERATION AND MAINTENANCE MANUAL

III. MCCROMETER products have been carefully designed to be as maintenance-free as possible. Periodic preventive maintenance, however, is highly recommended and should be practiced according to schedule to ensure continuous accuracy and trouble-free performance of your propeller meters. The maintenance and inspection procedure can also be used as a guide to locating a problem in the unit that may be the cause of abnormal meter operation.

Routine preventative maintenance should be performed on all meters, which includes cleaning and an inspection of the propeller and its bearing. The intervals between inspections depend on the water quality and the usage of the meter. The initial inspection should be performed after one to two years of service, to determine the period between future inspections. After five to ten years, the complete meter should be inspected to ensure years of dependable service.

IV. METER HEAD ASSEMBLY should be removed from the tee or meter tee tube by removing the meter head bolts (#20) and lifting the entire head assembly upward, taking care not to damage the propeller assembly as it is pulled clear of the tee flanged end. Inspect the meter head O-ring or flat gasket (#19) for any signs of damage and replace, if necessary. Replace the meter head assembly with a dummy cover plate if the service line is to remain in operation.

V. WORKING AREA chosen for disassembly and reassembly of the meter components should be clean to reduce the chance of dust or dirt particles being introduced into the propeller area.

VI. PROPELLER ASSEMBLY (#1) inspection includes cleaning the ceramic sleeve bearing (#8), separator assembly (#12), drive magnet (#9), and the propeller assembly (#1).

1. PROPELLER REMOVAL can be accomplished by first removing the thrust bearing cartridge assembly (#5). Loosen the set screw (#3) in the side of the nose of the propeller. Remove the thrust bearing cartridge (#5) by turning it counterclockwise while holding the propeller in place.

2. REVERSE THRUST BEARING CARTRIDGE (#6) must now be removed. Turn the propeller (#1) so that the Allen wrench clearance hole is lined up with the set screw in the side of the reverse thrust bearing cartridge (#6). The location of the set screw is marked by a small hole drilled in the face of the reverse thrust bearing cartridge. With a 5/64" Allen wrench, loosen the set screw (#7) in the reverse thrust bearing cartridge (#6) <u>one turn</u>, which will allow the set screw to protrude about 1/32" and should allow cartridge to be unscrewed without damaging the spindle thread. **Note:** If the bearing area appears to be clogged with dirt or sediment, making it difficult to locate the set screw (#7) or to allow the Allen wrench to fit into the set screw socket, then the bearing area should be flushed out with water. Insert Tool T-2402-X into the propeller through the threaded nose. The tabs in the tool should engage in the screwdriver slot in the end of the reverse thrust bearing cartridge (#6). Remove the propeller assembly (#1) and reverse thrust bearing cartridge (#6) by turning tool T-2402-X counterclockwise, unscrewing the reverse thrust bearing cartridge (#6) from the spindle (#12). The propeller assembly with reverse flow cartridge will now slide off the spindle.

WARNING: If the reverse thrust cartridge does not unscrew easily, it may be because the set screw was not unscrewed enough. If unscrewing of reverse flow cartridge is continued with set screw binding on spindle thread, damage to thread could occur.

3. WATER LUBRICATION of the ceramic sleeve bearing (#8) is achieved by means of two openings in the end of the thrust bearing cartridge (#5) which allow air to be purged from the bearing area. These should be cleared of any foreign material by running a small wire through the holes on either side of the screwdriver slot.

4. CERAMIC BEARING CARTRIDGE (#8) and drive magnet (#9) should be cleaned of any foreign material and inspected for damage. Using a bottle brush, thoroughly clean the ceramic bearing surface (#8) and the magnet inside diameter (#9). After cleaning the propeller, flush the inside out with water. The outside surfaces of the propeller should also be cleaned to ensure a smooth, unrestricted flow across the surface of the propeller. Do not use an oil-based solvent in cleaning, as damage to the assembly could occur.

5. SPINDLE CERAMIC SLEEVE and the O.D. or surface of the separator (#12) should be cleaned and inspected for any substantial amount of wear. The thrust bearing (#5) should be checked for any damage. If it is determined that the spindle ceramic sleeve or separator (#12) are worn sufficiently, the separator/support spindle assembly (#12) should be replaced.

6. SEPARATOR/SUPPORT SPINDLE ASSEMBLY (#12) can be removed for replacement by removing the four mounting screws (#13) which thread into the drop pipe. Separator o-ring (#14) should be replaced and the new o-ring (#14) covered with a thin coat of silicone grease. The separator and support spindle assembly (#12) can then be replaced in the front of the drop pipe (#7) with a firm push, gently rotating the assembly at the same time. Replace and tighten the four mounting screws (#13).

7. PROPELLER INSTALLATION is accomplished by following these steps:

a) The reverse thrust cartridge set screw (#7) should be protruding 1/32" out of the reverse thrust cartridge so it will not bind up on the spindle thread. **Note:** Look through the hole in the reverse thrust cartridge to be sure the set screw is not showing.

b) Slide the propeller assembly onto the support spindle (#12) until the reverse thrust bearing cartridge (#6) contacts the threads on the end of the spindle (#12). If you feel any resistance when threading the reverse thrust cartridge, stop at once and check to be sure the set screw is not binding on the thread. Be careful not to cross-thread the reverse thrust bearing cartridge.

c) Thread the reverse thrust bearing cartridge on the spindle (#12) until the trailing edge of the propeller contacts the drop pipe (#7).

d) Set the proper end play by using tool T-2402-X to loosen the reverse thrust bearing cartridge (#6) approximately one half to one full turn counterclockwise. There should be minimal clearance between the drop pipe (#7) and trailing edge of the propeller, however the propeller must not contact the drop pipe. Remove tool T-2402-X to determine the location of the set screw in the reverse thrust cartridge and then reinsert the tool and hold it while turning the propeller until the clearance hole in the propeller lines up with the set screw in the reverse thrust bearing cartridge.

e) Tighten the set screw (#7) in the side of the reverse thrust bearing cartridge (#6).

8. THRUST BEARING CARTRIDGE ASSEMBLY (#5) should be inspected for damage and replaced in the nose of the propeller. The thrust bearing cartridge (#5) is used to adjust the amount of longitudinal end play of the propeller assembly on its spindle (#12), which should be about 1/64". End play can be adjusted after the set screw (#3) in the side of the propeller (#1), is loosened and then by turning the thrust bearing cartridge assembly (#5) clockwise until it tightens against the end of the support spindle (#12), then turning thrust bearing cartridge (#5) counterclockwise 1/8 of a turn. Tighten set screw (#3). Check the longitudinal end play of the propeller to ensure it's not excessive and does not allow the propeller (#1) to contact the drop pipe (#7). Check the clearance between the propeller (#1) and drop pipe (#7). The clearance should be minimal and the propeller assembly (#1) must spin freely.

9. PROPELLER BEARING (#8) can be checked for excessive radial play by rocking the propeller (#2) gently from side to side on the spindle (#12). Some play is required for proper operation of the water lubricated ceramic sleeve bearing.

VII. SENSOR AND FC101 DIGITAL INDICATOR TOTALIZER

1. FC101 DIGITAL INDICATOR (#34) should not be removed from the meter unless battery or sensor replacement is required. If the unit must be removed, proceed as follows:

2. FC101 (#34) can be removed from meter head by removing the four screws (#32) then slightly lifting unit up and turning over to disconnect the 2-lead sensor wires from the bottom of the FC101. If the meter is equipped with a transmitter, the transmitter wires must also be disconnected.

3. SENSOR HOUSING should be removed only if replacement is necessary. It can be taken out of the separator after removing the propeller (Section VI Step 1) and the separator/support spindle (Section VI Step 6). Using an Allen wrench, loosen the sensor housing set screw in the side of the sensor housing. Slide the sensor housing and wire assembly out of the separator.

4. BEFORE REPLACING THE SENSOR, be sure the separator is dry. Slide sensor housing and wire assembly into the separator until it stops against the inside of separator. **Note:** It does not make any difference what rotation position sensor is installed; however, wire must be positioned toward back (open end) of separator. Tighten the sensor housing set screw to hold the sensor housing snugly in place. **DO NOT OVERTIGHTEN.** Feed the sensor wire up through the drop pipe and out the meter head.

5. LITHIUM BATTERY should offer 6 to 10 years of operation. The FC101 has a low battery display that comes on when approximately six months of life are remaining. The battery should test between 2.8 to 3.6 volts.

If battery replacement is necessary, refer to the Installation, Operation and Mantenance manual provided with the FC101.

NOTE: Batteries should be disposed of in an environmentally safe manner.

6. THE FC101 DIGITAL INDICATOR-TOTALIZER (#34) can now be installed in one of four positions for more convenient reading with four screws (#32).

VIII. PRIOR TO INSTALLING METER

1. PROPELLER ASSEMBLY (#1) should be dipped in water to lubricate the propeller ceramic sleeve bearing (#8). Spin the propeller (#2) gently to make certain the meter operates smoothly and no bind or drag is apparent.

2. FC101 (#34) and sensor (#15) should be checked to be sure they are connected and that the battery is good. Turn the propeller by hand at a fairly fast even speed and the indicator display should display a flow rate.

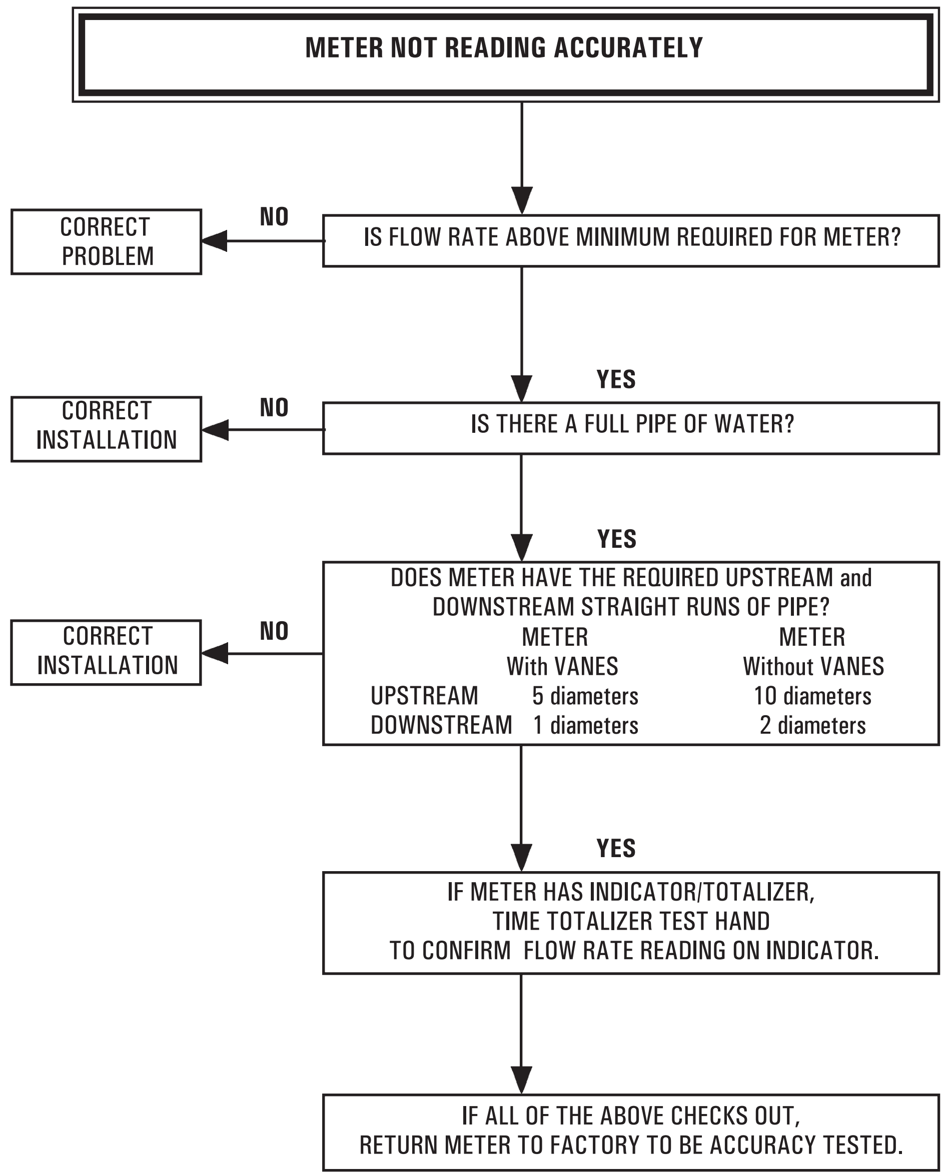
3. METER HEAD O-RING OR GASKET (#19) should be inspected for any sign of damage and covered with a thin coat of silicone grease (O-ring only). The meter can now be installed in the service line. When replacing the meter on the line, make certain that the top of the welding saddle is smooth and free of any foreign material. Make certain that no foreign materials are attached to the inside of the service line pipe, as any flow disturbance or obstructions may affect the accuracy of the meter.

IX. ORDERING PARTS OR RETURN TO FACTORY

Inspection of all meter components that may be replaced in the field has been accomplished at this point. Should any of the meter parts, upon inspection, appear to be damaged or excessively worn, they must be replaced to ensure proper meter operation and prevent further damage. Costs for replacement parts not covered by warranty are available by contacting the factory. If it is determined that the meter should be returned for repair, please notify McCrometer prior to shipment. Each meter must be properly packaged to prevent damage to the meter in shipment.

NOTES

PROPELLER METER TROUBLESHOOTING FLOW CHART



4”-20” ELECTRONIC VERTICAL FLOW METERS
MODELS VF28D, VF30D & VF32D
PARTS LIST

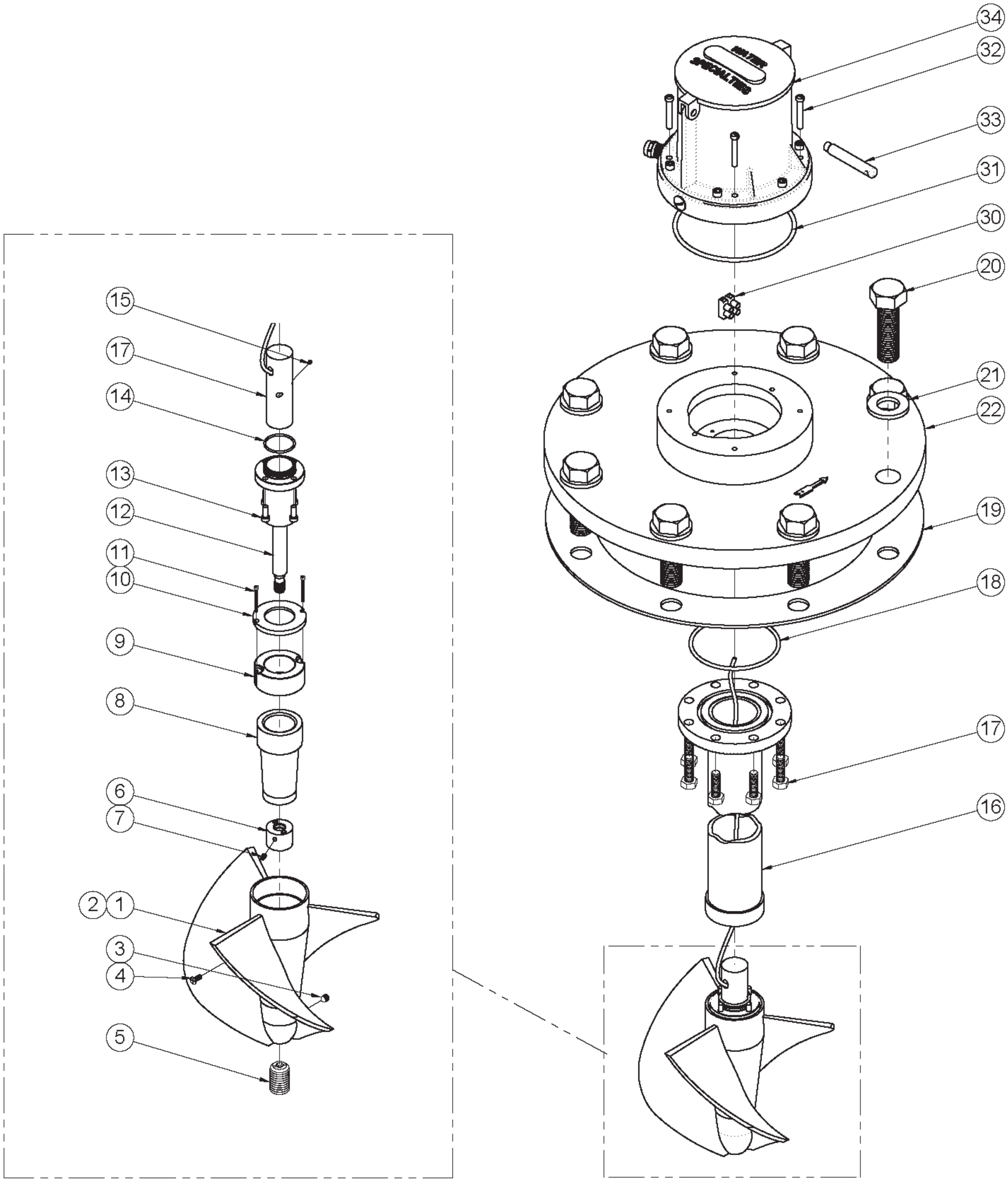
No.	QTY	Part Number	Description
none	1	7-VF28-D-*	Vertical Upflow Meter Head Assembly
none	1	7-VF30-D-*	Vertical Upflow Meter Head Assembly
none	1	7-VF32-D-*	Vertical Flow Meter Head Assembly
1	1	5-2425-‡-PT	Propeller Assembly (Items 2 thru 8)
2	1	3-2425-‡-P	Propeller
3	1	1-1125-6	Set Screw, Nylon Point
4	1	1-1116-8-6	Screw, Bearing Cartridge Mounting
5	1	3-2356	Thrust Bearing Cartridge Assembly
6	1	3-2402-2	Reverse Thrust Bearing Cartridge Assembly (Items 6 and 7)
7	1	1-1101-8-5	Set Screw, Reverse Thrust Bearing
8	1	2-2426-P-1	Ceramic Bearing Cartridge
9	1	2-1601-2	Drive Magnet
10	1	1-2428-‡	Drive Magnet Retaining Plate
11	2	1-1115-3-18	Screw, Magnet Retaining Plate (each)
12	1	4-2455-2	Separator/Support Spindle Assy
13	4	1-1103-8-7	Screw, Separator/Spindle Mounting (each)
14	1	1-1551-24	O-ring, Separator
15	1	4-2730-3-‡	Sensor Housing, Sensor and Wire Assembly
16	1	2-2238-*	Gearbox
17	8	1-1251-5-16	Bolt, Drop Pipe Top Flange (4” Only) each
17	8	1-1251-6-16	Bolt, Drop Pipe Top Flange (each)
18	1	1-1551-25	O-Ring, Drop Pipe Top Flange
19	1	1-1557-*	Gasket, Meter Head (VF28D & VF30D Vertical Flow Meter
19	1	1-1552-2	O-ring, Meter Head (VF30D) Vertical Tee Meter
20	8	1-1253-‡	Bolts, Meter Head (VF28D and VF32D) Vertical Flow Meter (each)
20	8	1-1251-8-24	Bolt, Meter Head (VF30D Vertical Tee Meter) each
20	8	1-1251-6-20	Bolt, Meter Head (VF30D Vertical Tee Meter) each
21	8	1-1301-‡	Washers, Meter Head Bolts (VF28D and VF32D) each
21	8	1-1301-14	Washers, Meter Head Bolts (VF30D) each
21	8	1-1301-12S	Washers, Meter Head Bolts (VF30D) each
22	1	2-2401-04	Meter Head (VF28D 4” Only)
22	1	3-2401-*	Meter Head (VF28D and VF32 Vertical Flow Meter)
22	1	2-2103-*	Meter Head (VF28D and VF32 Vertical Tee Meter)
22	1	2-2105	Meter Head (VF30 for 4” Only)
30	1	1-1707-19 /-20	InLine Terminal (19) 2 Wire (-20) 3 Wire For Remote
31	1	1-1551-38	O-Ring - 243 Buna
32	4	10605	Screw 10-32 x 1.25” Long
33	1	FC101-M	Magnet Wand
34	1	FC101-*	FC101 Flowcom Ind.-Tot. & Bonnet Complete - See IOM Manual
none	1	1-1607-5	Desiccant Capsule

* **INSERT METER SIZE TO COMPLETE PART NUMBER**
(For example: USE -04 FOR 4”; -06 FOR 6”; -08 FOR 8”; etc.)
‡ **CONSULT FACTORY TO COMPLETE PART NUMBER**

CONSULT FACTORY FOR PRICING.

When ordering replacement parts, please specify:
• Meter Size • Meter Model • Meter Serial Number

4"-20" ELECTRONIC VERTICAL FLOW METERS
MODELS VF28D, VF30D and VF32D
*FC101 DIGITAL INDICATOR-TOTALIZER
*CERAMIC BEARING CARTRIDGE PROPELLER
*ONE PIECE SEPARATOR/SPINDLE and THREADED REVERSE THRUST BEARING CARTRIDGE



References to 23-29 not used.

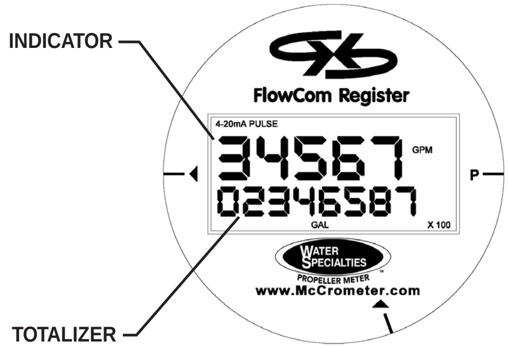
WARNING:

BEFORE REMOVING THE METER HEAD FROM THE PIPELINE THE WATER MUST BE TURNED OFF AND PRESSURE MUST BE RELIEVED FROM THE LINE. SERIOUS INJURY CAN RESULT FROM REMOVING A METER HEAD UNDER PRESSURE.

WATER SPECIALTIES™
PROPELLER METER

MODEL ML04-D

150 psi FLANGED TUBE METER
SOLID STATE ELECTRONIC PROPELLER METER
DIGITAL INDICATOR - TOTALIZER
SIZES 2" thru 48"



TYPICAL
DIGITAL INDICATOR-TOTALIZER

DESCRIPTION

MODEL ML04-D FLANGED TUBE METERS are manufactured to the highest standards. Materials used on all meters and flow ranges for the low velocity meter meet, or exceed, AWWA standard C704-02. The flanged end tube design permits use in a wide range of applications with up to 150 psi working pressure. Flanged ends are 150 lb. AWWA class D flat face steel flanges. Fabricated steel meter tubes have straightening vanes and are protected internally and externally with 12-15 mils of NSF approved, fusion bonded epoxy resin.

INSTALLATION is made similar to placing a short length of flanged end pipe in the line. The meter can be installed vertically, horizontally or inclined on suction or discharge lines. The meter must have a full flow of liquid for proper accuracy. Fully opened gate valves, fittings or other obstructions that tend to set up flow disturbances should be a minimum of five pipe diameters upstream and one pipe diameter downstream from the meter. An optional kit of adapters with up to 100 feet of cable is available to locate the indicator-totalizer at remote locations.

PROPELLER is magnetically coupled with the electronic sensor through the sealed gearbox. This completely eliminates water entering the meter assembly, and eliminates all moving parts except for the propeller. The propeller is a conical shaped three bladed propeller, injection molded of thermoplastic material resistant to normal water corrosion and deformity due to high flow velocities.

BEARING in propeller is a water lubricated ceramic sleeve and spindle bearing system with a ceramic/stainless spindle. Dual ceramic thrust bearings, standard on all meters, handle flows in both forward and reverse directions. The bearing design promotes extended periods of maintenance free propeller operation.

DIGITAL INDICATOR-TOTALIZER has a non-volatile EEPROM memory to store totalizer count (updated hourly while running). Features a large two line display. Five digit top line indicates flow rate, and eight digit bottom line provides volumetric flow data. Indicator is available in 22 different units, including GPM, CFS, MGD. Totalizer is available in 20 different units, including Gallons, AF, CF. Units of measurement are user-selectable. Battery life is 6 -10 years. Housing is NEMA 4X rated.

Available with optional 4-20mA and/or pulse output.

SPECIFICATIONS

ACCURACY Plus or minus 2% of actual flow within the range specified for each meter size.

PRESSURE RANGE Up to 150 PSI maximum working pressure.

TEMPERATURE RANGE 140° F Maximum. Consult factory for special construction for higher temperatures.

MINIMUM FLOWS As shown for each meter size and construction are required for accurate registration. See flow chart.

MAXIMUM FLOWS As shown for each meter size and construction are rated for continuous operation. See flow chart.

INTERMITTENT FLOWS As shown for each meter size are rated for 10% to 15% of the total time the meter is operating. Consult factory for High Velocity construction when intermittent flows are higher than shown on flow chart and/or when longer operating periods are required.

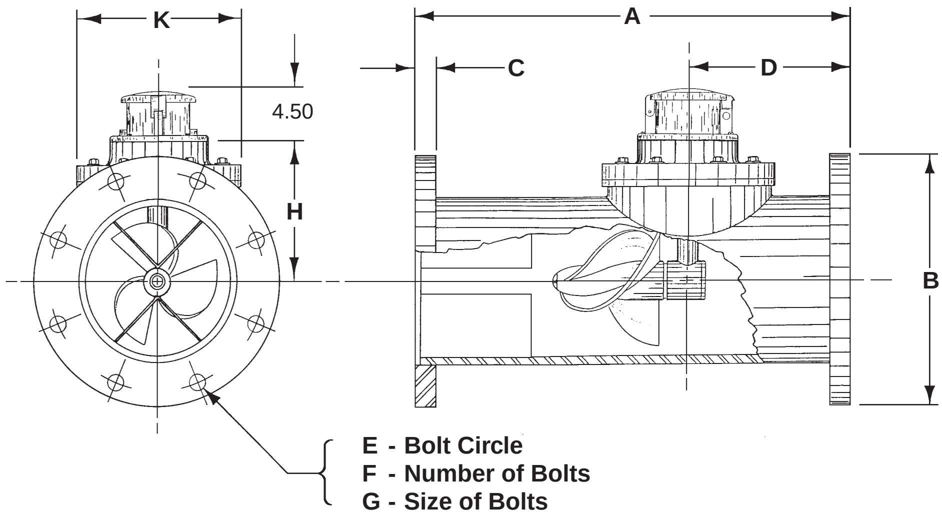
MATERIALS Used in construction are chosen to minimize the corrosive effects of the liquids measured by the meter assembly.
PROPELLER MAGNET - permanent ceramic type.
PROPELLER BEARING - ceramic sleeve type.
PROPELLER SPINDLE - ceramic sleeve/stainless steel.
PROPELLER - injection molded thermoplastic.
GEARBOX - cast bronze.
SEPARATOR - stainless steel.
METER HEAD BOLTS - stainless steel (2" - 20"), plated steel (24" - 48").
METER HEAD - cast iron or fabricated steel, NSF approved fusion epoxy coated.
METER TUBE - fabricated steel with straightening vanes and coated inside and out with 12-15 mils of NSF approved, fusion epoxy by the fluidized bed method.

OPTIONAL EQUIPMENT Remote mounting kit with up to 100 feet of cable, totalizer extensions, digital transmitter, and a wide range of controls and instruments for indicating, totalizing and recording flow data for each meter. Special constructions and materials are available upon request.

ORDERING INFO Must be specified by the customer and includes:
Minimum & maximum flow ranges
Temperature of meter environment
Indicator scale & units
Totalizer dial units
Type of materials and construction
Optional equipment desired

MODEL ML04-D

150 psi FLANGED TUBE METER
SOLID STATE ELECTRONIC PROPELLER METER
DIGITAL INDICATOR - TOTALIZER
SIZES 2" thru 48"



METER & PIPE SIZE	FLOW RANGES, GPM *LOW VELOCITY CONSTRUCTION MIN. - MAX.	STANDARD CONSTRUCTION MIN. - MAX. - INT.	HIGH VELOCITY CONSTRUCTION MIN. - MAX.	DIMENSIONS (INCHES) A	B	C	D	E	F	G	H	K	EST SHIPPING WEIGHT POUNDS
2	35-120	40-160-225	N/A	18¼	6	5/8	71/8	4¾	4	5/8	5¼	9	70
3	40-250	45-250-350	N/A	18	7½	5/8	7	6	4	5/8	5¼	9	70
4	50-500	55-500-700	200-700	18	9	5/8	7	7½	8	5/8	5¼	9	80
6	90-1200	120-1200-1500	300-1500	22	11	11/16	9	9½	8	3/4	6¼	9	150
8	100-1500	150-1500-2000	400-2500	24	13½	11/16	9	11¾	8	3/4	7¼	9	170
10	125-2000	180-2000-3000	500-3500	26	16	11/16	10	14¼	12	7/8	8½	11	230
12	150-2800	200-3000-3500	800-5000	28	19	13/16	10	17	12	7/8	9½	11	288
14	250-3750	300-4000-4500	1000-6000	42	21	15/16	12	18¾	12	1	10½	13½	396
16	350-4750	400-5000-6000	1200-7500	48	23½	1	12	21¼	16	1	11½	13½	547
18	N/A	700-6000-7500	1500-9000	54	25	$1^{1}/_{16}$	15	22¾	16	$1^{1}/_{8}$	12½	13½	665
20	N/A	850-8000-9000	2000-12000	60	27½	$1^{1}/_{8}$	15	25	20	$1^{1}/_{8}$	13½	13½	780
24	N/A	1000-10000-13500	3000-15000	72	32	1¼	18	29½	20	1¼	17½	21	1250
30	N/A	1800-15000-21000	4000-25000	84	38¾	$1^{3}/_{8}$	18	36	28	1¼	20½	21	2010
36	N/A	2000-20000-30000	5000-35000	96	46	$1^{5}/_{8}$	20	42¾	32	1½	23½	21	2840
42	N/A	3000-30000-40000	6000-50000	96	53	1¾	24	49¼	36	$1^{1}/_{8}$	28	32	4300
48	N/A	5500-35000-50000	7000-60000	96	59½	$1^{7}/_{8}$	24	56	44	$1^{5}/_{8}$	31	32	4730

Standard construction will be supplied for all main line meters unless special flow range, materials, or construction are required.

*** Low velocity (LV) construction has the same low and maximum flow rates as AWWA C704.**

McCROMETER
www.mccrometer.com
3255 WEST STETSON AVENUE • HEMET, CALIFORNIA 92545 USA
TEL: 951-652-6811 • FAX: 951-652-3078

CERTIFIED TEST REPORT

CUSTOMER: ARVIN-EDISON WTR STORAGE
MODEL NO: ML04-03
METER SERIAL NO: 20121801

CONFIGURATION

METER INSIDE DIAMETER: 3.018
DIAL: AFT X 0.001 1 CFS
GEARS: 10 / 48
TOTALIZER GEARS: 22C / 48C
ACTUAL METER INDEX: 0.0416
TEST FACILITY: Volumetric

CALIBRATION DATA

	FLOW RATE GPM	% ACCURACY
1	244.53	99.81
2	120.40	99.30
3	82.60	98.95

TEST DATE: 8/20/2012
CERTIFIED BY: Paul Hobbs
PRINT DATE: 12/3/2012

This calibration was performed on a primary or secondary test facility, traceable to the National Institute of Standards and Technology, USA. The estimated flow measurement uncertainty of the calibration facilities are:
Primary +/- 0.15% Secondary +/- 0.5%

McCROMETER
3255 WEST STETSON AVENUE
HEMET, CA 92545 USA
PHONE (951) 652-6811 / FAX (951) 652-3078
WEB SITE: http://www.mccrometer.com E-MAIL: info@mccrometer.com

20121801

30119-04 Rev. 3.0/07-09

WATER SPECIALTIES™
PROPELLER METER

2"-20"
MAIN LINE METERS

MODELS
ML04, ML08, ML12, ML16, ML20, ML22, MLI1

OPERATION AND MAINTENANCE MANUAL
PARTS LIST

FEATURING:
*MODEL CN06-2 INDICATOR-TOTALIZER
*CERAMIC BEARING CARTRIDGE PROPELLER
* ONE PIECE SEPARATOR/SPINDLE AND THREADED REVERSE THRUST BEARING CARTRIDGE

McCROMETER

3255 WEST STETSON AVENUE
HEMET, CALIFORNIA 92545 U.S.A.

PHONE: 951-652-6811
FAX: 951-652-3078
VISIT OUR WEBSITE: www.mccrometer.com

WARRANTY

This Warranty shall apply to and be limited to the original purchaser consumer of any McCrometer product. Meters or instruments defective because of faulty material or workmanship will be repaired or replaced, at the option of McCrometer, free of charge, FOB the factory in Hemet, California, within a period of one (1) year from the date of delivery.

Repairs or modifications by others than McCrometer or their authorized representatives shall render this Warranty null and void in the event that factory examination reveals that such repair or modification was detrimental to the meter or instrument. Any deviations from the factory calibration require notification in writing to McCrometer of such recalibrations or this Warranty shall be voided.

In case of a claim under this Warranty, the claimant is instructed to contact McCrometer, 3255 W. Stetson Ave., Hemet, California 92545, and to provide an identification or description of the meter or instrument, the date of delivery, and the nature of the problem.

The Warranty provided above is the only Warranty made by McCrometer with respect to its products or any parts thereof and is made expressly in lieu of any other warranties, by course of dealing, usages of trade or otherwise, expressed or implied, including but not limited to any implied warranties of fitness for any particular purpose or of merchantability under the uniform commercial code. It is agreed this Warranty is in lieu of and buyer hereby waives all other warranties, guarantees or liabilities arising by law or otherwise. Seller shall not incur any other obligations or liabilities or be liable to buyer, or any customer of buyer for any anticipated or lost profits, incidental or consequential damages, or any other losses or expenses incurred by reason of the purchase, installation, repair, use or misuse by buyer or third parties of its products (including any parts repaired or replaced); and seller does not authorize any person to assume for seller any other liability in connection with the products or parts thereof. This Warranty cannot be extended, altered or varied except by a written instrument signed by seller and buyer.

This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

McCrometer reserves the right to make improvements and repairs on product components which are beyond the Warranty period at the manufacturer's option and expense, without obligation to renew the expired Warranty on the components or on the entire unit. Due to the rapid advancement of meter design technology, McCrometer reserves the right to make improvements in design and material without prior notice to the trade.

All sales and all agreements in relation to sales shall be deemed made at the manufacturer's place of business in Hemet, California and any dispute arising from any sale or agreement shall be interpreted under the laws of the State of California.

MAIN LINE METER INDEX

MAIN LINE METER INSTALLATION

I.UNCRATING. When uncrating the meter, any damage due to rough or improper handling should be reported to the transportation firm and McCrometer. If, for any reason, it is determined that the unit or parts of the unit should be returned to the factory, please contact McCrometer for clearance prior to shipment. Each unit must be properly crated to prevent any further damage. The factory assumes no responsibility for equipment damage in return shipment due to improper packaging. The shipping crate contains the following items:

Main Line Meter Assembly with CN06-2........................1
Mounting Equipment as required.....................................–
Operation and Maintenance Manual................................1
Tool T-2420X-1..1

II.INSTALLATION of McCrometer Main Line Meters varies depending upon the type and model of meter selected for each application. The meter must have a full flow of liquid for proper accuracy. The meter installations fall into three basic categories:

1. FLANGED TUBE METERS can be installed exactly as you would install any short length of flanged pipe. Flanged ends are standard pattern and drilling for any meter size. Fully opened gate valves, fittings or other obstructions that tend to set up flow disturbances should be a minimum of five pipe diameters upstream and one pipe diameter downstream from the meter.

2. PLAIN END TUBE METERS can be installed similar to replacing a short length of plain end pipe in the line by either welding, or by using one of a variety of pipe couplings available. **Note:** Meter head assembly (#13) should be removed before welding (See step IV). Fully opened gate valves, fittings, or other obstructions that tend to set up flow disturbances should be a minimum of five pipe diameters upstream and one pipe diameter downstream from the meter.

3. WELDING SADDLE METERS can be installed on an existing pipeline by cutting a hole of proper size and welding a meter saddle (furnished with the meter) to the pipe. The installation steps outlined below should be followed carefully to achieve proper mounting of the meter:

A. ALIGN the cutout template in the desired position for the meter on the pipe. Make certain that the center line of the pipe and the center line marked on the template are parallel with each other. Some people prefer to use the saddle as the template.

B. SCRIBE the pipe along the line specified for your meter size cutout.

C. CUT OUT the section of pipe within the scribed line and remove all burrs, slag, and rough edges from the inside and outside of the cutout section.

D. STRAIGHTENING VANES are recommended when there are less than ten pipe diameters of straight pipe (no fittings or obstructions) directly upstream from the meter location. Straightening vanes are available from the factory and when required should be installed in the following manner prior to welding the saddle to the pipe:

a.) HOLD the vanes on the outside of the pipe ten (10) inches upstream from the center of the cutout opening. The vanes must be parallel to the center line of the pipe and should be equally spaced radially 120 degrees apart.

b.) MARK the pipe around the straightening vane bolts and drill holes for vane mounting (9/16" dia. hole for 4" through 12" meters or 11/16" dia. holes for 14" through 20" meters).

c.) INSERT the vanes into the pipe through the cutout opening after installing the brass and stainless/rubber washers over the vane bolts. The brass washer should be installed against the vane bolt head with the stainless/rubber washer installed against the brass washer (rubber side away from vane). Position the vanes inside the pipe with the bolts protruding through the vane mounting bolt holes. Place stainless/rubber washers over each bolt, rubber against the pipe. The brass washer should be placed between the stainless/rubber washer and the vane mounting nut. Secure nuts to hold the vanes to the pipe (approximately 60 ft/lbs torque). The vanes can be welded to the pipe if desired; however, the washers should not be used. **Note:** Meter head assembly (#13) should be removed before welding (See step IV).

E. WELDING SADDLE should be centered over the cutout section of the pipe. Make certain that no part of the pipe protrudes past the inside edge of the welding saddle. Tack weld the saddle to the pipe prior to welding a continuous bead around the saddle. **Note:** Meter head assembly (#13) should be removed before welding (See step IV).

F. METER ASSEMBLY should be placed in the line with the propeller nose facing the upstream flow in the pipe. Use care when installing the meter not to damage the propeller as it passes through the saddle opening. The meter head o-ring should be covered with a thin coat of silicone grease before installing the meter. Tighten the meter head bolts securely.

MAIN LINE METER
OPERATION AND MAINTENANCE MANUAL

III.MCCROMETER products have been carefully designed to be as maintenance free as possible. Periodic preventive maintenance, however, is highly recommended and should be practiced according to schedule to assure continuous accuracy and trouble-free performance of your propeller meters. The maintenance and inspection procedure can also be used as a guide to locating a problem in the unit that may be the cause of abnormal meter operation.

Routine preventative maintenance should be performed on all meters, which includes cleaning and an inspection of the propeller and its bearing. The interval between inspections depends on the water quality and the usage of the meter. The initial inspection should be performed after one to two years of service, to determine the period between future inspections. After five to ten years, the complete meter should be inspected to ensure years of dependable service.

IV.METER HEAD ASSEMBLY (#13) should be removed from the service line by removing the meter head bolts (#51) and lifting up the rear (downstream) portion of the meter head (#13), carefully pulling the assembly back (downstream) and up at the same time to allow the propeller (#38) to clear the inside of the meter saddle and be lifted free. Inspect the meter head o-ring (#50) for any sign of damage and replace, if necessary. Replace the meter head assembly (#13) with a dummy cover plate if the service line is to remain in operation. **Note:** Due to the limited clearance on an 8 inch size meter a different removal procedure is used. **a)** Remove the meter head bolts (#51). **b**) Lift the meter assembly and tilt it forward. **c)** Slide the assembly back out of the saddle opening. The propeller may have to be rotated in order to fit through the saddle opening.

V.WORKING AREA chosen for disassembly and reassembly of the internal meter components should be clean to reduce the chance of dust or dirt particles being introduced into the meter mechanism.

VI.INDICATOR-TOTALIZER service procedure should include removal, cleaning, and inspection of the unit, noting any excessive wear on the gears and other wear points that may lead to operational problems in the unit.

1. **BONNET MOUNTING SCREWS (#2),** located beneath the indicator-totalizer bonnet lid, should be removed and the entire bonnet (#1) lifted off the meter. Replace the o-ring seals around each of the four screws (#3) and at the bottom of the bonnet (#4) and cover each of the new o-rings with a thin coat of silicone grease.

2. **INDICATOR MOUNTING SCREWS (#6)** and shake-proof washers (#7) holding the indicator-totalizer unit (#5) to the meter head (#13) should be removed and the unit lifted off, exposing the A-drive gear (#11) attached to the top of the vertical shaft (#14).

3. **METER CHANGE GEARS** should be inspected for any sign of wear. The A-(drive) gear (#11) is attached to the top of the vertical shaft (#14) and the B-(driven) gear (#12) is attached to the bottom of the indicator (#5). The position of the A-drive gear should be checked and adjusted, if necessary, to position the top face of the gear 1/8 inch below the top surface of the meter head (#13). The position of the B-driven gear top face should be 1/8 inch below the bottom of the indicator-totalizer.

4. **INDICATOR-TOTALIZER** unit (#5) should be cleaned thoroughly using a mild soap and a soft brush. Under no circumstances should the entire unit be immersed in the soap or should any metal object be used when cleaning and inspecting the internal parts of the indicator-totalizer unit.

5. **GEARS** within the indicator-totalizer unit (#5) should be inspected carefully. If any excessive wear is visible on the gear teeth and other wear points, the unit must be returned to McCrometer for repair.

VII. **GEARBOX (#17)** on McCrometer meters is sealed and filled with gearbox oil to assure the long life and proper operation of the parts contained in the miter gear frame assembly (#26). Before disassembling the lower meter assembly, the oil must be emptied from the gearbox (#17). Vertical shaft assembly (#14) must be removed before the gearbox oil can be drained.

VIII. **VERTICAL SHAFT ASSEMBLY (#14)** is pulled directly out the top of the meter after removing two screws (#16) inside the meter head (#13). Spin the upper bearing assembly (#15) gently, checking for any sign of wear. Inspect the vertical shaft assembly (#14) to be sure it is not bent or damaged. To drain gearbox oil, turn meter over onto the meter head (#13) and drain oil into a container.

IX. **MITER GEAR FRAME ASSEMBLY (#26)** can be pulled out of the back of the gearbox (#17) after removing four screws (#36). Spin the driven magnet (#29) to make sure the unit runs freely and inspect the teeth on both the drive (#31) and the driven (#32) miter gear assemblies for any sign of excessive wear. If the assembly spins freely and the miter gears (#31 & #32) are not worn, there should be no further inspection or disassembly of the unit. Should this service procedure show that the unit does not spin freely or that the miter gears (#31 & #32) are worn, the miter gear frame assembly (#26) should be disassembled, as the following steps indicate, and all worn or damaged parts replaced.

1. **DRIVEN MITER GEAR ASSEMBLY (#32)** can be removed by loosening the Allen head set screw, located on the side of the gear hub, and pushing the driven miter gear shaft (#34) out of the assembly. Note the location of the shim washer (#33), if any, to be sure it is repositioned properly when reassembling the miter gear frame assembly (#26). When reassembling be sure the set screws go into recess in the miter gear shafts (#29 & #34), or damage could result. Be sure clevis end of the driven miter gear shaft (#34) is located at the same end as the miter gear or the meter will subtract from the totalizer.

2. **DRIVE MITER GEAR ASSEMBLY (#31)** can be removed by loosening the Allen head set screw, located on the side of the gear hub, and pulling the driven magnet and shaft assembly (#29) out the front of the miter gear frame (#26). Note any shim washer (#33) that may be positioned behind the drive miter gear (#31) when removing the shaft (#29).

3. **COMPONENTS** of the miter gear frame (#26) as well as the gearbox (#17) should be completely inspected at this point of disassembly. Each part of the miter gear frame assembly (#26) should be carefully inspected to determine the origin of any operational problem and those parts that are damaged or worn should be replaced. Clean the parts of the unit and reassemble reversing steps (1) and (2) above.

X. **PROPELLER ASSEMBLY (#37)** inspection includes cleaning the ceramic sleeve bearing (#39), separator assembly (#18), drive magnet (#41), and the propeller assembly (#37).

1. **PROPELLER REMOVAL** can be accomplished by first removing the thrust bearing cartridge assembly (#48). Loosen the set screw (#47) in the side of the nose of the propeller. Remove the thrust bearing cartridge (#48) by turning it counterclockwise while holding the propeller in place.

2. **REVERSE THRUST BEARING CARTRIDGE (#44)** must now be removed. Turn the propeller (#38) so that the Allen wrench clearance hole is lined up with the set screw in the side of the reverse thrust bearing cartridge (#44). The location of the set screw is marked by a small hole drilled in the face of the reverse thrust bearing cartridge. With a 5/64 inch Allen wrench, loosen the set screw (#45) in the reverse thrust bearing cartridge (#44) two to three turns, which will allow the cartridge to be unscrewed without damaging the spindle thread. **Note:** If the bearing area appears to be clogged with dirt or sediment, making it difficult to locate the set screw (#45) or to allow the Allen wrench to fit into the set screw socket, then the bearing area should be flushed out with water. Insert Tool T-2402X-1 into the propeller through the threaded nose. The tabs in the tool should engage in the screwdriver slot in the end of the reverse thrust bearing cartridge (#44). Remove the propeller assembly (#37) and reverse thrust bearing cartridge (#44) by turning Tool T-2402X-1 counterclockwise unscrewing the reverse thrust bearing cartridge (#44) from the spindle (#18). The propeller assembly with reverse flow cartridge will now slide off the spindle. **WARNING:** If the reverse thrust cartridge does not unscrew easily, it may be because the set screw was not unscrewed enough. If unscrewing the reverse flow cartridge is continued with the set screw binding on spindle thread, damage to thread could occur.

3. **WATER LUBRICATION** of the ceramic sleeve bearing (#39) is achieved by means of two openings in the end of the thrust bearing cartridge (#48) which allow air to be purged from the bearing area. These should be cleared of any foreign material by running a small wire through the holes on either side of the screwdriver slot.

4. **CERAMIC BEARING CARTRIDGE (#39)** and drive magnet (#41) should be cleaned of any foreign material and inspected for damage. Using a bottle brush, thoroughly clean the ceramic bearing surface (#39) and the magnet inside diameter (#41). After cleaning the propeller, flush the inside out with water. The outside surfaces of the propeller should also be cleaned to assure a smooth, unrestricted flow across

the surface of the propeller. Do not use an oil-based solvent in cleaning, as damage to the assembly could occur.

5. **SPINDLE CERAMIC SLEEVE (#20)** and the O.D. or surface of the separator (#18) should be cleaned and inspected for any substantial amount of wear. The thrust bearing (#49) should be checked for any damage. If it is determined that the spindle ceramic sleeve (#20) or separator (#18) are worn sufficiently, the separator/support spindle assembly (#18) should be replaced.

6. **SEPARATOR/SUPPORT SPINDLE ASSEMBLY (#18)** can be removed for replacement by removing the four mounting screws (#21) which thread into the gearbox. Separator o-ring (#22) should be replaced and the new o-ring (#22) covered with a thin coat of silicone grease. The separator/support spindle assembly (#18) can then be replaced in the front of the gearbox (#17) with a firm push, gently rotating the assembly at the same time. Replace and tighten the four mounting screws (#21).

7. **PROPELLER INSTALLATION** is accomplished by following these steps: **a)** The reverse thrust cartridge set screw (#45) should be protruding out of the reverse thrust bearing cartridge so it will not bind up on the spindle thread. **Note:** Look through the end of the propeller and hole in the reverse thrust cartridge to be sure the set screw is not showing. **b)** Slide the propeller assembly onto the support spindle (#18) until the reverse thrust bearing cartridge (#44) contacts the threads on the end of the spindle (#18). Using Tool T-2402X-1, thread the reverse thrust bearing cartridge onto the spindle. If you feel any resistance when threading the reverse thrust cartridge on, stop at once and check to be sure the set screw is not binding on the thread. Be careful not to cross-thread the reverse thrust bearing cartridge. Thread the reverse thrust bearing cartridge (#44) onto the spindle (#18) until the trailing edge of the propeller contacts the gearbox (#17). Set the proper end play by inserting a 5/64" Allen wrench into the reverse thrust bearing set screw (through the side of the propeller) and loosen the reverse thrust bearing cartridge (#44) 1/2 turn counterclockwise. Tighten the set screw in reverse thrust bearing cartridge. There should be approximately .020" clearance between the gearbox (#17) and trailing edge of the propeller when the propeller in pulled forward (away from the gearbox). The propeller must not contact the gearbox.

8. **THRUST BEARING CARTRIDGE ASSEMBLY (#48)** should be inspected for damage and replaced in the nose of the propeller. The thrust bearing cartridge (#48) is used to adjust the amount of longitudinal end play of the propeller assembly on its spindle (#18), which should be about 1/64 inch. End play can be adjusted by turning the thrust bearing cartridge assembly (#48) clockwise until it tightens against the end of the support spindle (#18), then turning thrust bearing cartridge (#48) counterclockwise 1/8 of a turn. Tighten set screw (#47). Check the longitudinal end play of the propeller to ensure it's not excessive and does not allow the propeller (#37) to contact the gearbox (#17). Check the clearance between the propeller (#38) and gearbox (#17). The clearance should be approximately .010" between the gearbox (#14) and trailing edge of the propeller when the propeller in pushed back (toward the gearbox). The propeller assembly (#37) must spin freely.

9. **PROPELLER BEARING (#39)** can be checked for excessive radial play by rocking the propeller (#38) gently from side to side on the spindle (#18). Some play is required for proper operation of the water lubricated ceramic sleeve bearing.

XI.INSPECTION of all internal meter parts that may be replaced in the field has been accomplished at this point. Should any of the meter parts, upon inspection, appear to be damaged or excessively worn, they must be replaced to assure proper meter operation and prevent further damage.

XII.REASSEMBLY is necessary at this point. Before reassembling any parts, make certain that each is cleaned of any dust or dirt and properly lubricated. Cost for replacement parts not covered by warranty are available from current parts and price list. If it is determined that the meter should be returned for repair, please notify McCrometer prior to shipment. Each meter must be properly packaged to prevent damage to the meter in shipment.

1. **MITER GEAR FRAME ASSEMBLY (#26)** can be replaced in the back of the gearbox (#17) with a firm push, gently rotating the assembly at the same time. Replace the miter gear frame o-ring (#35) and cover the new o-ring with a thin coat of silicone grease before replacing the assembly (#26). Make certain that the assembly is installed in a position such that the drive clevis portion of the driven miter gear shaft (#34) can accept the driven clevis portion of the vertical shaft assembly (#14). Secure with four mounting screws (#36).

2. **GEARBOX (#17)** must be filled with one ounce of 10w mineral oil. A small funnel or an oil can with a small nozzle will make filling the gearbox (#17) easier. Pour the oil through the opening in the top of the meter head (#13).

3. **VERTICAL SHAFT ASSEMBLY (#14)** should be inserted gently into the gearbox (#17) through the opening in the top of the meter head (#13). Rotate the shaft gently until it is engaged in the driven miter gear shaft (#34) of the miter gear frame assembly (#26). Replace and secure two screws (#16) that hold the upper bearing (#15) in place. Do not overtighten the screws (#16) as this could cock the bearing (#15) and bind the vertical shaft (#14). Turn the top of the vertical shaft (#14) to check for any bind or drag. Should any bind or drag be apparent, it can usually be corrected by adjusting the vertical shaft collar and bearing assembly (#15). Loosen the set screw (#16) in the side of the assembly (#15) and slide the shaft (#14) downward until it rests against the driven miter gear shaft (#34), then lift up about 1/64 inch. Tighten set screw (#16).

4. **CHANGE GEARS (#11 & 12)** should be checked again to make certain they are in proper alignment. (See step VI-3) The gear teeth should be lubricated with a light grease to assure longer life.

5. **INDICATOR-TOTALIZER** mechanism (#5) should be placed on the meter head (#13) with the mounting screws and shakeproof washers (#6 & 7). The B-driven gear (#12) should be set in the cutout in the meter head (#13). Do not tighten mounting screws (#6) until the gear mesh has been properly adjusted. To adjust gear mesh slide the indicator-totalizer mechanism (#5) towards the A-drive gear (#11) until the unit stops because of full gear mesh. Now back off the indicator-totalizer mechanism 1/64 inch and tighten mounting screws (#6).

6. **BONNET ASSEMBLY (#1)** should be cleaned and replaced over the indicator-totalizer unit (#5) after replacing the desiccant bag. Secure four screws (#2) beneath the bonnet lid. Do not overtighten the mounting screws (#2) as this will result in damage to the screw o-rings (#3).

7. **PROPELLER ASSEMBLY (#30)** should be dipped in water to lubricate the propeller ceramic sleeve bearing (#39). Spin the propeller (#38) gently to make certain the meter operates smoothly and no bind or drag is apparent.

8. **METER HEAD O-RING (#50)** should be inspected for any sign of damage and covered with a thin coat of silicone grease. The meter can now be installed in the service line. When replacing the meter on the line, make certain that the top of the welding saddle is smooth and free of any foreign material. Make certain that no foreign materials are attached to the inside of the service line pipe, as any flow disturbance or obstruction may affect the accuracy of the meter.

NOTES

2”-20 MAIN LINE METERS
MODELS ML04, ML08, ML12, ML16, ML20, ML22, MLI1

NO.	QTY.	PART NUMBER	DESCRIPTION
1	7-MLI1-*	MODEL MLI1	MAIN LINE METER HEAD ASSEMBLY
1	1	5-4337	INDICATOR-TOTALIZER BONNET ASSEMBLY
	1	1-4338	INDICATOR-TOTALIZER BONNET LID (W/PIN)
2	4	1-1115-10-56H	SCREW, BONNET MOUNTING (each)
3	4	1-1551-6	O-RING, BONNET MOUNTING SCREW (each)
4	1	1-1551-49	O-RING, BONNET
5	1	5-CN06-2	INDICATOR-TOTALIZER MECHANISM (SPECIFY DIAL)
	1	1-4013-‡	DIAL (AS SPECIFIED)
	2	1-1118-3-3	SCREW, DIAL MOUNTING (each)
	1	1-4321	INDICATOR HAND
	1	1-4326	TEST HAND
6	2	1-1113-10-6	SCREW, INDICATOR-TOTALIZER MOUNTING (each)
7	2	1-1302-10	SHAKEPROOF WASHER, IND-TOT MTG SCREW (each)
11	1	3-2176	A-GEAR ASSEMBLY (5-15 TEETH) (SPECIFY # OF TEETH)
11	1	3-2157	A-GEAR ASSEMBLY (16-54 TEETH) (SPECIFY # OF TEETH)
12	1	3-2163	B-GEAR ASSEMBLY (SPECIFY # OF TEETH)
13	1	3-2101-‡	METER HEAD (SIZES 2”THRU 12”)
	1	2-2101-14	METER HEAD (SIZES 14” THRU 20”)
14	1	2-2520-*	VERTICAL SHAFT
15	1	3-2352	VERTICAL SHAFT COLLAR & BEARING ASSEMBLY
16	2	1-1113-6-4	SCREW, VERTICAL SHAFT COLLAR & BEARING MTG. (each)
17	1	2-2238-*	GEARBOX
18	1	4-2455-2	SEPARATOR/SUPPORT SPINDLE ASSEMBLY
20	1	1-1508-20	CERAMIC SLEEVE FOR SUPPORT SPINDLE
21	4	1-1103-8-7	SCREW, SEPARATOR/SPINDLE MOUNTING (each)
22	1	1-1551-24	O-RING, SEPARATOR/SPINDLE
23	1	10110-10	O-RING, GEARBOX
24	4	1-1251-5-12	BOLT, GEARBOX MOUNTING (each)
25	-	1-1806	VIBRA-TITE, GEARBOX MOUNTING BOLT
26	1	4-2347	MITER GEAR FRAME ASSEMBLY (ITEMS 27 THRU 35)
27	1	2-2347	MITER GEAR FRAME
28	4	1-1504-2	BEARING, MITER GEAR FRAME (each)
29	1	3-2348	DRIVEN MAGNET & SHAFT ASSEMBLY
30	1	1-2354-A	DRIVEN MAGNET SPACER
31	1	3-2349	DRIVE MITER GEAR ASSEMBLY
32	1	3-2137	DRIVEN MITER GEAR ASSEMBLY
33	2	2-2148-1	SHIM WASHER (each)
34	1	2-2138	DRIVEN MITER GEAR SHAFT
35	1	1-1551-2	O-RING MITER GEAR FRAME
36	4	1-1103-8-7	SCREW, MITER GEAR FRAME MOUNTING (each)
37	1	5-2425-‡-PT	PROPELLER ASSEMBLY (ITEMS 38 THRU 48)
38	1	3-2425-‡-P	PROPELLER
39	1	2-2426-P-1	CERAMIC BEARING CARTRIDGE ASSEMBLY
40	1	1-1116-8-6	SCREW, CERAMIC BEARING CARTRIDGE MTG.
41	1	2-1601-2	DRIVE MAGNET
42	1	1-2428-‡	DRIVE MAGNET RETAINING PLATE
43	2	1-1115-3-18	SCREW, DRIVE MAGNET RETAINING PLATE (each)
44	1	3-2402-2	REVERSE THRUST BEARING CARTRIDGE ASSEMBLY
45	1	1-1101-8-5	SET SCREW, REVERSE THRUST BEARING
46	2	1-1509-1	CERAMIC THRUST BEARING, 3/16” DIA (each)
47	1	1-1125-6	SET SCREW, NYLON POINT
48	1	3-2356	THRUST BEARING CARTRIDGE ASSEMBLY
49	2	1-1510-1	CERAMIC THRUST BEARING, ¼” DIA. (each)
50	1	1-1552-‡‡	O-RING, METER HEAD
51	8	1-1251-8-24	BOLT, METER HEAD (each)
52	8	1-1301-14	WASHER, METER HEAD (each)
-	-	1-1804-2	GEARBOX OIL (1 ounce)
-	-	10015-00K	DESICCANT BAG

* INSERT METER SIZE TO COMPLETE PART NUMBER
INSERT -02 FOR 2”, -04 FOR 4”, -06 FOR 6”, ETC.
‡ CONSULT FACTORY TO COMPLETE PART NUMBER
‡‡ 2” - 8” INSERT -1, 10” - 12” INSERT -2, 14” -20” INSERT -3

CONSULT FACTORY FOR PRICES

When ordering replacement parts, please specify:
● **Meter Size** ● **Meter Model** ● **Meter Serial Number**

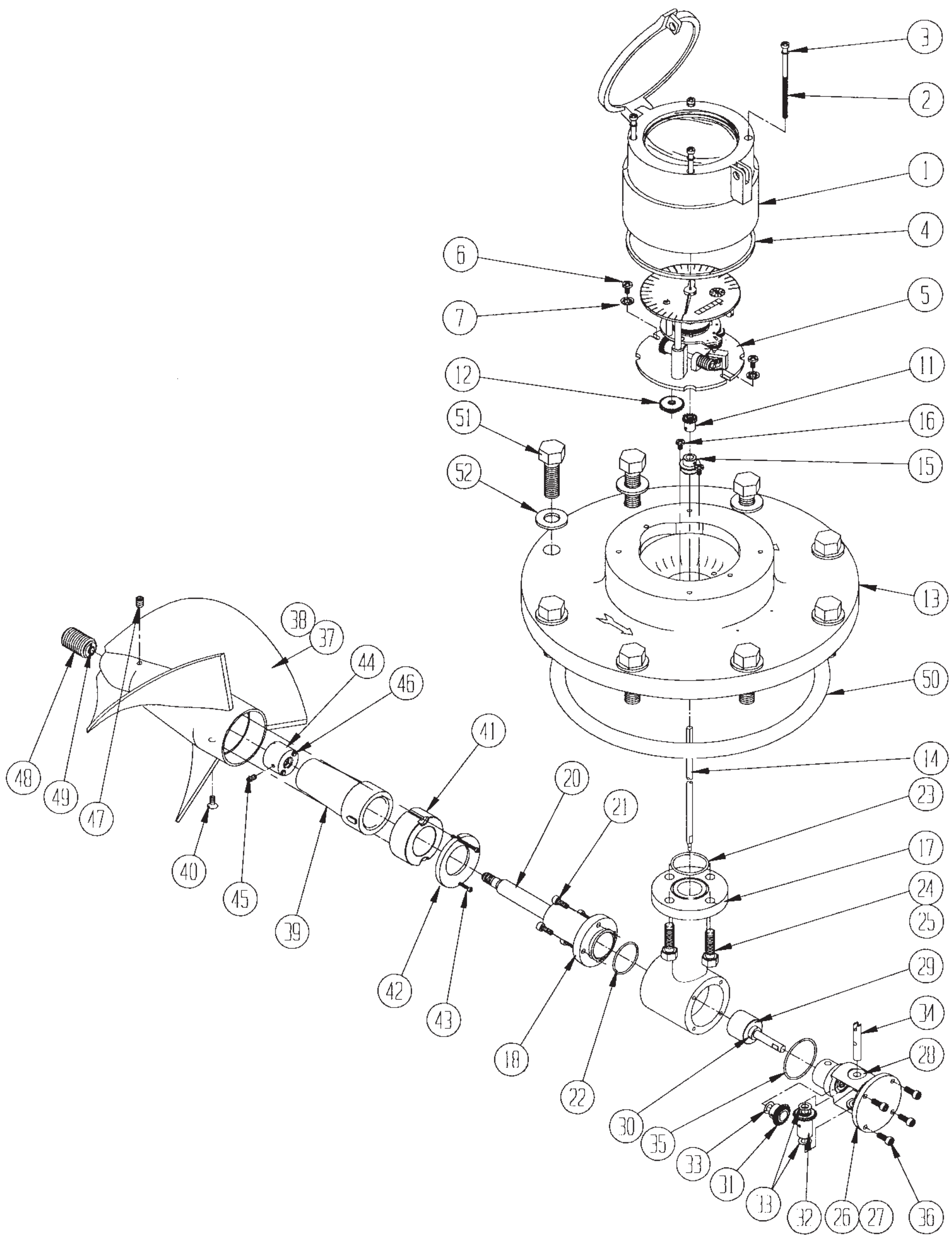
2”-20” MAIN LINE METERS

MODELS ML04, ML08, ML12, ML16, ML20, ML22, MLI1

*MODEL CN06 INDICATOR-TOTALIZER ASSEMBLY

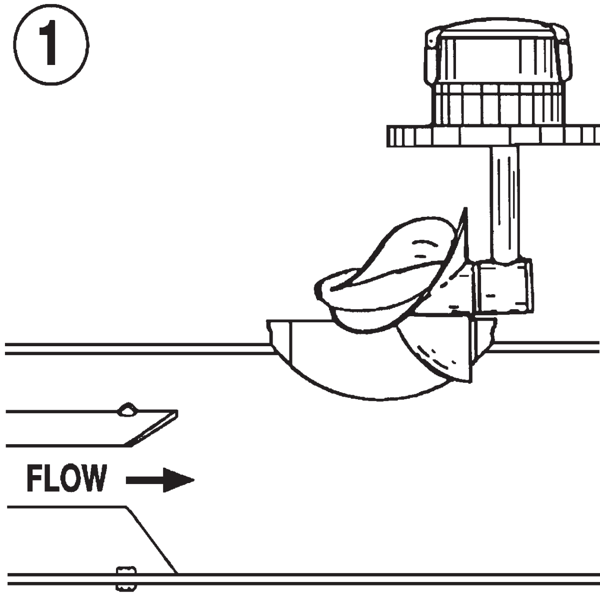
*CERAMIC BEARING CARTRIDGE PROPELLER

* ONE PIECE SEPARATOR/SPINDLE AND THREADED REVERSE THRUST BEARING CARTRIDGE



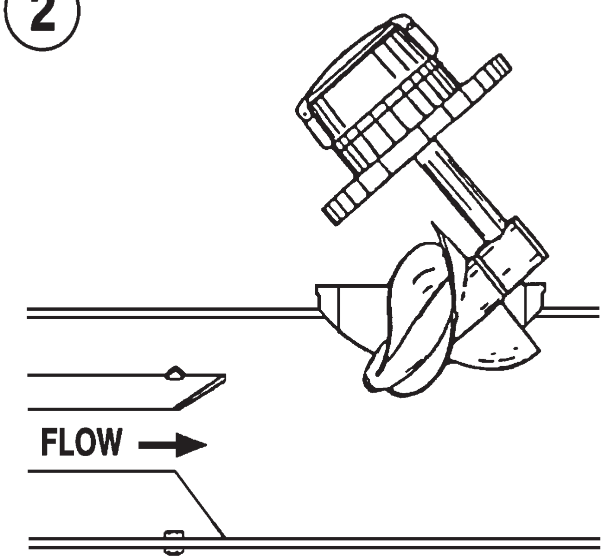
MAIN LINE METER INSTALLATION INSTRUCTIONS

1



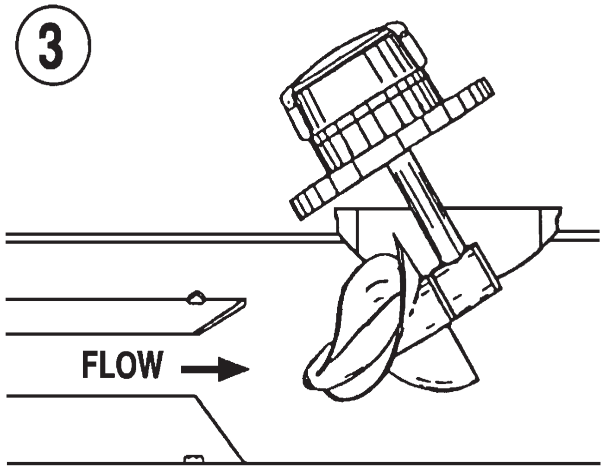
1. Set meter assembly on saddle as shown with one propeller blade pointing down. Propeller should point opposite the direction of flow.

2



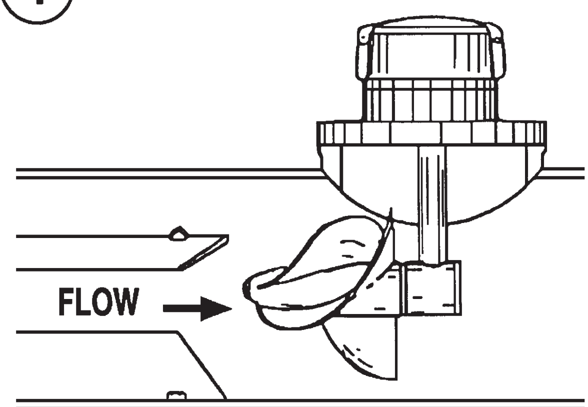
2. Tilt the meter head assembly forward allowing the propeller to move through the opening.

3



3. Slide the assembly forward and down. The propeller may have to be rotated in order to fit through the saddle opening.

4



4. Allow the meter head assembly to come to rest on the saddle. Install bolts and tighten to proper torque.

WATER SPECIALTIES™
PROPELLER METER

REPAIR RECORD

SERIAL NUMBER

PURCHASE DATE

SPECIFICATIONS		INDEX
METER SIZE & MODEL NO.		
REGISTRATION		
INDICATOR DIAL GEARING		

ODOMETER READING

CHANGE GEARS
A/B
RATIO

NOTES:

DATE	REPAIR	METER LOCATION	COMMENTS

WARNING:

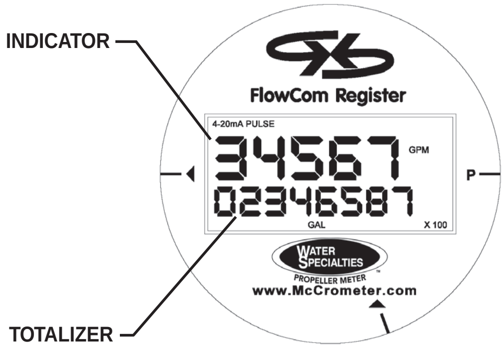
BEFORE REMOVING THE METER HEAD FROM THE PIPELINE THE WATER MUST BE TURNED OFF AND PRESSURE MUST BE RELIEVED FROM THE LINE. SERIOUS INJURY CAN RESULT FROM REMOVING A METER HEAD UNDER PRESSURE.

METER SHOULD NOT BE TURNED UPSIDE DOWN AS OIL WILL DRAIN OUT OF THE GEARBOX AND NOT PROVIDE PROPER LUBRICATION TO THE MITER GEARS AND BEARINGS.

WATER SPECIALTIES
PROPELLER METER ™

MODEL OF12-D

OPEN FLOW METER
SOLID STATE ELECTRONIC PROPELLER METER
DIGITAL INDICATOR - TOTALIZER
SIZES 10" thru 72"



TYPICAL
DIGITAL INDICATOR-TOTALIZER

DESCRIPTION

MODEL OF12-D OPEN FLOW METERS are designed for accurate metering of ditch turnouts, reservoir outlets, closed conduits or other similar installations. The rigid, light weight construction and simple installation allow easy removal for winter storage or transfer to other locations. The upper mounting plate is equipped with a padlock hasp. The lower bracket has suitable guides for easy installation. An optional revolving mounting bracket, with padlock hasp, is also available. The revolving mounting bracket allows the meter assembly to be raised approximately 2 inches permitting the column to be rotated 180 degrees and easily withdrawn. The revolving mounting bracket is ideal when high velocity flow conditions exist. An optional remote mounting kit with up to 100 feet of cable is available to locate the indicator-totalizer at remote locations.

INSTALLATION can be made to any wall or vertical structure which will center the propeller in the flow measuring area. The meter location must have a controlled flow measuring area and a full flow of liquid for proper accuracy. Fully opened gate valves, fittings or other obstructions that tend to set up flow disturbances should be a minimum of ten pipe diameters upstream from the meter. Installations with less than ten pipe diameters of straight pipe require straightening vanes. Meters with straightening vanes require at least five pipe diameters upstream.

PROPELLER is magnetically coupled with the electronic sensor through the sealed gearbox. This completely eliminates water entering the meter assembly, and eliminates all moving parts except for the propeller. The propeller is a conical shaped three bladed propeller, injection molded of thermoplastic material resistant to normal water corrosion and deformity due to high flow velocities.

BEARING in propeller is a water lubricated ceramic sleeve and spindle bearing system with a ceramic/stainless steel spindle. Dual ceramic thrust bearings, standard on all meters, handle flows in both forward and reverse directions. The bearing design promotes extended periods of maintenance free propeller operation.

DIGITAL INDICATOR-TOTALIZER has a non-volatile EEPROM memory to store totalizer count (updated hourly while running). Features a large two line display. Five digit top line indicates flow rate, and eight digit bottom line provides volumetric flow data. Indicator is available in 22 different units, including GPM, CFS, MGD. Totalizer is available in 20 different units, including Gallons, AF, CF. Units of measurement are user-selectable. Battery life is 6 -10 years. Housing is NEMA 4X rated.

Available with optional 4-20mA and/or pulse output.

SPECIFICATIONS

ACCURACY Plus or minus 2% of actual flow within the range specified for each meter size.

TEMPERATURE RANGE 140° F Maximum. Consult factory for special construction for higher temperatures.

MINIMUM FLOWS As shown for each meter size and construction are required for accurate registration. See flow chart.

MAXIMUM FLOWS As shown for each meter size and construction are rated for continuous operation. See flow chart.

INTERMITTENT FLOWS As shown for each meter size are rated for 10% to 15% of the total time the meter is operating. Consult factory for High Velocity construction when intermittent flows are higher than shown on flow chart and/or when longer operating periods are required.

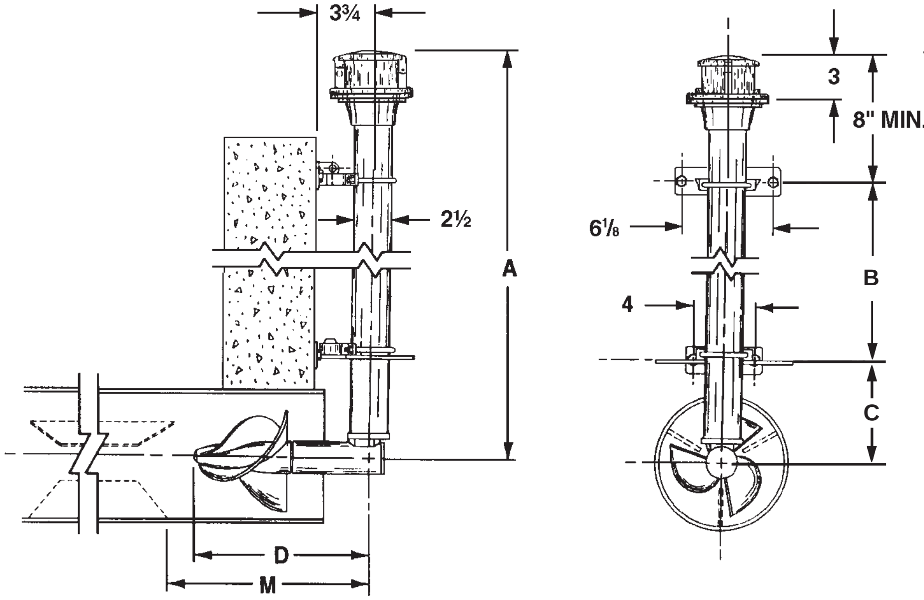
MATERIALS Used in construction are chosen to minimize the corrosive effects of the liquids measured by the meter assembly.
PROPELLER MAGNETS - permanent ceramic type
PROPELLER BEARING - ceramic sleeve type
PROPELLER SPINDLE - ceramic coated stainless steel
PROPELLER - injection molded thermoplastic
GEARBOX - cast bronze
SEPARATOR - stainless steel
BOLTS - stainless steel
DROP PIPE - bronze
METER HEAD - cast bronze
MOUNTING BRACKETS -cast bronze

OPTIONAL EQUIPMENT Includes a remote mounting kit with up to 100 feet of cable, digital transmitter, revolving mounting frame and a wide range of controls and instruments for indicating, totalizing and recording flow data for each meter. Special constructions and materials are available upon request.

ORDERING INFO Must be specified by the customer and includes:
- "A" dimension (see back of data sheet)
- Pipe I.D.
- Minimum & maximum flow ranges
- Temperature of meter environment
- Indicator scale and units
- Totalizer dial units
- Type of materials and construction
- Optional equipment desired

MODEL OF12-D

OPEN FLOW METER
SOLID STATE ELECTRONIC PROPELLER METER
DIGITAL INDICATOR-TOTALIZER
SIZES 10" thru 72"



METER & PIPE SIZE	FLOW RANGES,GPM			DIMENSIONS					SHIPPING WEIGHT POUNDS**
	MIN.	MAX.	INT.	A*	B	C	D	M	
10	300	2000	3000				11½	13½	80
12	400	3000	3500				11½	13½	80
14	500	4000	4500				11½	13½	80
16	600	5000	6000				11½	13½	80
18	800	6000	7500				11½	13½	80
20	900	8000	9000				11½	13½	80
24	1000	10000	13500				11½	13½	80
30	1800	15000	21000				11½	13½	80
36	2000	20000	30000				11½	13½	80
42	3000	30000	40000				11½	13½	80
48	5500	35000	50000				11½	13½	80
54	6500	45000	55000				11½	13½	200
60	7500	60000	80000				11½	13½	200
66	8500	75000	95000				11½	13½	200
72	9500	90000	115000				11½	13½	200

*** NOTE: Model OF12-D meters are equipped with a 6 foot "A" dim. unless otherwise specified.**
**** NOTE: Shipping weights are approximate. Actual weight depends upon "A" dim.**

McCROMETER
www.mccrometer.com
3255 WEST STETSON AVENUE • HEMET, CALIFORNIA 92545 USA
TEL: 951-652-6811 • FAX: 951-652-3078

CERTIFIED TEST REPORT

CUSTOMER: ARVIN-EDISON WTR STORAGE

MODEL NO: OF12D-54

METER SERIAL NO: 20090431

CONFIGURATION

METER INSIDE DIAMETER: 54

DIAL: AFT X 0.1 100 CFS

INDEX: 16.5743

TEST FACILITY: Volumetric

CALIBRATION DATA

	FLOW RATE GPM	% ACCURACY
1	30097.50	100.22
2	15441.33	100.67
3	6603.60	98.04

TEST DATE: 4/29/2009

CERTIFIED BY: Paul Hobbs **PRINT DATE:** 12/3/2012

This calibration was performed on a primary or secondary test facility, traceable to the National Institute of Standards and Technology, USA. The estimated flow measurement uncertainty of the calibration facilities are: Primary +/- 0.15% Secondary +/- 0.5%

McCROMETER
3255 WEST STETSON AVENUE
HEMET, CA 92545 USA
PHONE (951) 652-6811 / FAX (951) 652-3078
WEB SITE: http://www.mccrometer.com E-MAIL: info@mccrometer.com

20090431

WATER SPECIALTIES™
PROPELLER METER

10"-72" ELECTRONIC OPEN FLOW METERS

MODEL OF12D

OPERATION AND MAINTENANCE MANUAL PARTS LIST

FEATURING:
*MODEL FC101 FLOWCOM REGISTER INDICATOR-TOTALIZER
*CERAMIC BEARING CARTRIDGE PROPELLER
*ONE PIECE SEPARATOR/SPINDLE AND THREADED REVERSE THRUST BEARING CARTRIDGE

McCROMETER

3255 WEST STETSON AVENUE
HEMET, CALIFORNIA 92545 U.S.A.

PHONE: 951-652-6811
FAX: 951-652-3078
VISIT OUR WEBSITE: www.mccrometer.com

WARRANTY

This Warranty shall apply to and be limited to the original purchaser consumer of any McCrometer product. Meters or instruments defective because of faulty material or workmanship will be repaired or replaced, at the option of McCrometer, free of charge, FOB the factory in Hemet, California, within a period of one (1) year from the date of delivery.

Repairs or modifications by others than McCrometer or their authorized representatives shall render this Warranty null and void in the event that factory examination reveals that such repair or modification was detrimental to the meter or instrument. Any deviations from the factory calibration require notification in writing to McCrometer of such recalibrations or this Warranty shall be voided.

In case of a claim under this Warranty, the claimant is instructed to contact McCrometer, 3255 W. Stetson Ave., Hemet, California 92545, and to provide an identification or description of the meter or instrument, the date of delivery, and the nature of the problem.

The Warranty provided above is the only Warranty made by McCrometer with respect to its products or any parts thereof and is made expressly in lieu of any other warranties, by course of dealing, usages of trade or otherwise, expressed or implied, including but not limited to any implied warranties of fitness for any particular purpose or of merchantability under the uniform commercial code. It is agreed this Warranty is in lieu of and buyer hereby waives all other warranties, guarantees or liabilities arising by law or otherwise. Seller shall not incur any other obligations or liabilities or be liable to buyer, or any customer of buyer for any anticipated or lost profits, incidental or consequential damages, or any other losses or expenses incurred by reason of the purchase, installation, repair, use or misuse by buyer or third parties of its products (including any parts repaired or replaced); and seller does not authorize any person to assume for seller any other liability in connection with the products or parts thereof. This Warranty cannot be extended, altered or varied except by a written instrument signed by seller and buyer.

This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

McCrometer reserves the right to make improvements and repairs on product components which are beyond the Warranty period at the manufacturer's option and expense, without obligation to renew the expired Warranty on the components or on the entire unit. Due to the rapid advancement of meter design technology, McCrometer reserves the right to make improvements in design and material without prior notice to the trade.

All sales and all agreements in relation to sales shall be deemed made at the manufacturer's place of business in Hemet, California and any dispute arising from any sale or agreement shall be interpreted under the laws of the State of California.

OPEN FLOW METER INDEX

MAIN LINE METER INSTALLATION

I. UNCRATING. When uncrating the meter, any damage due to rough or improper handling should be reported to the transportation firm and McCrometer. If, for any reason, it is determined that the unit or parts of the unit should be returned to the factory, please contact McCrometer for clearance prior to shipment. Each unit must be properly crated to prevent any further damage. The factory assumes no responsibility for equipment damage in return shipment due to improper packaging. The shipping crate contains the following items:

Open Flow Meter Assembly with
FC101 1
Mounting Equipment as required...........................-
Operation and Maintenance Manual.....................1
Tool T-2402X-1..1

II. INSTALLATION of McCrometer Open Flow Meters can be made to any wall or vertical structure which will center the propeller in the flow measuring area. The meter must have a controlled flow measuring area and a full flow of liquid for proper accuracy. Installation is made in the following manner:

1. STRAIGHTENING VANES are normally not required in open flow installations. Fully opened gate valves, fittings, or other obstructions that tend to set up flow disturbances should be a minimum of ten pipe diameters upstream from the meter location. Installations with less than ten pipe diameters of straight pipe require straightening vanes. Consult factory for further information.

2. MARK the head wall with a line extending from the pipe centerline directly upward to be used to mount the meter support brackets.

3. MEASURE the distance between the propeller centerline and the underside of the lower bracket attached to the meter drop pipe. This is the same dimension as the distance between the centerline of the pipe and the location of the bolt pattern centerline for the lower bracket mounting plate. Mark the lower bracket bolt centerline on the head wall.

4. BRACKET SEPARATION should be determined by measuring the distance between the underside of the lower bracket attached to the meter drop pipe and the top side of the upper bracket attached to the meter drop pipe. This dimension is to determine the distance between the centerline of the lower bracket and upper bracket bolts. Mark the location of the upper bracket bolts. Mark the location of the upper bracket bolt centerline on the head wall.

5. ATTACH upper and lower brackets to the head wall, using the brackets themselves as drill templates. Make certain that the brackets are installed straddling the vertical centerline drawn on the head wall in step 2.

6. METER can now be placed carefully onto the brackets allowing the lower bracket to slide into the lower guide and then sliding the upper bracket into position.

7. PROPELLER POSITION should be double checked to make certain the propeller rides in the center of the pipe and is parallel to flow. Adjust brackets, if necessary, and make sure that all bolts are tightened securely.

8. PADLOCK can be inserted through the hasp cast into the upper bracket to eliminate unauthorized removal of the meter from the pipeline.

ELECTRONIC OPEN FLOW METER
OPERATION AND MAINTENANCE MANUAL

III. MCCROMETER products have been carefully designed to be as maintenance free as possible. Periodic preventive maintenance, however, is highly recommended and should be practiced according to schedule to assure continuous accuracy and trouble-free performance of your propeller meters. The maintenance and inspection procedure can also be used as a guide to locating a problem in the unit that may be the cause of abnormal meter operation.

Routine preventative maintenance should be performed on all meters, which includes cleaning and an inspection of the propeller and its bearing. The interval between inspections depends on the water quality and the usage of the meter The initial inspection should be performed after one to two years of service, to determine the period between future inspections. After five to ten years, the complete meter should be inspected to ensure years of dependable service.

IV. METER ASSEMBLY should be removed from the service position by removing padlock, if any, from the upper bracket and lifting the meter off of the support brackets. Care should be exercised when removing the meter to avoid propeller blade damage that can occur if the propeller is bumped against the lower guide or inside of pipe during removal.

V. WORKING AREA chosen for disassembly and reassembly of the meter components should be clean to reduce the chance of dust or dirt particles being introduced into the propeller area.

VI. DISASSEMBLY AND INSPECTION OF METER should include cleaning the propeller assembly (#1), ceramic sleeve bearing separator assembly (#12), and drive magnet (#9).

1. PROPELLER REMOVAL can be accomplished by first removing the thrust bearing cartridge assembly (#5). Loosen the set screw (#3) in the side of the nose of the propeller. Remove the thrust bearing cartridge (#5) by turning it counterclockwise while holding the propeller in place.

2. REVERSE THRUST BEARING CARTRIDGE (#6) must now be removed. Turn the propeller (#2) so that the allen wrench clearance hole is lined up with the set screw in the side of the reverse thrust bearing cartridge (#6). The location of the set screw is marked by a small hole drilled in the face of the reverse thrust bearing cartridge. With a 5/64 inch allen wrench, loosen the set screw (#7) in the reverse thrust bearing cartridge (#6) <u>two to three turns</u>, which will allow the cartridge to be unscrewed without damaging the spindle thread. NOTE: If the bearing area appears to be clogged with dirt or sediment, making it difficult to locate the set screw (#7) or to allow the allen wrench to fit into the set screw socket, then the bearing area should be flushed out with water. Insert Tool T-2402X-1 into the propeller through the threaded nose. The tabs in the tool should engage in the screwdriver slot in the end of the reverse thrust bearing cartridge (#6). Remove the propeller assembly (#1) and reverse thrust bearing cartridge (#6) by turning Tool T-2402X-1 counterclockwise unscrewing the reverse thrust bearing cartridge (#6) from the spindle (#12). The propeller assembly with reverse flow cartridge will now slide off the spindle. **WARNING:** If the reverse thrust cartridge does not unscrew easily, it may be because the set screw was not unscrewed enough. If unscrewing the reverse flow cartridge is continued with the set screw binding on spindle thread, damage to thread could occur.

3. WATER LUBRICATION of the ceramic sleeve bearing (#12) is achieved by means of two openings in the end of the thrust bearing cartridge (#5) which allow air to be purged from the bearing area. These should be cleared of any foreign material by running a small wire through the holes on either side of the screwdriver slot.

4. CERAMIC BEARING CARTRIDGE (#8) and drive magnet (#9) should be cleaned of any foreign material and inspected for damage. Using a bottle brush, thoroughly clean the ceramic bearing surface (#8) and inside diameter of the magnet (#9). After cleaning the propeller, flush the inside out with water. The outside surfaces of the propeller should also be cleaned to assure a smooth, unrestricted flow across the surface of the propeller. Do not use an oil based solvent in cleaning, as damage to the assembly could occur.

5. SPINDLE CERAMIC SLEEVE (#12) and the O.D. or surface of the separator (#12) should be cleaned and inspected for any substantial amount of wear. The thrust bearing (#26) should be checked for any damage. If it is determined that the spindle ceramic sleeve or separator (#12) are worn sufficiently, the separator/support spindle assembly (#12) should be replaced.

6. SEPARATOR/SUPPORT SPINDLE ASSEMBLY (#12) can be removed for replacement by removing the four mounting screws (#13) which thread into the gearbox. Separator O-ring (#14) should be replaced and the new O-ring (#14) covered with a thin coat of silicone grease. The separator/support spindle assembly (#12) can then be replaced in the front of the gearbox (#6) with a firm push, gently rotating the assembly at the same time. Replace and tighten the four mounting screws (#13).

VI. REASSEMBLING METER

1. PROPELLER INSTALLATION is accomplished by following these steps:

a) The reverse thrust cartridge set screw (#7) should be protruding out of the reverse thrust bearing cartridge so it will not bind up on the spindle thread. **Note:** Look through the end of the propeller and hole in the reverse thrust cartridge to be sure the set screw is not showing.

b) Slide the propeller assembly onto the support spindle (#12) until the reverse thrust bearing cartridge (#6) contacts the threads on the end of the spindle (#12). Using Tool T-2402X-1, thread the reverse thrust bearing cartridge onto the spindle. If you feel any resistance when threading the reverse thrust cartridge on, stop at once and check to be sure the set screw is not binding on the thread. Be careful not to cross-thread the reverse thrust bearing cartridge.

c) Thread the reverse thrust bearing cartridge (#6) onto the spindle (#12) until the trailing edge of the propeller contacts the gearbox (#6). Set the proper end play by inserting a 5/64 inch allen wrench into the reverse thrust bearing set screw (through the side of the propeller) and loosen the reverse thrust bearing cartridge (#6) one half turn counterclockwise.

d) Tighten the set screw in reverse thrust bearing cartridge. There should be approximately .02" clearance between the gearbox (#6) and trailing edge of the propeller when the propeller in pulled forward (away from the gearbox). The propeller must not contact the gearbox.

2. THRUST BEARING CARTRIDGE ASSEMBLY (#5) should be inspected for damage and replaced in the nose of the propeller. The thrust bearing cartridge (#5) is used to adjust the amount of longitudinal end play of the propeller assembly on its spindle (#12), which should be about 1/64 inch. End play can be adjusted by turning the thrust bearing cartridge assembly (#5) clockwise until it tightens against the end of the support spindle (#12), then turning thrust bearing cartridge (#5) counterclockwise 1/8 of a turn. Tighten set screw (#3). Check the longitudinal end play of the propeller to ensure it's not excessive and does not allow the propeller (#2) to contact the gearbox (#6). Check the clearance between the propeller (#2) and gearbox (#6). The clearance should be approximately .01" between the gearbox (#6) and trailing edge of the propeller when the propeller in pushed back (toward the drop pipe). The propeller assembly (#1) must spin freely.

3. PROPELLER BEARING (#8) can be checked for excessive radial play by rocking the propeller (#2) gently from side to side on the spindle (#12). Some play is required for proper operation of the water lubricated ceramic sleeve bearing.

VIII. SENSOR AND FC101 DIGITAL INDICATOR-TOTALIZER

1. FC101 DIGITAL INDICATOR (#34) should not be removed from the meter unless battery or sensor replacement is required. If the unit must be removed, proceed as follows:

2. FC101 (#34) can be removed from meter head by removing the four screws (#32) then slightly lifting unit up and turning over to disconnect the 2-lead sensor wires from the bottom of the FC101. If the meter is equipped with a transmitter, the transmitter wires must also be disconnected.

3. SENSOR HOUSING should be removed only if replacement is necessary. It can be taken out of the separator after removing the propeller (Section VI Step 1) and the separator/support spindle (Section VI Step 6). Using an allen wrench, loosen the sensor housing set screw in the side of the sensor housing. Slide the sensor housing and wire assembly out of the separator.

4. BEFORE REPLACING THE SENSOR be sure the separator is dry. Slide sensor housing and wire assembly into the separator until it stops against the inside of separator. **Note:** It does not make any difference what rotation position sensor is installed, however, wire must be positioned toward back (open end) of separator. Tighten the sensor housing set screw to hold the sensor housing snugly in place. **DO NOT OVERTIGHTEN.** Feed the sensor wire up through the gearbox and out the meter head.

5. LITHIUM BATTERY should offer 6 to 10 years of operation. The FC101 has a low battery display that comes on when approximately six months of life is remaining. The battery should test at least 2.8 to 3.6 volts to be considered good. **NOTE: Batteries should be disposed of in an environmentally safe manner.**

7. THE FC101 DIGITAL INDICATOR-TOTALIZER (#34) can now be installed in one of four positions for more convenient reading with four screws (#32).

IX. PRIOR TO INSTALLING METER

1. PROPELLER ASSEMBLY (#1) should be dipped in water to lubricate the propeller ceramic sleeve bearing (#8). Spin the propeller (#2) gently to make certain the meter operates smoothly and no bind or drag is apparent.

2. FC101 (#34) and sensor (#15) should be checked to be sure they are connected and that the battery is good. Turn the propeller by hand at a fairly fast even speed and the indicator should display a flow rate.

3. METER ASSEMBLY can now be installed in the service line. When lowering the meter back onto its bracket, take care not to damage the propeller blades on the lower guide. Make certain that no foreign materials are attached to the inside of the service line pipe, as any flow disturbance or obstruction may affect the accuracy of the meter.

X. ORDERING PARTS OR RETURN TO FACTORY

Inspection of all meter components that may be replaced in the field has been accomplished at this point. Should any of the meter parts upon inspection, appear to be damaged or excessively worn, they must be replaced to assure proper meter operation and prevent further damage. Cost for replacement parts not covered by warranty are available from current parts and price list. If it is determined that the meter should be returned for repair, please notify McCrometer prior to shipment. Each meter must be properly packaged to prevent damage to the meter in shipment.

NOTES

WATER SPECIALTIES
PROPELLER METER™

REPAIR RECORD

SERIAL NUMBER

PURCHASE DATE

SPECIFICATIONS		INDEX
METER SIZE & MODEL NO.		
REGISTRATION		
INDICATOR DIAL GEARING		

ODOMETER READING

CHANGE GEARS
A/B
RATIO

NOTES:

DATE	REPAIR	METER LOCATION	COMMENTS

10”-72” ELECTRONIC OPEN FLOW METERS

MODEL OF12D

PARTS LIST

No.	QTY	Part Number	Description
none	1	7-MLI1D-*	Model MLI1D Main Line Meter Head Assembly
1	1	5-2425-‡-PT	Propeller Assembly (Items 2 thru 8)
2	1	3-2425-‡-P	Propeller
3	1	1-1125-6	Set Screw, Nylon Point
4	1	1-1116-8-6	Screw, Bearing Cartridge Mounting
5	1	3-2356	Thrust Bearing Cartridge Assembly
6	1	3-2402-2	Reverse Thrust Bearing Cartridge Assembly (Items 6 and 7)
7	1	1-1101-8-5	Set Screw, Reverse Thrust Bearing
8	1	2-2426-P-1	Ceramic Bearing Cartridge
9	1	2-1601-2	Drive Magnet
10	1	1-2428-‡	Drive Magnet Retaining Plate
11	2	1-1115-3-18	Screw, Magnet Retaining Plate (each)
12	1	4-2455-2	Separator/Support Spindle Assy
13	4	1-1103-8-7	Screw, Separator/Spindle Mounting (each)
14	1	1-1551-24	O-ring, Separator
15	1	4-2730-3-‡	Sensor Housing, Sensor and Wire Assembly
16	1	2-2238-*	Gearbox
17	1	2-2731	Gearbox Backplate
18	1	1-1551-2	O-ring, Gearbox Backplate
19	4	1-1103-8-7	Screw, Gearbox Backplate Mounting (each)
20	2	2-2448	U-Bolt (each)
21	4	1-1205	Nut, U Bolt (each)
22	1	2-2447	Clamp, Lower
23	1	2-2445	Wall Mounting Bracket, Lower
24	1	2-2446	Clamp, Upper
25	1	2-2444	Wall Mounting Bracket, Upper
30	1	1-1707-19 /-20	InLine Terminal (19) 2 Wire (-20) 3 Wire For Remote
31	1	1-1551-38	O-Ring - 243 Buna
32	4	10605	Screw 10-32 x 1.25” Long
33	1	FC101-M	Magnet Wand
34	1	FC101-*	FC101 Flowcom Ind.-Tot. & Bonnet Complete - See IOM Manual
none	1	10015-00K	Desiccant Bag

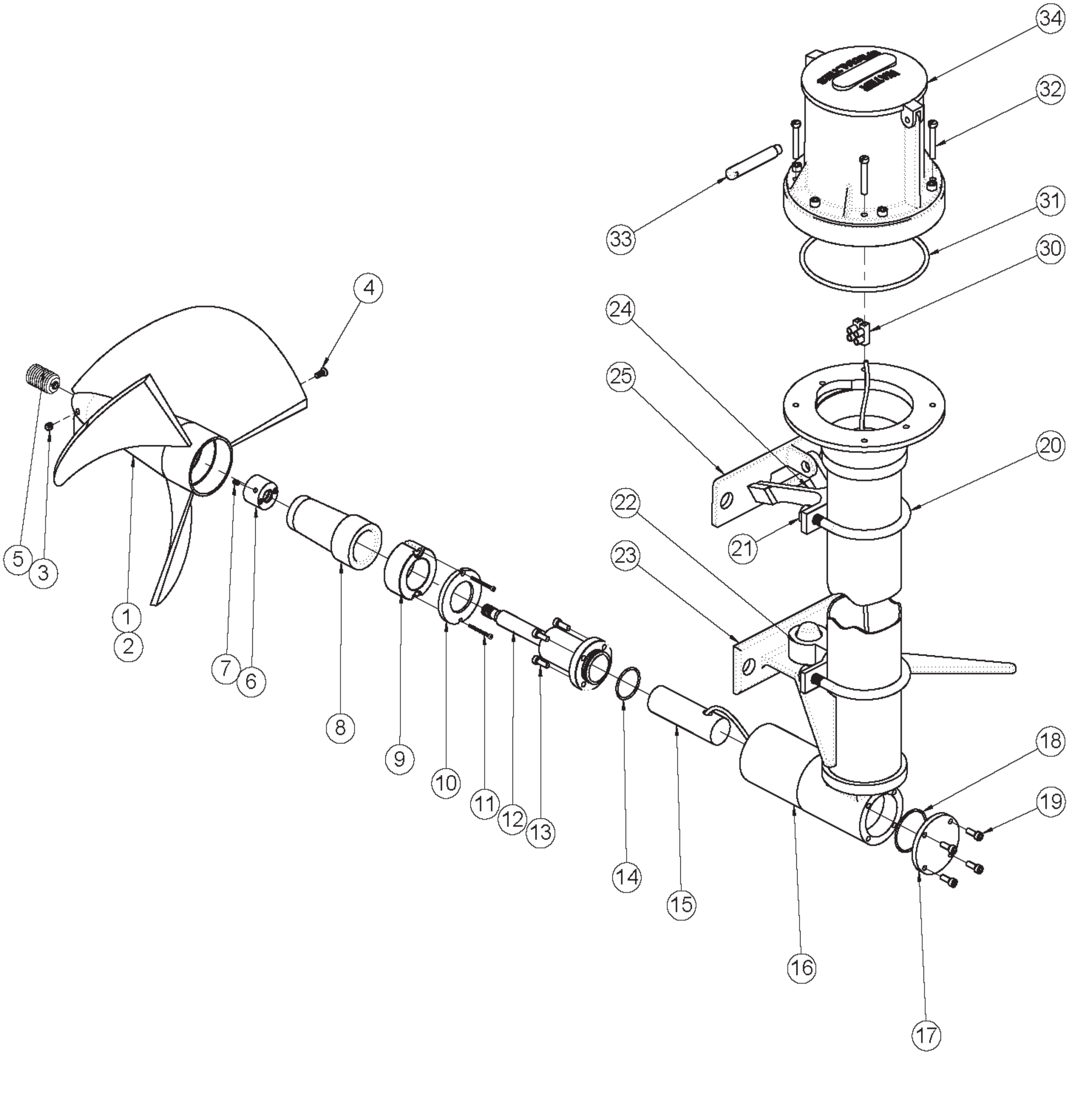
When ordering replacement parts, please specify: ● Meter Size ● Meter Model Meter ● Serial Number

* *INSERT METER SIZE TO COMPLETE PART NUMBER - FOR EXAMPLE: INSERT -10 FOR 10”, -12 FOR 12”, ETC.*

‡ *CONSULT FACTORY TO COMPLETE PART NUMBER.*

CONSULT FACTORY FOR PRICING.

10”-72” ELECTRONIC OPEN FLOW METERS
MODEL OF12D
* MODEL FC101 DIGITAL INDICATOR-TOTALIZER ASSEMBLY
*CERAMIC BEARING CARTRIDGE PROPELLER
*THREADED SPINDLE AND REVERSE THRUST BEARING CARTRIDGE



References to 26-29 not used.

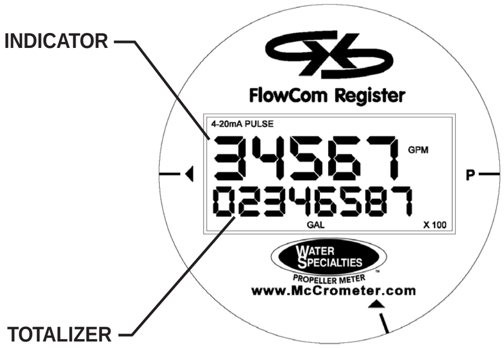
WARNING:

BEFORE REMOVING THE METER FROM THE PIPELINE THE WATER MUST BE TURNED OFF AND PRESSURE MUST BE RELIEVED FROM THE LINE. SERIOUS INJURY CAN RESULT FROM REMOVING A METER HEAD UNDER PRESSURE.

WATER SPECIALTIES ™
PROPELLER METER

MODEL LP32-D

150 psi STRAP-ON SADDLE METER
SOLID STATE ELECTRONIC PROPELLER METER
STAINLESS STEEL STRAP-ON SADDLE
DIGITAL INDICATOR-TOTALIZER
SIZES 6" thru 20"



TYPICAL
DIGITAL INDICATOR-TOTALIZER

DESCRIPTION

MODEL LP32-D STRAP-ON SADDLE METERS are designed for irrigation or other low pressure service up to 150 PSI working pressure. The stainless steel saddle and u-straps permit installation on a wide range of steel, cast iron, plastic (3/16" PVC wall minimum), asbestos, and other pipe materials for each nominal meter size. It is necessary upon ordering to furnish the I.D. dimension of the pipe the meter is to be mounted on, for calibration purposes. The pipe O.D. dimension or wall thickness must also be furnished for proper sizing of the U-straps.

INSTALLATION is made by cutting a hole in the existing pipe line and then attaching the meter securely to the line. U-straps for attaching the meter saddle to the line are furnished with each meter. The meter can be installed horizontally, or inclined on suction or discharge lines. The meter must have a full flow of liquid for proper accuracy. Fully opened gate valves, fittings, or other obstructions that tend to set up flow disturbances should be a minimum of ten pipe diameters upstream and two pipe diameters downstream from the meter. Installations with less than ten pipe diameters of straight pipe require straightening vanes. Meters with straightening vanes require at least five pipe diameters upstream and two pipe diameters downstream. An optional remote mounting kit with up to 100 feet of cable for the indicator-totalizer is available.

PROPELLER is magnetically coupled with the electronic sensor through the sealed gearbox. This completely eliminates water entering the meter assembly, and eliminates all moving parts except for the propeller. The propeller is a conical shaped three bladed propeller, injection molded of thermoplastic material resistant to normal water corrosion and deformity due to high flow velocities.

BEARING in propeller is a water lubricated ceramic sleeve and spindle bearing system with a ceramic/stainless steel spindle. Dual ceramic thrust bearings, standard on all meters, handle flows in both forward and reverse directions. The bearing design promotes extended periods of maintenance free propeller operation.

DIGITAL INDICATOR-TOTALIZER has a non-volatile EEPROM memory to store totalizer count (updated hourly while running). Features a large two line display. Five digit top line indicates flow rate, and eight digit bottom line provides volumetric flow data. Indicator is available in 22 different units, including GPM, CFS, MGD. Totalizer is available in 20 different units, including Gallons, AF, CF. Units of measurement are user-selectable. Battery life is 6 -10 years. Housing is NEMA 4X rated.

Available with optional 4-20mA and/or pulse output.

SPECIFICATIONS

ACCURACY Plus or minus 2% of actual flow within the range specified for each meter size.

PRESSURE RANGE Up to 150 PSI maximum working pressure.

TEMPERATURE RANGE 140° F Maximum. Consult factory for special construction for higher temperatures.

MINIMUM FLOWS As shown for each meter size and construction are required for accurate registration. See flow chart. NOTE: Minimum flow will be higher when auxiliary equipment is added.

MAXIMUM FLOWS As shown for each meter size and construction are rated for continuous operation. See flow chart.

INTERMITTENT FLOWS As shown for each meter size are rated for 10% to 15% of the total time the meter is operating. Consult factory for High Velocity construction when intermittent flows are higher than shown on flow chart and/or when longer operating periods are required.

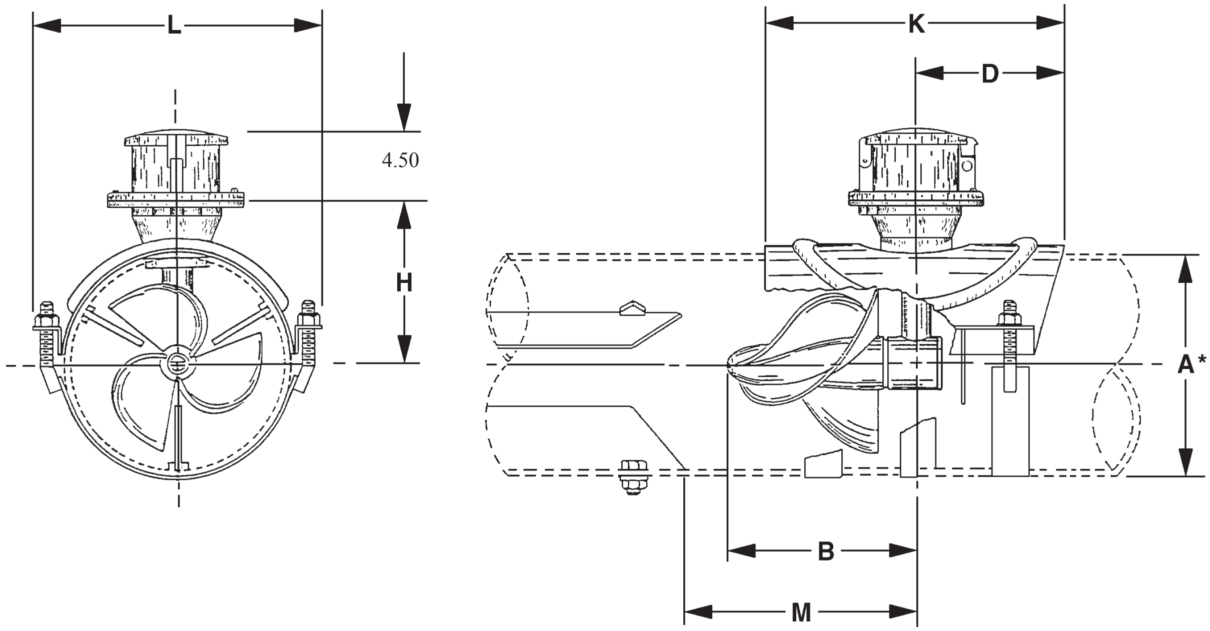
MATERIALS Used in construction are chosen to minimize the corrosive effects of the liquids measured by the meter assembly.
PROPELLER MAGNET - permanent ceramic type
PROPELLER BEARING - ceramic sleeve type
PROPELLER SPINDLE - ceramic sleeve/stainless steel
PROPELLER - injection molded thermoplastic
GEARBOX - cast bronze
SEPARATOR - stainless steel
BOLTS - stainless steel
SADDLE - stainless steel
LUG STRIPS - stainless steel
U-STRAPS - stainless steel

OPTIONAL EQUIPMENT Includes a remote mounting kit with up to 100 feet of cable, digital transmitter, and a wide range of controls and instruments for indicating, totalizing, and recording flow data for each meter. Special constructions and materials are available upon request.

ORDERING INFO Must be specified by the customer and includes: minimum & maximum flow ranges, pipe I.D. and O.D. or wall thickness, position of meter (horizontal, inclined), temperature of meter environment, indicator scale and units, totalizer dial units, type of materials and construction, and optional equipment desired.

MODEL LP32-D

150 psi STRAP-ON SADDLE METER
SOLID STATE ELECTRONIC PROPELLER METER
STAINLESS STEEL STRAP-ON SADDLE
DIGITAL INDICATOR-TOTALIZER
SIZES 6" thru 20"



METER & PIPE SIZE	FLOW RANGES, GPM			DIMENSIONS							SHIPPING WEIGHT POUNDS
	MIN.	MAX.	INT.	A	B	D	H	K	L	M	
6	200	1200	1500	6⅝	8	6	5¼	12	13	10	20
8	250	1500	2000	8⅝	8	6	6¼	12	12½	10	25
10	300	2000	3000	10¾	8	6	7⅜	12	13¼	10	28
12	350	3000	3500	12¾	8	6	8⅜	12	15¼	10	32
14	450	4000	4500	14	8	6	9¼	12	15½	10	35
16	500	5000	6000	16	8	6	10¼	12	17½	10	38
18	800	6000	7500	18	8	6	11¼	12	19½	10	43
20	950	8000	9000	20	8	6	12¼	12	21½	10	49

*** PLEASE SPECIFY PIPE I.D. AND O.D.**

McCROMETER
www.mccrometer.com

3255 WEST STETSON AVENUE • HEMET, CALIFORNIA 92545 USA
TEL: 951-652-6811 • FAX: 951-652-3078

CERTIFIED TEST REPORT

CUSTOMER: ARVIN-EDISON WTR STORAGE

MODEL NO: LP32D-14

METER SERIAL NO: 20120549

CONFIGURATION

METER INSIDE DIAMETER: 14.464

DIAL: AFT X 0.01 8 CFS

INDEX: 1.2358

TEST FACILITY: Volumetric

As Calibrated

CALIBRATION DATA

	FLOW RATE GPM	% ACCURACY
1	3028.16	101.55
2	1897.29	101.27
3	519.17	98.64

TEST DATE: 3/5/2012

CERTIFIED BY: Paul Hobbs **PRINT DATE:** 12/3/2012

This calibration was performed on a gravimetric or volumetric test facility, traceable to the National Institute of Standards and Technology, USA. The estimated flow measurement uncertainty of the calibration facilities are:
Gravimetric +/- 0.15% Volumetric +/- 0.5%

McCROMETER
3255 WEST STETSON AVENUE
HEMET, CA 92545 USA
PHONE (951) 652-6811 / FAX (951) 652-3078
WEB SITE: http://www.mccrometer.com E-MAIL: info@mccrometer.com

20120549

WATER SPECIALTIES
PROPELLER METER ™

6”-20” STRAP-ON ELECTRONIC LOW PRESSURE METERS

MODEL
LP04D, LP12D, LP32D

OPERATION AND MAINTENANCE MANUAL
PARTS LIST

FEATURING:
*CERAMIC BEARING CARTRIDGE
*STAINLESS STEEL SADDLE & U-STRAP
*MODEL FC101 FLOWCOM REGISTER INDICATOR-TOTALIZER
*ONE PIECE SEPARATOR/SPINDLE AND THREADED REVERSE THRUST BEARING CARTRIDGE

McCROMETER
3255 WEST STETSON AVENUE
HEMET, CALIFORNIA 92545 U.S.A.

PHONE: 951-652-6811
FAX: 951-652-3078
VISIT OUR WEBSITE: www.mccrometer.com

WARRANTY

This Warranty shall apply to and be limited to the original purchaser consumer of any McCrometer product. Meters or instruments defective because of faulty material or workmanship will be repaired or replaced, at the option of McCrometer, free of charge, FOB the factory in Hemet, California, within a period of one (1) year from the date of delivery.

Repairs or modifications by others than McCrometer or their authorized representatives shall render this Warranty null and void in the event that factory examination reveals that such repair or modification was detrimental to the meter or instrument. Any deviations from the factory calibration require notification in writing to McCrometer of such recalibrations or this Warranty shall be voided.

In case of a claim under this Warranty, the claimant is instructed to contact McCrometer, 3255 W. Stetson Ave., Hemet, California 92545, and to provide an identification or description of the meter or instrument, the date of delivery, and the nature of the problem.

The Warranty provided above is the only Warranty made by McCrometer with respect to its products or any parts thereof and is made expressly in lieu of any other warranties, by course of dealing, usages of trade or otherwise, expressed or implied, including but not limited to any implied warranties of fitness for any particular purpose or of merchantability under the uniform commercial code. It is agreed this Warranty is in lieu of and buyer hereby waives all other warranties, guarantees or liabilities arising by law or otherwise. Seller shall not incur any other obligations or liabilities or be liable to buyer, or any customer of buyer for any anticipated or lost profits, incidental or consequential damages, or any other losses or expenses incurred by reason of the purchase, installation, repair, use or misuse by buyer or third parties of its products (including any parts repaired or replaced); and seller does not authorize any person to assume for seller any other liability in connection with the products or parts thereof. This Warranty cannot be extended, altered or varied except by a written instrument signed by seller and buyer.

This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

McCrometer reserves the right to make improvements and repairs on product components which are beyond the Warranty period at the manufacturer's option and expense, without obligation to renew the expired Warranty on the components or on the entire unit. Due to the rapid advancement of meter design technology, McCrometer reserves the right to make improvements in design and material without prior notice to the trade.

All sales and all agreements in relation to sales shall be deemed made at the manufacturer's place of business in Hemet, California and any dispute arising from any sale or agreement shall be interpreted under the laws of the State of California.

ELECTRONIC LOW PRESSURE METER
INDEX

ELECTRONIC LOW PRESSURE METER
INSTALLATION

I. UNCRATING. When uncrating the meter, any damage due to rough or improper handling should be reported to the transportation firm and McCrometer. If for any reason it is determined that the unit or parts of the unit should be returned to the factory, please contact McCrometer for clearance prior to shipment. Each unit must be properly crated to prevent any further damage. The factory assumes no responsibility for equipment damage in return shipment due to improper packaging. The shipping crate contains the following items:

Low Pressure Meter Assembly with FC101..................1
Mounting Equipment as required....................................-
Operation and Maintenance Manual..............................1
Tool T-2402X-1...1

II. INSTALLATION of McCrometer Low Pressure Electronic Meters varies depending upon the type and model of meter selected for each application. The meter must have a full flow of liquid for proper accuracy. Fully opened gate valves, fittings or other obstructions that tend to set up flow disturbances should be a minimum of ten pipe diameters upstream and two pipe diameters downstream from the meter. Installations with less than ten pipe diameters of straight pipe require straightening vanes. Meters with straightening vanes require at least five pipe diameters upstream and one pipe diameter downstream from the meter. The meter installations fall into three basic categories:

1. FLANGED TUBE METERS can be installed exactly as you would install any short length of flanged pipe. Flanged ends are standard pattern and drilling for any meter size.

2. PLAIN END TUBE METERS can be installed similar to replacing a short length of plain end pipe in the line by either welding, or by using one of a variety of pipe couplings available. **Note:** Meter saddle assembly (#23) should be removed before welding. (See step IV.)

3. STRAP-ON SADDLE METERS can be installed on an existing pipeline by cutting a hole of proper size in the existing pipeline. The installation steps outlined below should be followed carefully to achieve proper mounting of the meter:

A. ALIGN the cutout template in the desired position for the meter on the pipe. Make certain that the center line of the pipe and the center line marked on the template are parallel with each other.

B. MARK the pipe using a center punch as indicated on the cutout template. These marks will help to properly align the saddle over the cutout opening.

C. SCRIBE the pipe along the line specified for your meter size cutout.

D. CUT OUT the section of pipe within the scribed line and remove all burrs, slag, and rough edges from the inside and outside of the cutout section.

E. STRAIGHTENING VANES are recommend when there are less than ten pipe diameters of straight pipe (no fittings or obstructions) directly upstream from the meter location. Straightening vanes are available from the factory. (See Straightening Vane Installation Instructions if required for your meter.)

F. METER ASSEMBLY should be placed on the pipe with the "D" shaped ring gasket in position on the bottom of the saddle. The saddle must be positioned so that the D-ring maintains contact with the surface of the pipe completely around the cutout opening. Align the centerline of the saddle with centerline of the pipe and locate the saddle so that it is exactly between, and aligned with, the center punch marks on the pipe. Each edge of the meter saddle should be approximately 1/8" from the center punch mark on the pipe. U-Strap nuts should be tightened evenly. **WARNING**: Customers are warned that the U-Strap nuts are to be tightened evenly to approximately 30 foot pound torque. This is sufficient to seal the saddle to the pipeline. Additional tightening may be required to seal the saddle on rough or irregular pipe.

ELECTRONIC LOW PRESSURE METER INSTRUCTION AND MAINTENANCE MANUAL

III. MCCROMETER products have been carefully designed to be as maintenance free as possible. Periodic preventive maintenance, however, is highly recommended and should be practiced according to schedule to assure continuous accuracy and trouble-free performance of your propeller meters. The maintenance and inspection procedure can also be used as a guide to locating a problem in the unit that may be the cause of abnormal meter operation.

Routine preventative maintenance should be performed on all meters, which includes cleaning and an inspection of the propeller and its bearing. The interval between inspections depends on the water quality and the usage of the meter. The initial inspection should be performed after one to two years of service to determine the period between future inspections. After five to ten years, the complete meter should be inspected to ensure years of dependable service.

IV. METER SADDLE ASSEMBLY (#23) should be removed from the service line by removing the U-strap nuts (#27) and lifting up the rear (downstream) portion of the meter saddle (#23), carefully pulling the assembly back (downstream) and up at the same time to allow the propeller (#2) to clear the cutout opening in the pipeline so the meter can be lifted free. Inspect the meter saddle D-ring (#22) for any sign of damage and replace, if necessary. Replace the meter assembly (#23) with a dummy cover saddle if the service line is to remain in operation.

V. WORKING AREA chosen for disassembly and reassembly of the meter components should be clean to reduce the chance of dust or dirt particles being introduced into the propeller area.

VI. DISASSEMBLY AND INSPECTION OF METER includes cleaning the propeller assembly (#1), ceramic sleeve bearing (#8), separator assembly (#12) and drive magnet (#9).

1. PROPELLER REMOVAL can be accomplished by first removing the thrust bearing cartridge assembly (#5). Loosen the set screw (#3) in the side of the nose of the propeller. Remove the thrust bearing cartridge (#5) by turning it counterclockwise while holding the propeller in place.

2. REVERSE THRUST BEARING CARTRIDGE (#6) must now be removed. Turn the propeller (#2) so that the Allen wrench clearance hole is lined up with the set screw in the side of the reverse thrust bearing cartridge (#6). The location of the set screw is marked by a small hole drilled in the face of the reverse thrust bearing cartridge. With a 5/64 inch Allen wrench, loosen the set screw (#7) in the reverse thrust bearing cartridge (#6) <u>two to three turns</u>, which will allow the cartridge to be unscrewed without damaging the spindle thread. **Note:** If the bearing area appears to be clogged with dirt or sediment, making it difficult to locate the set screw (#7) or to allow the Allen wrench to fit into the set screw socket, then the bearing area should be flushed out with water. Insert Tool T-2402X-1 into the propeller through the threaded nose. The tabs in the tool should engage in the screwdriver slot in the end of the reverse thrust bearing cartridge (#6). Remove the propeller assembly (#1) and reverse thrust bearing cartridge (#6) by turning Tool T-2402X-1 counterclockwise, unscrewing the reverse thrust bearing cartridge (#6) from the spindle (#12). The propeller assembly with reverse flow cartridge will now slide off the spindle. **WARNING:** If the reverse thrust cartridge does not unscrew easily, it may be because the set screw was not unscrewed enough. If unscrewing the reverse flow cartridge is continued with the set screw binding on spindle thread, damage to thread could occur.

3. WATER LUBRICATION of the ceramic sleeve bearing (#8) is achieved by means of two openings in the end of the thrust bearing cartridge (#5) which allows air to be purged from the bearing area. These should be cleared of any foreign material by running a small wire through the holes on either side of the screwdriver slot.

4. CERAMIC BEARING CARTRIDGE (#8) and drive magnet (#9) should be cleaned of any foreign material and inspected for damage. Using a bottle brush, thoroughly clean the ceramic bearing surface (#8) and the magnet inside diameter (#9). After cleaning the propeller, flush the inside out with water. The outside surfaces of the propeller should also be cleaned to assure a smooth, unrestricted flow across the surface of the propeller. Do not use an oil-based solvent in cleaning, as damage to the assembly could occur.

5. SPINDLE CERAMIC SLEEVE and the O.D. or surface of the separator should be cleaned and inspected for any substantial amount of wear. The reverse thrust bearing (#6) should be checked for any damage. If it is determined that the spindle ceramic sleeve or separator are worn sufficiently, the separator/support spindle assembly (#12) should be replaced.

6. SEPARATOR / SUPPORT SPINDLE ASSEMBLY (#12) can be removed for replacement by removing the four mounting screws (#13) which thread into the gearbox. The separator O-ring (#14) should be replaced and the new O-ring (#14) covered with a thin coat of silicone grease. The separator/support spindle assembly (#12) can then be replaced in the front of the gearbox (#16) with a firm push, gently rotating the assembly at the same time. Replace and tighten the four mounting screws (#19).

VII. REASSEMBLING METER

1. PROPELLER INSTALLATION is accomplished by following these steps:

a) The reverse thrust cartridge set screw (#7) should be protruding out of the reverse thrust bearing cartridge so it will not bind up on the spindle thread. **Note:** Look through the end of the propeller and hole in the reverse thrust cartridge to be sure the set screw is not showing.

b) Slide the propeller assembly onto the support spindle (#12) until the reverse thrust bearing cartridge (#6) contacts the threads on the end of the spindle (#12). Using Tool T-2402X-1, thread the reverse thrust bearing cartridge onto the spindle. If you feel any resistance when threading the reverse thrust cartridge on, stop at once and check to be sure the set screw is not binding on the thread. Be careful not to cross-thread the reverse thrust bearing cartridge. Thread the reverse thrust bearing cartridge (#6) onto the spindle (#12) until the trailing edge of the propeller contacts the gearbox (#16). Set the proper end play by inserting a 5/64" Allen wrench into the reverse thrust bearing set screw (through the side of the propeller) and loosening the reverse thrust bearing cartridge (#6) one half turn counterclockwise. Tighten the set screw in reverse thrust bearing cartridge. There should be approximately .02" clearance between the gearbox (#16) and trailing edge of the propeller when the propeller in pulled forward (away from the gearbox). The propeller must not contact the gearbox.

2. THRUST BEARING CARTRIDGE ASSEMBLY (#5) should be inspected for damage and replaced in the nose of the propeller. The thrust bearing cartridge (#5) is used to adjust the amount of longitudinal end play of the propeller assembly on its spindle (#12), which should be about 1/64 inch. End play can be adjusted by turning the thrust bearing cartridge assembly (#5) clockwise until it tightens against the end of the support spindle (#12), then turning thrust bearing cartridge (#5) counterclockwise 1/8 of a turn. Tighten set screw (#3). Check the longitudinal end play of the propeller to insure it's not excessive and does not allow the propeller (#2) to contact the gearbox (#16). Check the clearance between the propeller (#2) and gearbox (#16). The clearance should be approximately .01" between the gearbox (#16) and trailing edge of the propeller when the propeller is pushed back (toward the gearbox). The propeller assembly (#1) must spin freely.

3. PROPELLER BEARING (#1) can be checked for excessive radial play by rocking the propeller (#2) gently from side to side on the spindle (#12). Some play is required for proper operation of the water lubricated ceramic sleeve bearing.

VIII. SENSOR AND FC101 DIGITAL INDICATOR-TOTALIZER

1. FC101 DIGITAL INDICATOR (#34) should not be removed from the meter unless battery or sensor replacement is required. If the unit must be removed, proceed as follows:

2. FC101 (#34) can be removed from meter head by removing the four screws (#32) then slightly lifting unit up and turning over to disconnect the 2-lead sensor wires from the bottom of the FC101. If the meter is equipped with a transmitter, the transmitter wires must also be disconnected.

3. SENSOR HOUSING should be removed only if replacement is necessary. The sensor can be taken out of the separator after removing the gearbox backplate (#17). Once the backplate is removed, pull the sensor wire and sensor assembly out of the back of the gearbox.

4. BEFORE REPLACING THE SENSOR be sure the separator is dry. Slide sensor housing and wire assembly into the separator until it stops against the inside of separator. **Note:** It does not make any difference what rotation position sensor is installed, however, wire must be positioned toward back (open end) of separator. Feed the sensor wire up through the gearbox and out the meter head.

5. LITHIUM BATTERY should offer 6 to 10 years of operation. The FC101 has a low battery display that comes on when approximately six months of life is remaining. The battery should test at least 2.8 to 3.6 volts to be considered good. **NOTE: Batteries should be disposed of in an environmentally safe manner.**

6. THE FC101 DIGITAL INDICATOR-TOTALIZER (#34) can now be installed in one of four positions for more convenient reading with four screws (#32).

IX. PRIOR TO INSTALLING METER

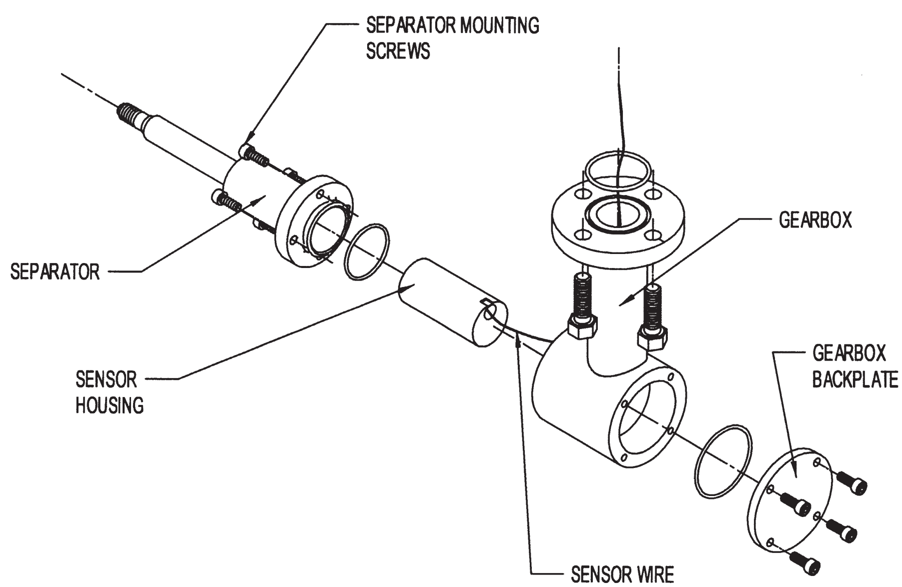
1. PROPELLER ASSEMBLY (#1) should be dipped in water to lubricate the propeller ceramic sleeve bearing (#8). Spin the propeller (#2) gently to make certain the meter operates smoothly and no bind or drag is apparent.

2. FC101 (#34) and sensor (#15) should be checked to be sure they are connected and that the battery is good. Turn the propeller by hand at a fairly fast even speed and the indicator should display a flow rate.

3. METER SADDLE D-RING (#22) should be inspected for any sign of damage and covered with a thin coat of silicone grease. The meter can now be installed in the service line. (See step II-F for proper installation.) When replacing the meter on the line, make certain that the top of the pipeline is smooth and free of any foreign material. Make certain that no foreign materials are attached to the inside of the service line pipe, as any flow disturbance or obstruction may affect the accuracy of the meter.

X. ORDERING PARTS OR RETURN TO FACTORY

Inspection of all meter components that may be replaced in the field has been accomplished at this point. Should any of the meter parts, upon inspection, appear to be damaged or excessively worn, they must be replaced to assure proper meter operation and prevent further damage. Cost for replacement parts not covered by warranty are available by contacting the factory. If it is determined that the meter should be returned for repair, please notify McCrometer prior to shipment. Each meter must be properly packaged to prevent damage to the meter in shipment.



NOTES

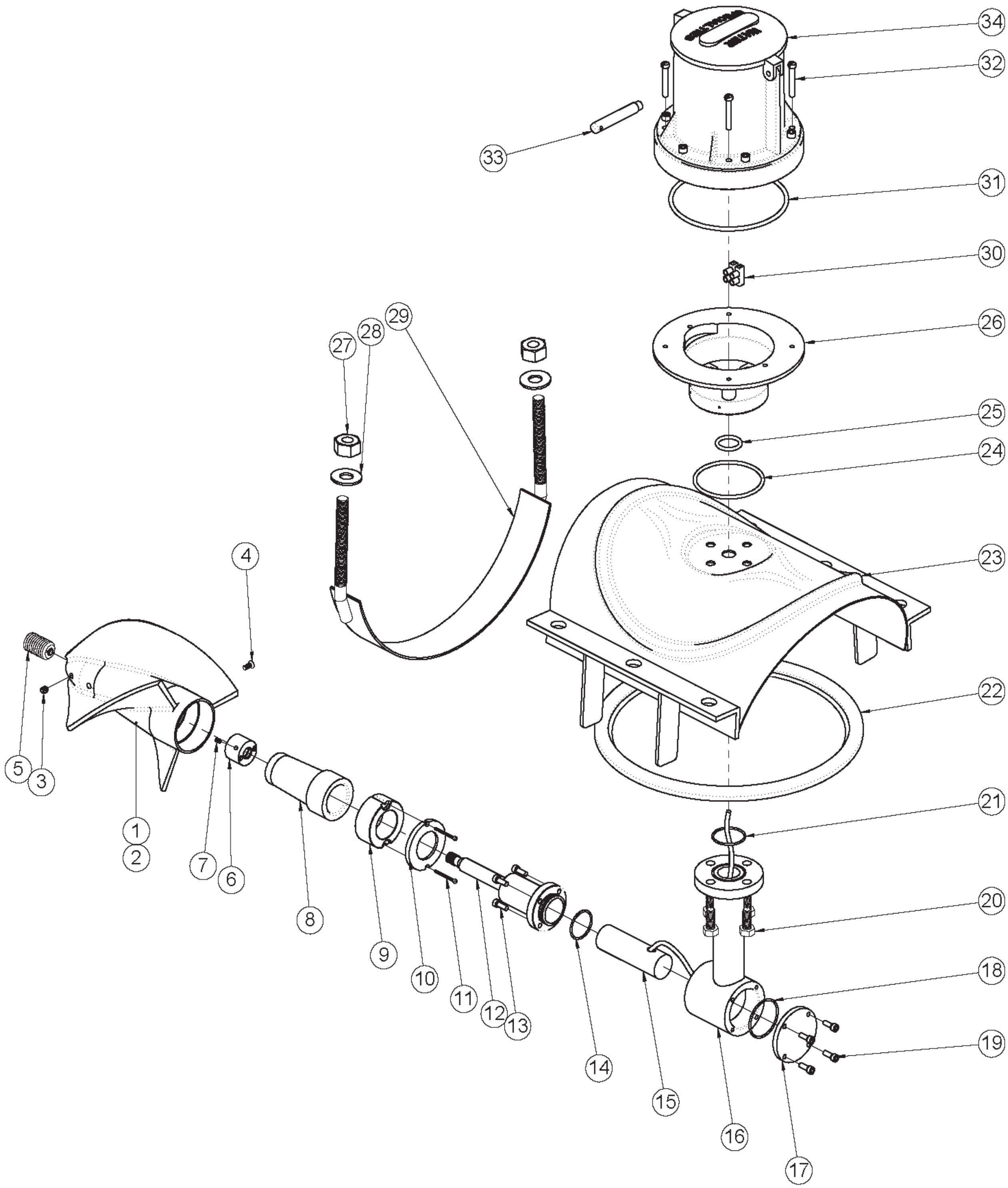
6”-20” STRAP-ON LOW PRESSURE METERS
MODEL LP04D, LP12D, LP32D
PARTS LIST

No.	QTY	Part Number	Description
none	1	7-MLI1D-*	Model MLI1D Main Line Meter Head Assembly
1	1	5-2425-‡-PT	Propeller Assembly (Items 2 thru 8)
2	1	3-2425-‡-P	Propeller
3	1	1-1125-6	Set Screw, Nylon Point
4	1	1-1116-8-6	Screw, Bearing Cartridge Mounting
5	1	3-2356	Thrust Bearing Cartridge Assembly
6	1	3-2402-2	Reverse Thrust Bearing Cartridge Assembly (Items 6 and 7)
7	1	1-1101-8-5	Set Screw, Reverse Thrust Bearing
8	1	2-2426-P-1	Ceramic Bearing Cartridge
9	1	2-1601-2	Drive Magnet
10	1	1-2428-‡	Drive Magnet Retaining Plate
11	2	1-1115-3-18	Screw, Magnet Retaining Plate (each)
12	1	4-2455-2	Separator/Support Spindle Assy
13	4	1-1103-8-7	Screw, Separator/Spindle Mounting (each)
14	1	1-1551-24	O-ring, Separator
15	1	4-2730-3-‡	Sensor Housing, Sensor and Wire Assembly
16	1	2-2238-*	Gearbox
17	1	2-2731	Gearbox Backplate
18	1	1-1551-2	O-ring, Gearbox Backplate
19	4	1-1103-8-7	Screw, Gearbox Backplate Mounting (each)
20	4	1-1251-5-12	Bolt, Gearbox Mounting (each)
21	1	10110-10	O-ring, Gearbox
22	1	1-1552-23	D-Ring Meter Saddle
23	1	3-2414-‡‡	Meter Saddle Assembly
24	1	1-1551-25	O-Ring, Meter Head - Outer
25	1	1-1551-50	O-Ring, Meter Heat - Inner
26	1	2-2440	Meter Head (Sizes 6” thru 20”)
27	6	1-1211-1	Nut, U Strap (each)
28	6	1-1301-14	Washer, U Strap Bolt (each)
29	3	3-2437-*	U Strap Assembly (each)
30	1	1-1707-19 or -20	InLine Terminal (19) 2 Wire (-20) 3 Wire For Remote
31	1	1-1551-38	O-Ring - 243 Buna
32	4	10605	Screw 10-32 x 1.25” Long
33	1	FC101-M	Magnet Wand
34	1	FC101-*	FC101 Flowcom Ind.-Tot. & Bonnet Complete - See IOM Manual
none	1	10015-00K	Desiccant Bag

**Insert meter size to complete part number - for example: use -06 for 6”, -08 for 8”, etc.)*
‡Consult factory to complete part number
‡‡Insert -06 for 6”; -08 for 8” - 20”

When ordering replacement parts, please specify:
• Meter Size • Meter Model • Meter Serial Number
Contact Factory For Pricing.

6”-20” STRAP-ON LOW PRESSURE METERS
MODEL LP04D, LP12D, LP32D
*MODEL FC101 INDICATOR-TOTALIZER ASSEMBLY
*CERAMIC BEARING CARTRIDGE PROPELLER
*ONE PIECE SEPARATOR/SPINDLE & THREADED REVERSE THRUST BEARING CARTRIDGE



WARNING:

BEFORE REMOVING THE METER SADDLE FROM THE PIPELINE THE WATER MUST BE TURNED OFF AND PRESSURE MUST BE RELIEVED FROM THE LINE. SERIOUS INJURY CAN RESULT FROM REMOVING A METER SADDLE UNDER PRESSURE.

ARVIN-EDISON WATER STORAGE DISTRICT

EXHIBIT B

LIST OF DISTRICT MEASUREMENT DEVICES

ARVIN-EDISON WATER STORAGE DISTRICT

DISTRICT TURNOUT MEASUREMENT DEVICE SUMMARY (NORTH SIDE)

N55-P1

C- 3	VF
C- 6	VF
C- 11	VF
C- 15	REMOVED
C- 19	VF
C- 20	VF
C- 21	VF
C- 25	VF
C- 26	VF
C- 27	VF
C- 86	VF
C- 93	VF
C- 94	VF
C- 96	VF
C- 101	VF
C- 103	VF
C- 104	REMOVED
C- 108	VF
C- 111	VF

N55-P2

C- 23	VF
C- 24	VF
C- 30	VF
C- 31	VF
C- 32	VF
C- 33	VF
C- 34	VF
C- 35	VF
C- 38	VF
C- 39	VF
C- 40	VF
C- 43	VF
C- 44	VF
C- 45	VF
C- 46	VF
C- 55	VF
C- 56	VF
C- 82	VF
C- 83	VF
C- 97	VF
C- 105	VF
C- 106	VF
C- 107	VF

N55-P3

C- 49	VF
C- 50	VF
C- 51	VF
C- 53	VF
C- 54	VF
C- 61	VF
C- 62	VF
C- 63	VF
C- 84	REMOVED
C- 91	REMOVED
C- 92	VF
C- 99	VF
C- 109	VF
C- 110	VF

N55-P4

C- 64	VF
C- 65	VF
C- 66	VF
C- 67	VF
C- 68	VF
C- 69	VF
C- 70	VF
C- 71	VF
C- 72	VF
C- 73	VF
C- 74	VF
C- 80	VF

N55-P5

C- 76	VF
C- 77	VF
C- 78	VF
C- 79	VF
C- 85	VF

N55-P6

C- 7	VF
C- 9	VF
C- 10	VF
C- 95	VF
C- 98	VF
C- 100	VF

N55-P7

C- 2	VF
C- 5	VF

N55-P8

C- 1	VF
C- 4	VF
C- 8	VF

N55-P9

C- 13	VF
C- 14	VF
C- 17	VF
C- 18	VF

N55-P10

C- 12	VF
C- 16	VF

N55-P11

C- 22	VF
C- 28	VF
C- 36	VF

N55-P12

C- 41	VF

N55-P13

C- 48	VF
C- 58	VF
C- 59	VF

N55-P14

C- 37	VF
C- 42	VF
C- 90	VF
C- 102	VF

N55-P15

C- 81	VF

N1-P1

E- 33	VF
E- 39	VF
E- 40	VF
E- 43	VF
E- 45	VF
E- 46	VF
E- 49	VF
E- 52	REMOVED
E- 53	VF
E- 55	REMOVED
E- 56	REMOVED
E- 57	REMOVED
E- 58	VF
E- 61	VF
E- 63	ML
E- 68	VF
E- 69	REMOVED
E- 70	VF
E- 72	VF
E- 75	REMOVED
E- 76	REMOVED
E- 79	VF
E- 82	VF
E- 83	REMOVED
E- 89	VF
E- 91	VF
E- 95	VF
E- 98	REMOVED
E- 100	VF
E- 101	VF
E- B	VF
E- C	VF

N1-P2

E- 17	VF
E- 21	REMOVED
E- 24	VF
E- 26	VF
E- 28	REMOVED
E- 29	VF
E- 31	VF
E- 32	VF
E- 36	VF
E- 37	VF
E- 38	VF
E- 62	VF
E- 66	VF
E- 77	VF
E- 92	VF
E - 102	VF
E - 103	VF

N1-P3

E- 8	VF
E- 9	VF
E- 11	VF

N1-P4

E- 1	VF
E- 2	VF
E- 3	VF
E- 5	VF
E- 6	VF
E- 7	VF
E- 12	REMOVED
E- 13	REMOVED
E- 14	REMOVED

N1-P5

E- 35	VF
E- 41	VF
E- 42	VF
E- 59	VF
E- 78	VF
E- 94	ML
E- 97	VF

N1-P6

E- 25	REMOVED
E- 27	VF
E- 65	VF
E- 80	ML
E- 81	VF
E- 85	VF
E- 86	ML
E- 87	ML
E- 88	REMOVED
E- 96	VF
E- 99	VF

N1-P7

E- 50	REMOVED
E- 51	REMOVED
E- 60	REMOVED
E- 84	ML
E- 90	REMOVED
E- 93	ML

existing served from N1-P1

N1-P8

E- 4	VF
E- 10	VF
E- 15	VF
E- 16	VF
E- 19	VF
E- 20	VF
E- 22	REMOVED
E- 23	VF

N8-P1

A- 50	VF
A- 56	VF
A- 72	VF
A- D	VF

N8-P2

A- 45	VF
A- 46	VF
A- 49	VF
A- 59	REMOVED
A- 60	VF
A- 61	VF
A- 65	VF
A- 66	VF
A- 67	VF
A- 68	VF
A- 70	VF
A- 83	VF
A- C	VF

N8-P3

A- 44	VF
A- 47	VF
A- 48	VF
A- 51	VF
A- 52	Blind Flange
A- 54	VF
A- 55	VF
A- 64	VF
A- 73	VF
A- 85	VF

N8-P4

A- 53	REMOVED
A- 57	VF
A- 58	VF
A- 62	VF
A- 63	VF
A- 69	VF
A- A	VF

N24-P1

A- 33	REMOVED
A- 34	VF
A- 38	VF
A- 41	VF
A- 42	VF
A- 74	VF
A- 78	VF
A- 79	VF
A- 81	VF
A- 82	VF
A- B	VF

N41-P1

A- 1	VF
A- 2	VF
A- 4	VF
A- 5	VF
A- 8	VF
A- 9	VF
A- 10	VF
A- 11	VF
A- 12	VF
A- 13	VF
A- 14	VF
A- 15	VF
A- 19	VF
A- 20	VF
A- 21	VF
A- 22	VF
A- 25	VF
A- 26	VF
A- 32	VF
A- 37	VF
A- 77	VF
A- 84	LP
A- 88	ML

N41-P2

A- 30	VF
A- 31	VF
A- 35	VF
A- 36	VF
A- 71	VF

GRAVITY

NC-B	ML
NC-C	ML
NC-E	ML
NC-G	ML
NC-H	ML
A- 27	ML
A- 86	LP
A- 87	ML
A- 89	ML
SW-1	VF
SW-2	VF
SW-3	VF

NOT IN SERVICE

END OF LINE PLANTS

TEMPORARY WATER ONLY

ARVIN-EDISON WATER STORAGE DISTRICT

DISTRICT TURNOUT MEASUREMENT DEVICE SUMMARY (SOUTH SIDE)

S31-GRV	
T- 48	VF
T- 49	VF
T- 65	VF
T- 67	VF
T- 68	VF
T- 69	VF
T- 70	VF
T- 71	VF
T- 85	VF
T- 90	OF

S32-P1	
T- 43	VF
T- 45	VF
T- 81	VF

S38-P1	
T- 42	VF
T- 44	VF
T- 47	VF
T- 57	VF
T- 62	VF
T- 72	VF
T- 76	VF
T- 77	VF
T- 78	VF
T- 79	VF
T- 83	VF
T- 84	VF

S38-P2	
T- 14	VF
T- 15	VF
T- 18	VF
T- 19	VF
T- 23	VF
T- 24	VF
T- 30	VF
T- 31	VF
T- 32	VF
T- 37	VF
T- 38	VF
T- 39	VF
T- 46	VF
T- B	VF

S64-P1	
T- 16	VF
T- 17	VF
T- 21	VF
T- 22	VF
T- 25	VF
T- 26	VF
T- 27	VF
T- 28	VF
T- 29	VF
T- 33	VF
T- 34	VF
T- 35	VF
T- 36	VF
T- 40	VF
T- 74	VF
T- 75	VF
T- 82	VF
T- 94	VF

S64-P2	
T- 7	VF
T- 8	VF
T- 9	VF
T- 10	VF
T- 11	VF
T- 12	VF
T- 13	VF
T- 50	VF
T- 89	VF

S64-P3	
T- 1	VF
T- 2	VF
T- 3	REMOVED
T- 4	VF
T- 5	VF
T- 6	VF
T- 51	VF
T- 52	VF
T- 53	VF
T- 54	VF
T- 55	VF
T- 56	VF
T- 93	VF
T- A	VF

S68-P1	
W- 39	VF

S73-P1	
W- 23	VF
W- 24	VF
W- 25	VF
W- 26	REMOVED
W- 27	VF
W- 28	VF
W- 30	VF
W- 32	VF
W- 33	VF
W- 34	VF
W- 35	VF
W- 38	REMOVED
W- 69	REMOVED
W- 76	VF
W- 77	VF
W- B	VF

S73-P2	
W- 9	VF
W- 10	VF
W- 12	VF
W- 13	VF
W- 14	VF
W- 15	VF
W- 16	VF
W- 17	VF
W- 18	VF
W- 19	VF
W- 20	VF
W- 21	VF
W- 22	VF
W- A	VF

S73-P3	
W- 3	VF
W- 4	VF
W- 5	VF
W- 6	VF
W- 64	VF
W- 65	VF
W- 66	VF
W- 67	VF
W- 68	VF
W- 79	VF
W- 85	VF

S73-P4	
W- 1	VF
W- 2	VF
W- 63	VF

S73-GRV	
W- 40	VF
W- 42	VF
W- 49	VF

S78-GRV	
W- 41	VF
W- 43	VF
W- 44	VF
W- 50	VF
W- 51	VF

S88-P1	
W- 29	VF
W- 36	VF
W- 37	VF
W- 72	VF
W- 73	VF
W- 74	VF

S88-GRV	
W- 45	VF
W- 46	VF
W- 47	REMOVED
W- 48	REMOVED
W- 52	VF
W- 53	VF
W- 54	VF
W- 55	VF
W- 56	VF
W- 57	VF
W- 59	VF
W- 60	VF
W- 61	VF
W- 62	VF
W- 75	VF
W- 78	REMOVED
W- C	VF

S93-GRV	
M- 4	VF
M- 8	VF
M- 10	VF
M- 11	VF
M- 12	VF
M- 14	VF
M- 19	VF
M- 21	VF
M- 22	VF
M- 23	VF
M- 29	VF
M- 30	VF
M- 31	VF
M- 34	VF
M- 35	VF
M- 36	VF
M- 39	VF
M- 40	VF
M- 44	VF
M- 47	VF
M- 48	VF
M- 49	VF
M- 55	VF

GRAVITY	
SC- A	LP
SC- A1	LP
SC- B	LP
SC- C	ML
SC- D	ML
SC- H	VF
SC- J	VF
TW- 1	VF
TW- A	VF
T- 80	ML
T- 91	OF
T- 86	ML
T- 87	LP
T- 88	OF
T- 92	ML
W- 80	OF
W- 81	ML
W- 82	ML
W- 83	ML
W- 86	ML

S93-P1	
M- 2	VF
M- 5	VF
M- 6	VF
M- 7	VF
M- 15	VF
M- 16	VF
M- 17	VF
M- 20	VF
M- 24	VF
M- 25	VF
M- 56	VF
M- 59	ML

S93-P2	
M- 1	VF
M- 9	VF
M- 18	VF
M- 26	VF
M- 27	VF
M- 33	VF
M- 57	VF
M- 58	VF

S93-P3	
M- 28	VF
M- 32	VF
M- 37	VF
M- 38	VF
M- 41	VF
M- 42	VF
M- 43	VF
M- 45	VF
M- 46	VF
M- 50	VF
M- 51	VF
M- 52	VF
M- 53	VF
M- 54	VF

NOT IN SERVICE

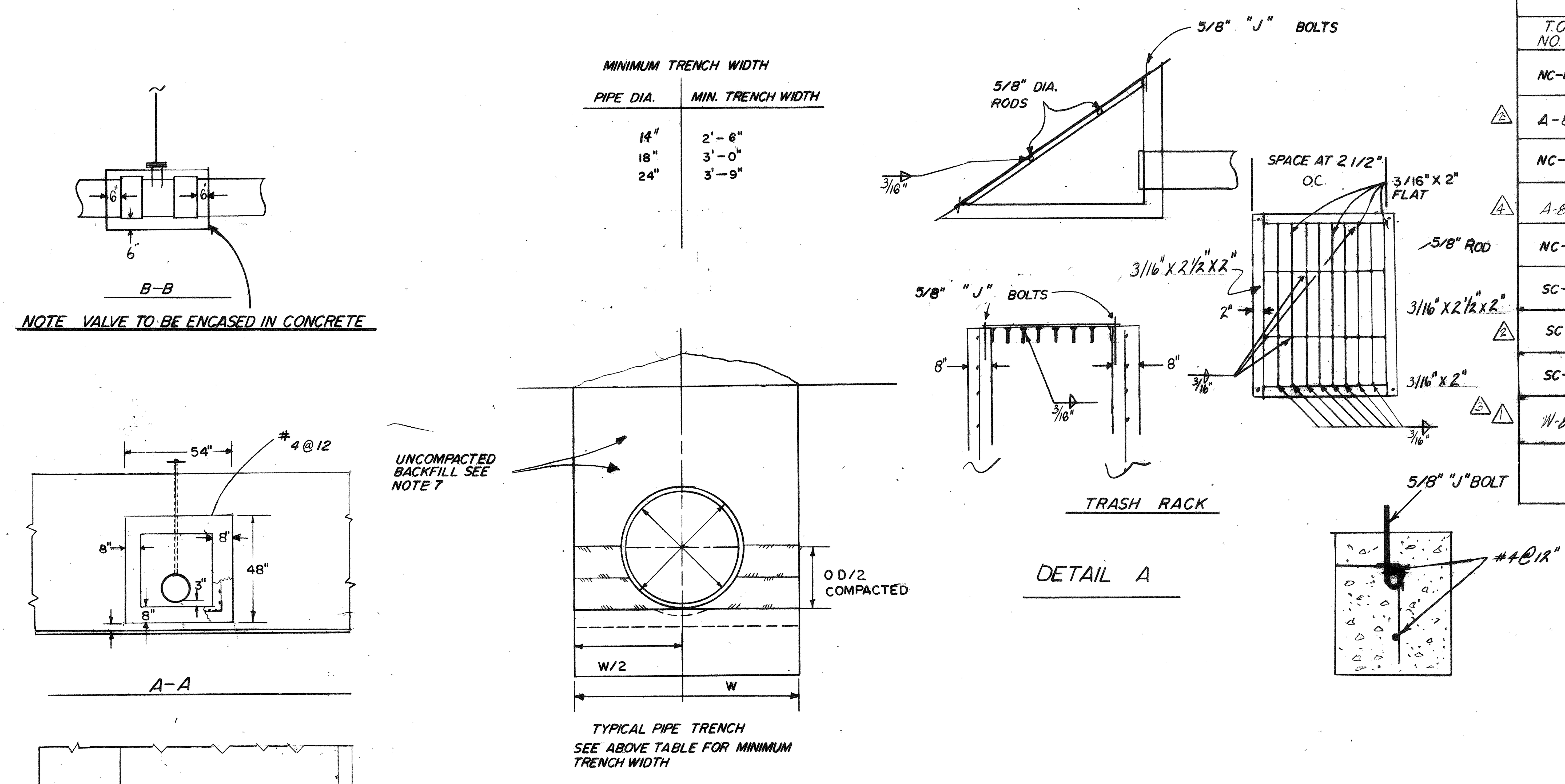
END OF LINE PLANTS

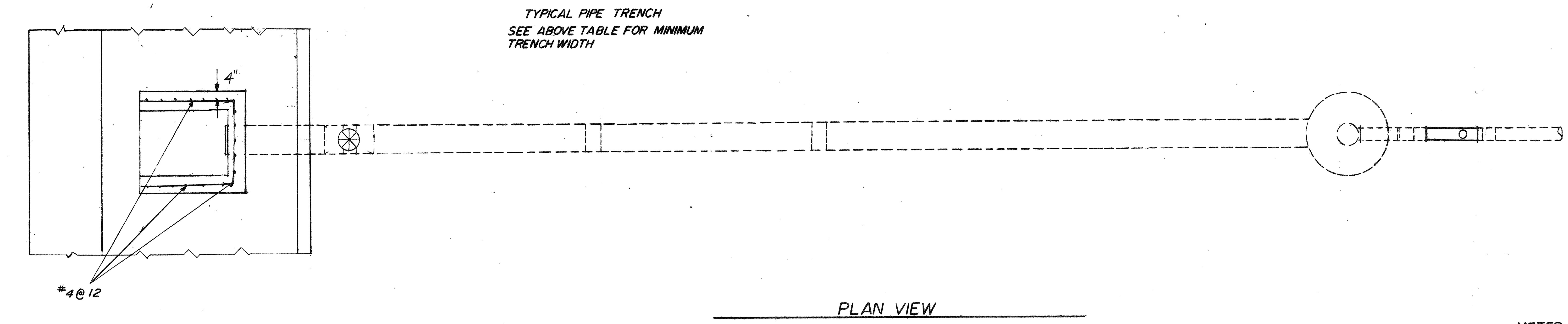
TEMPORARY WATER ONLY

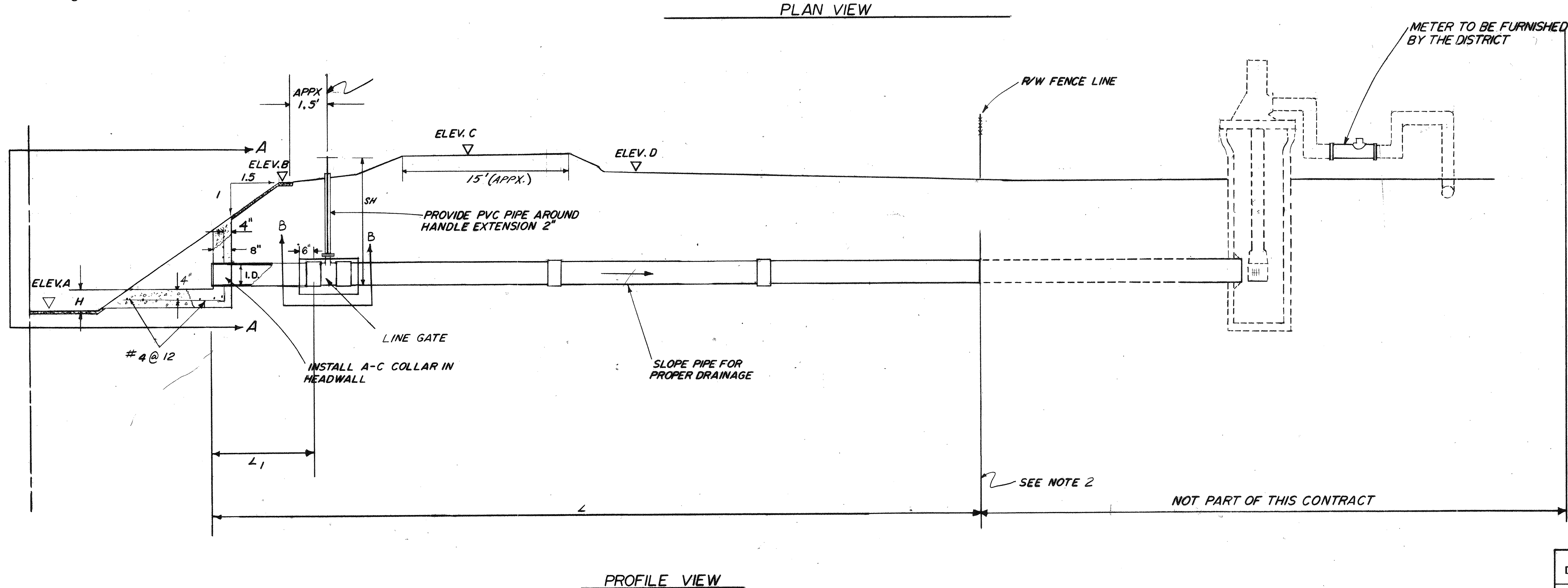
ARVIN-EDISON WATER STORAGE DISTRICT

EXHIBIT C

TYPICAL INSTALLATION OF GRAVITY OUTLETS







CANAL		L	L1	H	I.D.	SH	ELEV.	ELEV.	ELEV.	ELEV.
T.O. NO.	STA. NO.	FEET	FEET	FEET	INCHES	FEET	A	B	C	D
NC-B	N139+11R	78'	13'	1.5'	24"	14'	497.17	509.71	512.91	509.32
△2 A-86	N469+57R	39'	13'	2.5'	24"	12'	491.91	504.45	506.96	506.55
NC-A	N94+40R	39'	13'	1.5'	14"	15'	497.53	510.07	512.70	508.23
△4 A-87	N77+91R	65'	13'	1.5'	18"	16'	497.66	510.20	514.62	512.78
NC-C	N171+96L	65'	13'	1.5'	14"	16'	496.91	509.45	512.96	512.42
SC-A	S42+64R	39'	8'6"	.75	24"	12'	492.84	501.46	503.13	501.14
△2 SC-E	S288+43R	39'	13'	.75	24"	10'	487.51	496.13	500.79	499.92
SC-F	S357+37L	39'	8'6"	.75	24"	10'	485.72	494.34	495.64	494.81
△3 △1 W-80	S819+09	58'	4.3	.60	24"	10'	476	481	484	484

1 THE PIPE SHALL BE ASBESTOS-CEMENT FT-40 AS MANUFACTURED BY CERTAIN-TEED OR T-40 AS MANUFACTURED BY JM OR APPROVED EQUAL

2 LINE GATE WILL BE INSTALLED AT NORMAL JOINT. LIMIT OF "L" DIMENSION WILL BE AT EVEN JOINT
THE VALVE SHALL BE A LINE GATE MODEL H-30-AC AS MANUFACTURED BY WATERMAN INDUSTRIES INC. OR, AS APPROVED EQUAL. THE CONTRACTOR IS RESPONSIBLE FOR ASSURING A WATER TIGHT JOINT, AS APPROVED BY THE ENGINEER, BETWEEN THE PIPELINE AND THE VALVE.

3 ALL CONCRETE SHALL CONTAIN NOT LESS THAN 5 SACKS OF CEMENT PER CUBIC YARD AND HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3000 P.S.I.

4 COMPACTION REQUIREMENTS ARE 90% OF MAXIMUM DENSITY THIS IS REQUIRED FOR ANY STRUCTURAL BACKFILL, AND/OR CANAL LINER BACKFILL, AND / OR PIPELINE BACKFILL AS SHOWN ON TYPICAL PIPE TRENCH SECTION.

5 WHERE NECESSARY TO CUT CANAL LINER, CUT SHALL BE A NEAT EVEN LINE, AND CANAL LINER SHALL BE RESTORED TO ORIGINAL CONDITION

6 WHERE NECESSARY DISTRICT PERSONAL WILL REMOVE AND RESTORE FENCE. HOWEVER THE CONTRACTOR IS RESPONSIBLE FOR PROTECTION OF THE WORKSITE AND FOR RESTORING THE AREA TO ITS ORIGINAL CONDITION.

7 WHEN PIPELINE IS IN FARM ROAD OR CANAL ROAD UNCOMPACTED BACKFILL SHALL BE WHEEL ROLLED

NOTE: THE LETTERS PRECEDING THE STATION NUMBER DENOTE THE FOLLOWING:
N—NORTH CANAL
S—SOUTH CANAL

THE LETTERS FOLLOWING THE STATION NUMBERS DENOTE THE FOLLOWING:
R-RIGHT SIDE OF CANAL GOING WITH THE FLOW
L-LEFT SIDE OF CANAL GOING WITH THE FLOW

REV.	DATE		SUB.	APP.
4	6-14-88	CHANGED NC-F TO A-87	PLH	CWB
3	1-7-88	ADDED W-80	PLH	CWB
2	12/9/83	A-86, SC-E CHANGES AS NOTED	PLH	CWB
1	12/9/83	REMOVE W-80	PLH	CWB

ARVIN-EDISON WATER STORAGE DISTRICT

CANAL TURNOUTS

DRAWN: PL Hyatt CHECKED:

APPROVED: C.W. Bowers R.C.E. 25399 DATE: 09-20-1983

DRAWING No AE-14

ARVIN-EDISON WATER STORAGE DISTRICT

EXHIBIT D

DAILY WATER ORDER CHANGE SHEET

NORTHERN

UNITS (CFS) | Water Orders For: Tuesday, January 02, 2018

EDISON	METER READING	TIME	REMARKS
E-B ON 2.30 0800	581.520	0902	307
E-17 ON 1.00	1580.007	1901	303
E-77 ✓ MTR READING FOR SONNY	853.295	0844	307
ARVIN			
A-65 ON 2.50	2261.225	1556	303
A-65 OFF 2100	2262.592	1922	303
A-C ON 2.50	280.175	1852	303
A-C OFF 2100	281.443	1933	303
A-44 ON 3.00	3045.066	1847	303
A-9 ON 2.22	5376.984	1836	303
A-15 ON 2.22	404.124	1839	303
CALIENTE			
C-86 ON 1.50	1943.095	1801	303
C-96 ON 4.00 0700	381.584	1752	303
C-96 OFF 2100	384.507	0430	303
C-24 ON .89 0800	18.871	1808	303
C-24 OFF 1700	19.836	1828	303
C-55 ON 3.00 0700	524.088	1825	303
C-55 OFF ~~1900~~ 1700	525.980	2144	303
C-83 ON .50	411.921	1829	303
C-105 ON 1.50	552.293	1810	303
C-61 ON .89 0800	823.408	1817	303
C-61 OFF 1700	824.204	1843	303
C-98 ON .89 0800	174.462	1756	303
C-98 OFF 1700	174.751	1802	303
C-59 ON .89 0700	660.862	0728	307
C-59 OFF 1900	661.608	1900	303
C-102 ON 1.00 0700	931.787	0712	307
C-102 OFF 1900	932.453	1832	303
SW-2 ON 4.44 0700	2259.803	1745	303
SW-2 OFF 1900	2261.347	1748	303

SOUTHERN
UNITS (CFS)

Water Orders For: Tuesday, January 02, 2018

TEJON	METER READING	TIME	REMARKS
T-69 ON 3.00	10184.122	1805	301
T-19 ON 3.00	995.077	1920	301
T-17 ON 2.75	4964.666	1853	301
T-33 ON 3.33 0600	801.186	1833	301
T-33 OFF 1600	803,903	1614	308
WHITE WOLF			
W-66 ON 3.33 0600	5963.870	1916	301
W-66 OFF 1600	5966.540	1840	301
W-68 ON 3.33 0600	5930.791	1914	301
W-68 OFF 1600	5933.452	1838	301
W-42 ON 3.00 0800	672.053	1930	301
W-42 OFF 1600	673,512	1606	308
METTLER			
M-12 ON 2.00 0700	674.664	1936	301
M-12 OFF 1900	674.107	1918	301
M-21 ON 3.00 0700	1518.540	1938	301
M-21 OFF 1400	1520,321	1510	308
M-34 ON 3.50 0700	1832.055	1945	301
M-34 OFF 1900	1835.548	1929	301
M-47 ON 3.50	1338.143	1952	301
M-47 OFF 1600	1338.143	1925	301
M-6 ON 3.00	1723.462	2030	301
M-45 ON 3.50 0700	1730.813	2020	301
M-45 OFF 1900	1733.622	1947	301
M-50 ON 2.00 0700	306.931	2015	301
M-50 OFF 1900	308.809	1945	301

ARVIN-EDISON WATER STORAGE DISTRICT

EXHIBIT E

METER READING SPREADSHEET

METER READING SPREADSHEET
FEBRUARY 2018

Turnout #	Prior Date	Current Date	Prior Reading	Prior reading rounded	Current Reading	Current reading rounded	A.F. Billed
T- 1	1/31/2018	2/1/2018	1055.319	1055	1066.246	1066	11
T- 2	1/31/2018	2/1/2018	556.294	556	556.294	556	0
T- 4	1/31/2018	2/1/2018	468.492	468	468.492	468	0
T- 5	1/31/2018	2/1/2018	168.199	168	168.199	168	0
T- 6	1/31/2018	2/1/2018	4847.869	4848	4847.949	4848	0
T- 7	1/31/2018	2/1/2018	2243.79	2244	2250.104	2250	6
T- 8	1/31/2018	2/1/2018	5070.876	5071	5082.160	5082	11
T- 9	1/31/2018	2/1/2018	0	0	0.000	0	0
T- 10	1/31/2018	2/1/2018	916.438	916	927.086	927	11
T- 11	1/31/2018	2/1/2018	212.674	213	218.393	218	5
T- 12	1/31/2018	2/1/2018	396.24	396	408.610	409	13
T- 13	1/31/2018	2/1/2018	0.016	0	0.016	0	0
T- 14	1/31/2018	2/1/2018	571.358	571	571.358	571	0
T- 15	1/31/2018	2/1/2018	1671.087	1671	1691.764	1692	21
T- 16	1/31/2018	2/1/2018	186	186	17.000	17	18
T- 17	1/31/2018	2/1/2018	4976.414	4976	5018.052	5018	42
T- 18	1/31/2018	2/1/2018	2781.924	2782	2786.183	2786	4
T- 19	1/31/2018	2/1/2018	932.058	932	950.550	951	19
T- 21	1/31/2018	2/1/2018	701.088	701	731.459	731	30
T- 22	1/31/2018	2/1/2018	784.72	785	784.720	785	0
T- 23	1/31/2018	2/1/2018	2270.963	2271	2274.400	2274	3
T- 24	1/31/2018	2/1/2018	2111.718	2112	2132.608	2133	21
T- 25	1/31/2018	2/1/2018	829.13	829	829.130	829	0
T- 26	1/31/2018	2/1/2018	678.693	679	687.277	687	8
T- 27	1/31/2018	2/1/2018	922.552	923	922.552	923	0
T- 28	1/31/2018	2/1/2018	115.701	116	115.701	116	0
T- 29	1/31/2018	2/1/2018	938.914	939	949.398	949	10
T- 30	1/31/2018	2/1/2018	427.599	428	449.524	450	22
T- 31	1/31/2018	2/1/2018	1466.665	1467	1484.681	1485	18
T- 32	1/31/2018	2/1/2018	1047.857	1048	1075.765	1076	28
T- 33	1/31/2018	2/1/2018	822.497	822	842.218	842	20
T- 34	1/31/2018	2/1/2018	313.603	314	12.000	12	12
T- 35	1/31/2018	2/1/2018	765.616	766	765.616	766	0
T- 36	1/31/2018	2/1/2018	1803.405	1803	1803.405	1803	0
T- 37	1/31/2018	2/1/2018	568.499	568	568.499	568	0
T- 38	1/31/2018	2/1/2018	1136.669	1137	1136.669	1137	0
T- 39	1/31/2018	2/1/2018	542.591	543	556.888	557	14

METER READING SPREADSHEET
FEBRUARY 2018

T- 40	1/31/2018	2/1/2018	0.013	0	0.013	0	0
T- 42	1/31/2018	2/1/2018	576.58	577	608.972	609	32
T- 43	1/31/2018	2/1/2018	463.138	463	468.940	469	6
T- 44	1/31/2018	2/1/2018	747.478	747	755.703	756	9
T- 45	1/31/2018	2/1/2018	2291.208	2291	2321.079	2321	30
T- 46	1/31/2018	2/1/2018	404.658	405	413.878	414	9
T- B	1/31/2018	2/1/2018	0	0	0.000	0	0
T- 47	1/31/2018	2/1/2018	1143.593	1144	1182.917	1183	39
T- 48	1/31/2018	2/1/2018	237.298	237	248.577	249	12
T- 49	1/31/2018	2/1/2018	110.448	110	129.743	130	20
T- 50	1/31/2018	2/1/2018	245.732	246	245.732	246	0
T- 51	1/31/2018	2/1/2018	155.86	156	174.750	175	19
T- 52	1/31/2018	2/1/2018	2642.074	2642	2646.035	2646	4
T- 53	1/31/2018	2/1/2018	4244.015	4244	4283.806	4284	40
T- 54	1/31/2018	2/1/2018	4.125	4	4.125	4	0
T- 55	1/31/2018	2/1/2018	274.42	274	274.420	274	0
T- 56	1/31/2018	2/1/2018	26.483	26	26.483	26	0
T- 57	1/31/2018	2/1/2018	528.975	529	530.557	531	2
T- 62	1/31/2018	2/1/2018	954.228	954	958.245	958	4
T- 65	1/31/2018	2/1/2018	1432.618	1433	1440.364	1440	7
T- 67	1/31/2018	2/1/2018	777.705	778	784.522	785	7
T- 68	1/31/2018	2/1/2018	377.222	377	377.222	377	0
T- 69	1/31/2018	2/1/2018	10264.174	10264	10356.426	10356	92
T- 70	1/31/2018	2/1/2018	690.682	691	690.682	691	0
T- 71	1/31/2018	2/1/2018	118.423	118	118.423	118	0
T- 72	1/31/2018	2/1/2018	2635.588	2636	2658.947	2659	23
T- 74	1/31/2018	2/1/2018	661.326	661	661.326	661	0
T- 75	1/31/2018	2/1/2018	518.356	518	538.272	538	20
T- 76	1/31/2018	2/1/2018	810.524	811	820.652	821	10
T- 77	1/31/2018	2/1/2018	1282.855	1283	1322.680	1323	40
T- 78	1/31/2018	2/1/2018	69.202	69	100.788	101	32
T- 79	1/31/2018	2/1/2018	0	0	0.000	0	0
T- 80	1/31/2018	2/1/2018	341.053	341	358.022	358	17
T- 81	1/31/2018	2/1/2018	785.233	785	788.937	789	4
T- 82	1/31/2018	2/1/2018	0.003	0	0.003	0	0
T- 83	1/31/2018	2/1/2018	618.859	619	659.063	659	40
T- 84	1/31/2018	2/1/2018	267.808	268	312.206	312	44
T- 85	1/31/2018	2/1/2018	363.092	363	376.228	376	13
T- 86	1/31/2018	2/1/2018	1003.493	1003	1012.641	1013	10

METER READING SPREADSHEET
FEBRUARY 2018

T- 87	1/31/2018	2/1/2018	6173.26	6173	6190.450	6190	17
T- 88	1/31/2018	2/1/2018	0	0	0.000	0	0
T- 89	1/31/2018	2/1/2018	339.269	339	340.696	341	2
T- 90	1/31/2018	2/1/2018	237.09	237	237.190	237	0
T- 91	1/31/2018	2/1/2018	890.616	891	890.616	891	0
T- 92	1/31/2018	2/1/2018	62.405	62	62.405	62	0
T- 93	1/31/2018	2/1/2018	2123.155	2123	2123.155	2123	0
T- 94	1/31/2018	2/1/2018	20.559	21	20.559	21	0
T- A	1/31/2018	2/1/2018	460.262	460	460.262	460	0
SC-A	1/31/2018	2/1/2018	275.774	276	275.774	276	0
SCA-1	1/31/2018	2/1/2018	4231.490	4231	4358.280	4358	127
SC-B	1/31/2018	2/1/2018	0.020	0	0.020	0	0
SC-C	1/31/2018	2/1/2018	1064.040	1064	1064.040	1064	0
SC-D	1/31/2018	2/1/2018	93.710	94	93.710	94	0
SC-H	1/31/2018	2/1/2018	499.793	500	509.708	510	10
SC-J	1/31/2018	2/1/2018	269.767	270	304.324	304	34
TW-A	1/31/2018	2/1/2018	246.520	247	246.520	247	0
TW-1	1/31/2018	2/1/2018	2.250	2	5.210	5	3
TOTAL ACRE FEET USED IN TEJON UNIT							**1,125**

Meter Change
Meter reset
Prorate
Prorate

ARVIN-EDISON WATER STORAGE DISTRICT

EXHIBIT F

MONTHLY TURNOUT METER READING SHEET

ARVIN-EDISON WATER STORAGE DISTRICT

MONTHLY TURNOUT METER READINGS

S38-P2

TURNOUT	METER READING July 31, 2018	ORDERED FLOW	ACTUAL FLOW	NOTES
T- 14	571.359			
T- 15	2012.070			
T- 18	2839.887			
T- 19	1335.080			
T- 23	2457.627			
T- 24	2387.426			
T- 30	928.502			
T- 31	1588.401			
T- 32	1321.397			
T- 37	568.499			
T- 38	1215.055			
T- 39	16.54			
T- 46	567.111			
T- B	0.000			

READINGS TAKEN BY: 306

ARVIN-EDISON WATER STORAGE DISTRICT

MONTHLY TURNOUT METER READINGS

S64-P1

TURNOUT	METER READING July 31, 2018	ORDERED FLOW	ACTUAL FLOW	NOTES
T- 16	341.902			
T- 17	5292.895			
T- 21	907.335			
T- 22	947.286			
T- 25	941.541			
T- 26	779.420			
T- 27	0.000			replaced battery
T- 28	143.560			
T- 29	1179.129			
T- 33	1127.418			
T- 34	116.38			
T- 35	879.881			
T- 36	2129.242			
T- 40	008.018			NOT IN SERVICE
T- 74	661.326			NOT IN SERVICE
T- 75	792.073			
T- 82	0.003			
T- 94	20.559			NOT IN SERVICE

READINGS TAKEN BY: 306

ARVIN-EDISON WATER STORAGE DISTRICT

EXHIBIT G

TYPICAL INVOICE

ARVIN-EDISON WATER STORAGE DISTRICT
P.O. BOX 175
ARVIN, CALIFORNIA 93203-0175
PHONE: (661) 854-5573 FAX: (661) 854-5213
EMAIL: arvined@aewsd.org

STATEMENT

Water Year: 2018
Billing Date: July 31, 2018
Turnout Number: T-79

42082

STANDBY CHARGE - $/ACRE	WATER USE CHARGE - $/ACRE FOOT	
6.1 Acres @ $100.00 Per Acre = $610.00 The Standby Charge will only be collected to the extent Water Use Charges for the water year are less than your total Standby Charges. In that event, the remaining balance will be due with the February 2019 Invoice	Energy Pump Lift(s) 1 @ $42.00	$ 42.00
	Energy Pump Lift(s) 1 @ 16.00	16.00
	Water Component	100.00
	TOTAL OF WATER USE RATES	$ 158.00

2018 WATER YEAR
WATER USAGE - ACRE FEET

Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	AF/AC
0	0	0	0	0	0	0	0	0	0	0	0	0.00

TOTAL ACRE FEET 0

WATER CHARGE AND STANDBY USE CHARGE

Month	Due Date	Water Use Charge	Penalty Interest	Month Total	Amount Paid	Balance Due	* Standby Charge Balance
March	4/10	$0.00	$0.00	$0.00	$0.00	$0.00	$610.00
April	5/10	$0.00	$0.00	$0.00	$0.00	$0.00	$610.00
May	6/10	$0.00	$0.00	$0.00	$0.00	$0.00	$610.00
June	7/10	$0.00	$0.00	$0.00	$0.00	$0.00	$610.00
July	8/10	$0.00	$0.00	$0.00	$0.00	$0.00	$610.00
August	9/10	$0.00	$0.00	$0.00	$0.00	$0.00	$610.00
September	10/10	$0.00	$0.00	$0.00	$0.00	$0.00	$610.00
October	11/10	$0.00	$0.00	$0.00	$0.00	$0.00	$610.00
November	12/10	$0.00	$0.00	$0.00	$0.00	$0.00	$610.00
December	1/10	$0.00	$0.00	$0.00	$0.00	$0.00	$610.00
January	2/10	$0.00	$0.00	$0.00	$0.00	$0.00	$610.00
February	3/10	$0.00	$0.00	$0.00	$0.00	$0.00	$610.00
				Standby Reconciliation Amount			
TOTAL BILLED:		$0.00	$0.00	$0.00	$0.00	$0.00	$610.00

Due and Payable: **$0.00**

*Notes:

Any remaining Standby Charge Balance will be collected at the end of the water year and will be accounted for on a by contract basis. A reconciliation will be made at the end of the water year to account for contracts with multiple turnouts, convenience turnouts and water users that use turnouts on multiple contracts.

NOTE: EXPLANATION OF TERMS APPEARS ON BACK

EXPLANATION OF TERMS

STANDBY CHARGE

The StandBy Charge will only be collected to the extent Water Use Charges for the water year is less than your total Standby Charges. In that event, any remaining Standby Charge Balance will be collected at the end of the water year and will be accounted for on a by contract basis. Reconciliation will be made at the end of the water year to account for contracts with multiple turnouts, convenience turnouts and water users that use turnouts on multiple contracts.

WATER USE CHARGE PAYMENT

The water use charge will be billed based on the quantity of water delivered during the prior month. The amount of the water use charge shall consist of a water use component plus a per pump lift energy component. An invoice will be mailed approximately the 5th of the month following the deliveries and shall be due on the 10th of the month and delinquent one month thereafter.

If payment is not received in the District office by 5:00 p.m. on the 10th date of the month in which it becomes delinquent, water service will be discontinued without prior notice. No further water deliveries will be made until all delinquencies, including penalties and interest, are received. Also on the date a payment becomes delinquent, a penalty of 10 percent of the amount of the payment due will be imposed, as will interest at the rate of one percent per month.

ARVIN-EDISON WATER STORAGE DISTRICT

EXHIBIT H

TYPICAL DEVICE CHANGE FORM

TURNOUT NO. M-34 SIZE 10" MH

DATE 8-1-18

TIME 1230

	OLD	NEW
SERIAL NO.	2003396l-10	20180099-10
METER READING	221,745	0.04

_______ VALVE

Water specialties METER

CHANGED BY 306/311

ATTACHMENT D

Water Rates, District Sample Bill and Historical Rates

ARVIN-EDISON WATER STORAGE DISTRICT

SCHEDULE OF WY 2017 DRY YEAR CHARGES

Unrestricted Delivery Months

Standby Charge- $/ac $0.00

Water Use Charges - $/AF

# Lifts	Water	Energy	Total
1	$98.00	$41.00	$139.00
2	$98.00	$57.00	$155.00
3	$98.00	$73.00	$171.00
4	$98.00	$89.00	$187.00
5	$98.00	$105.00	$203.00
6	$98.00	$121.00	$219.00

In Lieu Charges - $/AF

5(a)	Water Use	$	147.95
6(b)	O,M&R	$	31.55

****Miscellaneous Water***

Cattle Water	N/A
Construction Water	N/A

* Not available during District prorate periods

General Admin & General Project Service Charge

GA	$3.48/Acre
GA/GP	$99.44/Acre
Sub Acre	$20.29/parcel

Prorate Period

Standby Charge- $/ac $44.00

Water Use Charges - $/AF

# Lifts	Water	Energy	Total
1	$98.00	$41.00	$139.00
2	$98.00	$57.00	$155.00
3	$98.00	$73.00	$171.00
4	$98.00	$89.00	$187.00
5	$98.00	$105.00	$203.00
6	$98.00	$121.00	$219.00

In Lieu Charges - $/AF

5(a)	Water Use	$	147.95
6(b)	O,M&R	$	31.55

****Miscellaneous Water***

Cattle Water	N/A
Construction Water	N/A

* Not available during District prorate periods

General Admin & General Project Service Charge

GA	$3.48/Acre
GA/GP	$99.44/Acre
Sub Acre	$20.29/parcel

ARVIN-EDISON WATER STORAGE DISTRICT

P.O. BOX 175
ARVIN, CALIFORNIA 93203-0175
PHONE: (661) 854-5573 FAX: (661) 854-5213
EMAIL: arvined@aewsd.org

STATEMENT

Water Year: 2017
Billing Date: February 28, 2018
Turnout Number: W-42

38486

STANDBY CHARGE - $/ACRE	WATER USE CHARGE - $/ACRE FOOT
155.71 Acres @ $100.00 Per Acre = $15,571.00 The Standby Charge will only be collected to the extent Water Use Charges for the water year are less than your total Standby Charges. In that event, the remaining balance will be due with the February 2018 Invoice	Energy Pump Lift(s) 1 @ $41.00 $ 41.00 Energy Pump Lift(s) 0 @ 16.00 .00 Water Component 98.00 TOTAL OF WATER USE RATES $ 139.00

2017 WATER YEAR
WATER USAGE - ACRE FEET

Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	AF/AC
23	29	121	99	62	44	38	18	35	12	7	36	3.37

TOTAL ACRE FEET 524

WATER CHARGE AND STANDBY USE CHARGE

Month	Due Date	Water Use Charge	Penalty Interest	Month Total	Amount Paid	Balance Due	* Standby Charge Balance
March	4/10	$3,197.00	$0.00	$3,197.00	$0.00	$3,197.00	$12,374.00
April	5/10	$4,031.00	$0.00	$4,031.00	$3,197.00	$4,031.00	$8,343.00
May	6/10	$16,819.00	$0.00	$16,819.00	$39,745.00	($18,895.00)	$0.00
June	7/10	$13,761.00	$0.00	$13,761.00	$0.00	($5,134.00)	$0.00
July	8/10	$8,618.00	$0.00	$8,618.00	$0.00	$3,484.00	$0.00
August	9/10	$6,116.00	$0.00	$6,116.00	$3,484.00	$6,116.00	$0.00
September	10/10	$5,282.00	$0.00	$5,282.00	$6,116.00	$5,282.00	$0.00
October	11/10	$2,502.00	$0.00	$2,502.00	$5,282.00	$2,502.00	$0.00
November	12/10	$4,865.00	$0.00	$4,865.00	$2,502.00	$4,865.00	$0.00
December	1/10	$1,668.00	$0.00	$1,668.00	$4,865.00	$1,668.00	$0.00
January	2/10	$973.00	$0.00	$973.00	$1,668.00	$973.00	$0.00
February	3/10	$5,004.00	$0.00	$5,004.00	$973.00	$5,004.00	$0.00
				Standby Reconciliation Amount			$0.00
	TOTAL BILLED:	$72,836.00	$0.00	$72,836.00	$67,832.00	$5,004.00	$0.00

Due and Payable: $5,004.00

*Notes:

For the 2017 Water Year, the Water Use Charges exceeded the Standby Charge, therefore, there is no remaining Standby Charge to be paid for this water year.

NOTE: EXPLANATION OF TERMS APPEARS ON BACK

HISTORY OF WATER COSTS AND ASSESSMENTS

Water Year	Water Service Charges - $/AF			Total	Standby	GA & GP	Total Costs	
	Power	Water	Total	$/AC	$/AC	($/AC)	($/AC)	($/AF)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1966	2.70	0.00	2.70	7.43	33.00	0.00	40.43	14.70
1967	2.70	0.00	2.70	7.43	33.00	0.00	40.43	14.70
1968	2.70	0.00	2.70	7.43	33.00	0.00	40.43	14.70
1969	2.70	0.00	2.70	7.43	33.00	0.00	40.43	14.70
1970	2.70	0.00	2.70	7.43	33.00	0.00	40.43	14.70
1971	2.70	0.00	2.70	7.43	33.00	0.00	40.43	14.70
1972	2.70	0.00	2.70	7.43	33.00	0.00	40.43	14.70
1973	2.70	0.00	2.70	7.43	33.00	6.65	47.08	17.12
1974	2.70	0.00	2.70	7.43	33.00	6.65	47.08	17.12
1975	2.70	0.00	2.70	7.43	33.00	6.65	47.08	17.12
1976	2.70	0.00	2.70	7.43	33.00	6.65	47.08	17.12
1977	2.70	0.00	2.70	7.43	33.00	6.65	47.08	17.12
1978	7.20	0.00	7.20	19.80	44.00	6.65	70.45	25.62
1979	7.20	0.00	7.20	19.80	49.50	6.65	75.95	27.62
1980	7.20	0.00	7.20	19.80	49.50	6.65	75.95	27.62
1981	7.20	0.00	7.20	19.80	68.75	6.65	95.20	34.62
1982	7.20	0.00	7.20	19.80	68.75	0.00	88.55	32.20
1983	11.00	0.00	11.00	30.25	68.75	0.00	99.00	36.00
1984	13.50	0.00	13.50	37.13	74.25	6.65	118.03	42.92
1985	18.90	0.00	18.90	51.98	90.75	6.65	149.38	54.32
1986	24.30	0.00	24.30	66.83	74.25	6.65	147.73	53.72
1987	27.00	0.00	27.00	74.25	74.25	6.65	155.15	56.42
1988	27.00	0.00	27.00	74.25	74.25	6.65	155.15	56.42
1989	27.00	0.00	27.00	74.25	79.75	6.65	160.65	58.42
1990	27.00	5.00	32.00	88.00	79.75	6.65	174.40	63.42
1991	27.00	10.00	37.00	101.75	79.75	6.65	188.15	68.42
1992	27.00	6.00	33.00	90.75	101.75	6.65	199.15	72.42
1993	24.30	12.00	36.30	99.83	110.00	17.55	227.38	82.68
1994	24.30	21.00	45.30	124.58	118.25	18.00	260.83	94.85
1995	24.30	41.00	65.30	179.58	71.00	23.00	273.58	99.48
1996	24.30	41.00	65.30	179.58	71.00	23.00	273.58	99.48
1997	24.30	41.00	65.30	179.58	71.00	23.00	273.58	99.48
1998	20.80	44.00	64.80	178.20	57.00	23.00	258.20	93.89
1999	20.80	30.00	50.80	139.70	57.00	23.00	219.70	79.89
2000	20.80	30.00	50.80	139.70	57.00	23.00	219.70	79.89
2001	20.80	30.00	50.80	139.70	48.00	10.00	197.70	71.89
2002	20.80	30.00	50.80	139.70	48.00	10.00	197.70	71.89
2003	23.40	37.00	60.40	166.10	49.00	23.00	238.10	86.58
2004	23.40	37.00	60.40	166.10	49.00	23.00	238.10	86.58
2005	42.20	30.00	72.20	198.55	32.00	23.00	253.55	92.20
2006	61.80	37.00	98.80	271.70	0.00	54.00	325.70	118.44
2007	55.00	44.00	99.00	272.25	0.00	54.00	326.25	118.64
2008	50.00	54.00	104.00	286.00	0.00	56.52	342.52	124.55
2009	49.00	60.00	109.00	299.75	0.00	56.52	356.27	129.55
2010	49.00	66.00	115.00	316.25	0.00	59.17	375.42	136.52
2011	49.00	68.00	117.00	321.75	0.00	59.17	380.92	138.52
2012	49.00	68.00	117.00	321.75	0.00	59.17	380.92	138.52
2013	52.00	72.00	124.00	341.00	0.00	61.95	402.95	146.53
2014	58.00	75.00	133.00	365.75	0.00	64.87	430.62	156.59
2015	64.00	85.00	149.00	409.75	0.00	94.87	504.62	183.50
2016	65.00	88.00	153.00	420.75	0.00	99.44	520.19	189.16
2017	67.00	98.00	165.00	453.75	0.00	99.44	553.19	201.16
2018	68.00	100.00	168.00	462.00	0.00	99.44	561.44	204.16

NOTES: (1) MARCH THROUGH FEBRUARY

(2) ROUNDED POWER CHARGE BASED ON AVERAGE PUMPED DELIVERIES OF 2.0 LIFTS ABOVE FFPP (See Exhibit 11)

(3) REQUIRED PURSUANT TO RECLAMATION LAW

WTR&PWR/charge2.xls

(4) SUM OF (2) AND (3)

Shaded cells indicate estimated or proposed

(5) 2.75 X (4). ASSUMES A 2.75 AF/AC WATER APPLICATION RATE

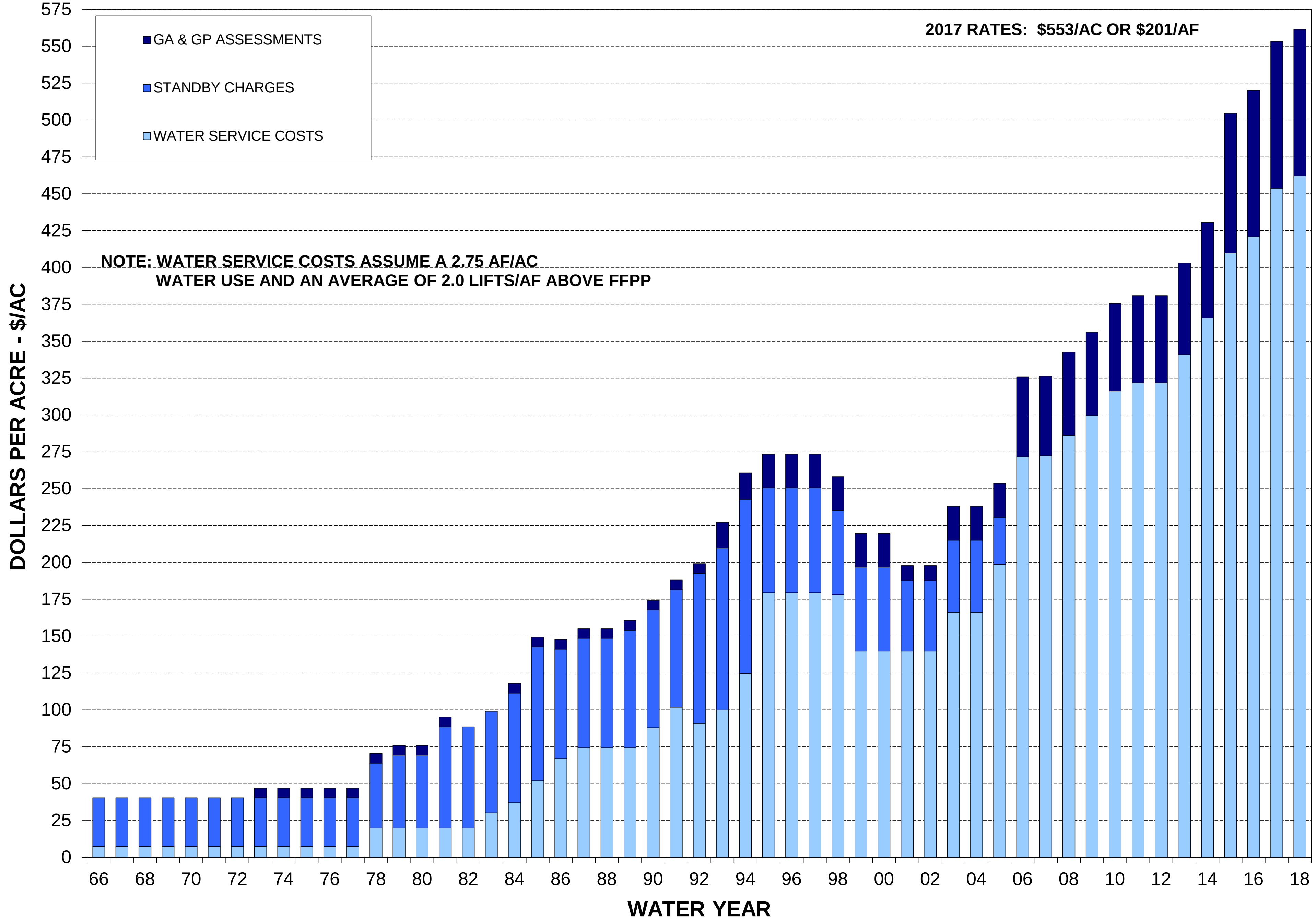
(6) FIXED CHARGE BASED ON CONTRACT ACRE-FT THROUGH 1994 (ASSUMES 2.75 AF/AC), THEN BASED ON CONTRACT $/AC RATES FROM 1995 ON. BEGINNING IN 2006, CREDITED TOWARDS WATER USE CHARGES.

(7) ESTABLISHED IN 1973, WAIVED FOR 1982 & 1983, CONSISTS OF GENERAL ADMINISTRATIVE AND GENERAL PROJECT SERVICE CHARGES

(8) (5) + (6) + (7). TOTAL PER ACRE COSTS FOR WATER SERVICE AND ASSESSMENTS

(9) (8) / 2.75 ASSUMES A 2.75 AF/AC WATER APPLICATION RATE

HISTORY OF WATER COSTS AND ASSESSMENTS



ATTACHMENT E

District Water Shortage Statement

(See Attachment B1, Page 15)

ATTACHMENT F

Groundwater Management Plan

(text only)

Arvin-Edison Water Storage District
Groundwater Management Plan

6/5/03

1801 21st Street, Suite 6
Bakersfield, CA 93301
Office Phone (661) 327-1985

Table of Contents

<u>Attachments</u>

A. List of Exhibits:

1. Tables
2. Figures
3. Appendices

B. References

I. Introduction

A. Background and History

The Arvin-Edison Water Storage District (District) was organized in 1942 under California Water Storage District law (Division 14 of the California Water Code) for the expressed purpose of, among other things, providing an agency to contract with the United States for water service from the Central Valley Project (CVP) as well as contracting for a Federal Power Contract and a Federal loan for construction of new facilities. The need for supplemental CVP supplies reflected the overdraft conditions occurring in the District at that time. The District is comprised of approximately 132,000 acres of land, 113,000 acres that are irrigated crops, located in the southeasterly portion of the San Joaquin Valley of California and lies entirely within Kern County. A Location Map and District Map are provided as Figures 1 and 2. Figure 1 shows the District's boundary as it relates to the boundary of the Kern groundwater basin as defined in the California Department of Water Resources (DWR) Bulletin 118.

In 1962, the District entered into a water supply contract with the United States Bureau of Reclamation (USBR) to supply water for the District's project from the Friant-Kern System of the Federal Central Valley Project (CVP). The water supply contract provides for the annual delivery of 40,000 acre-feet of Class 1 (firm) water and up to 311,675 acre-feet of Class 2 (non-firm) water. This contract was renewed in 2001 through 2026, with provisions for renewal after that.

Because the imported Friant Class II water is highly erratic, a key issue for the District has been to develop means to regulate this variable supply to a fairly constant irrigation demand. The original concept for the District program involved substantially greater recharge capacity within the District than has been constructed to date. However, the District has successfully regulated its imported water supplies historically through the use of groundwater banking facilities in combination with water management exchanges and transfers.

During the period 1964 through 1968, the District's water distribution facilities were constructed. Construction was financed with a $40 million loan by the USBR under Public Law 130.

Prior to the construction and operations of the District's water distribution facilities, groundwater overdraft was estimated at 126,000 acre-feet per year. See Appendix A-Attachment 2, Hydrologic Inventory for Arvin-Edison Water Storage District. This resulted in the continual lowering of groundwater levels, until pumping lifts exceeded 600 feet in many areas of the District.

Project operations commenced in July 1966, with the first diversions of water to the Sycamore Spreading Works. From 1966 to the present, the District has operated the project to provide reliable irrigation water supply to approximately 52,000 acres (approximately 40% of the District's area, and approximately 50% of all cropped acreage), and to stabilize groundwater levels in the remainder of the District, where, for the most part, growers rely solely on well water.

During 1974, the District entered into agreements for participation in the construction and operation of the Cross Valley Canal with the Kern County Water Agency and water exchange agreements with ten other public agencies (Exchangors) located on the east side of the San Joaquin Valley. This provided an exchange of a portion of the District's Federal water supply from the Friant-Kern System for Federal water supplies from the Shasta System of the CVP to be delivered into District facilities through the California Aqueduct and the Cross Valley Canal. Under the Exchange Program, the District received up to 128,000 acre-feet of a relatively firm water supply from the Exchangors delivered on an irrigation demand schedule, in return for delivery of a variable amount of Friant water to the Exchangors. The amount the Exchangors received varied up to 174,000 acre-feet in any given year. It was anticipated that the two hydrologically different supplies would generate roughly equivalent volumes of water over an extended period. The Lower Tule River and Pixley Irrigation Districts withdrew from the exchange agreement with the District in 1995. This reduced the amount of water available under the exchange program each year to 71,000 acre-feet of Friant-Kern CVP water and 66,000 acre-feet of Shasta CVP water.

To compensate, in part, for the loss of a portion of the CVP Exchange capacity, the District entered into a water banking agreement with Rosedale-Rio Bravo Water Storage District (RRBWSD) in 1995. Under this agreement, RRBWSD stores District water in RRBWSD groundwater storage facilities, and returns it later to the District. In addition, the District entered into a water management program with Metropolitan Water District of Southern California. As a result of this program the District was afforded the opportunity to expand its water banking facilities thus enhancing its ability to regulate erratic supplies and providing for a more reliable water supply.

The District expanded its spreading basins with the construction of the Tejon Spreading Basin in 1972, the North Canal Spreading Basin in 1999 and the construction of several new wells in the period of 1996-98. The construction of the North Canal Spreading Basin and associated wells was financed by a low interest loan from the State of California under Proposition 204, administered by DWR.

In December 1997, after over 10 years of planning and negotiations, the District entered into a 25-year water management program with Metropolitan Water District of Southern California (MWD). Under the agreement, the District agreed to bank a minimum of 250,000 acre-feet of MWD water in the aquifer below the District and return the water in certain drought years. Returned water is to be delivered during the District's off-peak periods so as not to interfere with normal, historic District operations. In order to accomplish these objectives, a program was structured to fund nearly $25 million in facility improvements within the District as well as reimbursing the District for all pass-through water banking costs.

The District's program with MWD was designed to enhance efficient use of available water supplies, and water bank facilities, for both parties. For MWD, the program allowed it to regulate 250,000 acre-feet to enhance dry year supplies. For the District, the program generated significant benefits in the form of reduced costs, improved water supply reliability and enhanced facilities. As part of the program, the District expanded its spreading works by 500 acres, added 17 new groundwater wells and constructed a 4.3-mile, bi-directional intertie pipeline and pump station connecting the terminus of the District's South Canal directly to the California Aqueduct. These facilities were constructed in the late 1990's, with substantial completion in 2000. The District has imported and stored approximately 250,000 acre-feet of MWD water in the District since December 1997, utilizing the Cross Valley Canal to transport the water to the District. Return of a portion of the water began in January 2003 (by exchange before then) through use of the Intertie Pipeline to deliver the return water to the California Aqueduct.

The District also constructed a new regulation/balancing reservoir near the beginning of the North Canal in 2000. The balancing reservoir provides canal regulation capabilities, access to stored water for power or load management and water recharge benefits as well. The property acquired for the Balancing Reservoir has room for future expansion of the reservoir.

Also, during the 1990's temporary interties between Kern Delta Water District's (KDWD) canals and Arvin-Edison's Intake Canal were constructed and utilized by both Districts to facilitate mutually beneficial exchanges of various water supplies. KDWD and Arvin-Edison are presently negotiating a Memorandum of Understanding with the goal of furthering the two District's coordinated use of the shared groundwater basin, joint regulation of surface water supplies, and joint use of facilities and interconnections. Appendix L contains a copy of Arvin-Edison Board Resolution Number 01-25 (dated October 9, 2001) directing Arvin-Edison staff and consultants to explore, investigate, and identify mutually beneficial activities that may be implemented with KDWD.

Currently, the District owns and operates a total of approximately 1,500 acres in spreading basins and 72 production wells. Landowners own and operate approximately 350 (active) additional wells within the District.

By the end of the 2002 Water Year, the District had imported a total of 5,714,000 acre-feet of water into the District. A total of 1,665,000 acre-feet had been delivered to spreading basins, with a net total (after evaporation losses) of 1,608,000 acre-feet of recharge. During the same period, the District extracted 901,000 acre-feet of water from its wells. A total of 4,649,000 acre-feet were delivered to customers, with 301,000 acre-feet of losses or metering inaccuracies. A summary of District water operations data from water years 1966-67 through 2002-2003 is included in Appendix B-Water Resources Management Program, April 2003.

As a result of project operations, groundwater levels in the District no longer have a downward trend, but have stabilized. The District has also experienced a substantial reduction in subsurface inflow from neighboring areas and a significant improvement in both groundwater depths and water quality for the irrigators in the District, who continue to rely on groundwater.

Changing conditions that could reduce or threaten the District's water supply are an on-going concern. Neighboring agencies and Exchangors that rely on Sacramento – San Joaquin River Delta imports have seen their water supplies cut dramatically since 1991 due to regulatory decisions arising from endangered species issues and water quality concerns. This has resulted in increased reliance on groundwater in neighboring areas and has reduced the volume and reliability of the District's exchange program. Urbanization in the greater Bakersfield area places additional demand on groundwater supplies. The District's own surface water supply is also facing a threat of reduction. The National Resources Defense Council (NRDC) and other environmental groups filed suit against USBR and various Friant districts over USBR contract renewal issues in 1988. The NRDC's goal is to re-establish regular flows in the San Joaquin River below Gravelly Ford. The Friant Water User's Joint Powers Authority, of which the District is a member, and the NRDC have been attempting to negotiate a settlement agreement that would allow river restoration without negative impacts to water supply reliability or costs for FWUA members. The District has been a key participant in negotiations and pilot projects. Studies and negotiations toward that goal were recently terminated by the NRDC.

B. Purpose and Goal

The purpose of this Groundwater Management Plan is to document and review the past 37 years of successful groundwater management in the District, and to develop a coordinated and comprehensive approach to the future evaluation and management of groundwater resources within the District specifically, and in concert with other groundwater management activities within the groundwater basin. The Plan will integrate past and present effective groundwater management activities with new proposed activities as part of a Management Program to meet specific Management Objectives.

The goal of this Plan is to implement effective groundwater management that works toward maintaining a high quality and dependable water resource for the District's water users and landowners while minimizing negative impacts to other affected parties. Specific Basin Management Objectives that reflect this goal are discussed in Section IV.

Upon adoption of this Plan, action on specific elements will be maintained and/ or initiated within the Management Program to achieve the stated Management Objectives. As specific elements take effect, and/ or other concerns arise; the Management Program will periodically be reviewed, and revised as needed to assure continued progress toward the Management Objectives.

C. Authority

The California legislature recognized that local groundwater management is preferable to State or Federal groundwater controls, and passed Assembly Bill 255 (AB 255) in 1989. AB 255 was the first statewide legislation allowing local water agencies to prepare and adopt groundwater management plans for their jurisdictions. California Assembly Bill No. 3030 (AB-3030), which became law on January 1, 1993, superceded AB 255, and authorized local agencies that are within groundwater basins, as defined in California Department of Water Resources (DWR) Bulletin 118, to prepare and adopt groundwater management plans. The District qualifies under this law. The District lies within the southeastern portion of the Kern County Groundwater Basin as defined in Bulletin 118 (Figure 1).

The District initiated the process of drafting a Groundwater Management Plan in 1996. But, that effort was not completed as other District activities, including long-term water contract renewal and the MWD Program were in the process of being finalized and those terms and conditions are an integral part of the District's groundwater management activities. California Senate Bill 1938, adopted in 2002, which added new requirements for Groundwater Management Plans, including requirement involving public funding, motivated the District to complete the process of drafting a Groundwater Management Plan.

Pursuant to AB-3030 provisions in the California Water Code, the powers of a Water Replenishment District will be added to the District if and when it adopts a Groundwater Management Plan. In general, the effect of adding these powers is relatively minor for Water Storage Districts.

D. Documentation of Public Participation

On December 24th and December 31st, 2002, the District published notice of a hearing on the Resolution of Intention to Draft a Groundwater Management Plan in the Bakersfield Californian and the Arvin Tiller respectively. As required by SB-1938, the notice included information on how members of the public may participate in the preparation of the Groundwater Management Plan. Copies of the hearing notice are included as Appendix C.

On January 14, 2003 a noticed public hearing was conducted at the District's office, and the District's Board of Directors adopted a resolution of intention to draft a Groundwater Management Plan, pursuant to California Assembly Bill No. 3030 (AB-3030). A copy of the District's Resolution No. 03-01 is included as Appendix D. Minutes of the Hearing and an attendance list are provided in Appendix E.

II. Description of District

A. Management Area

1. Location

The Arvin-Edison Water Storage District is situated at the extreme southern end of the San Joaquin Valley in California and approximately 14 miles southeast of the City of Bakersfield (Figure 2). The District lies mostly south of Highway 58 on the southern side of the Kern River.

2. Topography

The District lands overlie alluvial fans and cones (a piedmont alluvial plain) built up by the Kern River, the streams of the Caliente Creek group, and the southern stream group, that drain from the westerly slope of the Sierra Nevada and Tehachapi Mountains across the District's east and southern boundaries. Land elevations vary from below 400 feet at the west edge of the District to 1,000 feet at points along the east boundary. Prevailing land slopes are approximately 66 feet per mile southwesterly in the north end of the District, about 30 feet per mile westerly in the north central portion and approximately 44 feet per mile northwesterly in the south half of the District.

3. Climate

Hot, dry summers and mild winters characterize the climate of the District. The average frost-free period varies from 274 days at the west edge of the District to 320 days on the east edge. Average annual rainfall varies within the District, but averages approximately 8.2 inches per year. Annual evaporation in the District averages approximately 5 feet. The magnitude of annual rainfall is extremely erratic and during any given year, occurs largely during winter and spring months. Occasionally watershed areas tributary to the District experience summer or early fall “cloudburst” type storms and in the past, have wrought severe flood damage in portions of the District. Because of the magnitude and pattern of rainfall, agricultural enterprise is almost entirely dependant on irrigation.

B. Water Supplies

1. Surface Water

The District’s long-term contract for surface water is with the Friant-Kern portion of the CVP. Those supplies are utilized directly by the District, and have also been used to effect water transfers and exchanges for water management purposes. Subsequently, the imported supply consists mostly of Friant Class I, Class II, CVC exchange water, SWP water, and local Kern River supplies. Table 1 summarizes District surface water supplies imported since 1966.

In addition to Friant (CVP) contract supplies and CVC exchange supplies, the District has also historically purchased other supplies for spreading when available. These purchases have averaged approximately 13,000 acre-feet per year (ranging from zero purchases in some years to as much as 74,000 acre-feet in other years). Typically, such water is available in relatively “wet” years, in which Friant Class II water is also allocated to the District. These historical purchases have included: Friant Section 215 water (San Joaquin River Flood water) and Kern River Flood water.

The District participates in numerous water transfers and exchanges and, in a typical year, will participate in water transfers and exchanges with 15 to 20 other agencies in various locations throughout the State. The District’s strategic position, its interconnections to major Federal, State, and local water conveyance facilities, and its versatile facilities gives the District a unique ability to facilitate these transfers and exchanges. As a result, the District and its partners realize significant water management and cost-saving benefits.

2. Groundwater

Groundwater is found underlying essentially all parts of the District. Groundwater management within the District is rooted in the conjunctive use of surface water and groundwater resources, since water supplies from these two sources are integrated to accomplish optimum utilization of each supply. District landowners have conjunctively used imported surface water supplies with groundwater since the completion of the District's irrigation distribution system facilities. Since the availability of most of the imported water supply is extremely erratic, the District devised a plan of conjunctive use where the underlying groundwater reservoir is utilized directly for seasonal and long-term carry-over storage. Because of this, the District's distribution system, from the beginning, has incorporated recharge basins and District owned deep wells to capture, store, and recover wet period water for later use during dry periods.

C. Land Use

The District has approximately 113, 000 acres developed to irrigated crops with vineyards, truck crops, potatoes, cotton and citrus presently dominating. Table 2 summarizes District land use since 1993. Figures 3, 4 & 5 provide information regarding the Spring 2001 Land Use Survey for Agricultural Classes, Perennial Crops and Irrigation Methods respectively.

D. Distribution System

The District's backbone facility is a 45-mile canal system (Figure 2) that extends from the terminus of the Friant-Kern Canal, around the urbanized area of Bakersfield and through the District. This canal has a capacity, in its initial 30 miles, of 1,000 cubic feet per second; a rate of flow required to accommodate maximum water deliveries as provided in the District's original Federal water service contract.

A major feature of the project is the Forrest Frick Pumping Plant, located about three miles west of the District's westerly boundary and approximately 14 miles from the Friant-Kern Canal. This plant has a capacity of 27,500 horsepower, consisting of four pumping units rated at 5,500 horsepower each, two 2,000 horsepower units, and two smaller units rated at 1,000 and 500 horsepower. The pumps are the vertical turbine type designed to operate against a maximum total dynamic head of 190 feet and have a composite flow rate of 1,000 cubic feet per second.

This plant discharges water into a three-mile long pipeline, eleven feet in diameter and constructed of pre-stressed reinforced concrete.

Other facilities of the system include approximately 170 miles of pressure pipeline varying in diameter from 6 to 60 inches, 45 booster-pumping plants with a total of 25,000 horsepower and 462 farm turnouts.

From an operational standpoint, two key features of the water-related facilities are the spreading works and the associated well fields through which water is percolated to underground storage and later recovered when required through District owned wells.

The District's spreading basins consist of the Sycamore, Tejon and North Canal spreading works. The Sycamore Spreading Works comprise a total area of 569 acres and is located on the alluvial fan of Sycamore Creek near the middle of the District. The Tejon Spreading Works, which is located on the Tejon Creek alluvial fan, is approximately six miles south of the Sycamore Spreading Works and covers an area of 448 acres. The North Canal Spreading Basin consists of 300 acres and is 2 miles northwest of the Sycamore Spreading Works. The District also accomplishes groundwater recharge at its balancing reservoir near the beginning of the North Canal. These project facilities are shown on Figure 2.

The Sycamore well field is comprised of a total of 33 wells, 22 of which are located within the spreading works, and the remainder being located west of and adjacent to the Sycamore spreading works. The Tejon well field consists of 25 wells, 21 of which are located within the spreading works area, and 4 being located outside of the spreading works property. The North Canal well field consists of 14 wells in which 5 wells of similar design are located along the District Canal in the northern area of the District. The total number of wells in and adjacent to the District's spreading basins is 72.

E. Water Demand and Deliveries

1. Historic

Although the District's surface water supply varies widely from year to year, the District's conjunctive use facilities (spreading areas and wells) allow the District to provide a firm water supply for lands in the Surface Water Service Area within the District. Over a long-term period, the District's annual Friant-Kern Canal water entitlement has ranged from a minimum of approximately 10,000 acre-feet in a very dry year such as 1977, to a maximum of 352,000 acre-feet in very wet years such as 1978 and 1995.

In addition, by the end of the 2002-2003 water year, over 4.6 million acre-feet had been delivered directly to surface water users, 5.7 million acre-feet of water was imported to the District Basin and a total of 900,600 acre-feet of water extracted from underground storage. A history of Friant-Kern CVP entitlement is provided as Figure 6.

2. Projected Future

The future demand for water in the District cannot be predicted with certainty, as it will be highly dependent upon variations in planted acres, cropping patterns, and other factors. However, there is not presently any planned expansion of the acreage in the District's Surface Water Service Area and the most reasonable expectation is that future demands for water will likely be similar to demands experienced during the past 20 years.

F. Other Agencies and Programs related to Groundwater in AEWSD

A number of other Federal, State and local agencies have jurisdiction for regulatory activities and/or programs that may affect groundwater management in the District. A list of these agencies is provided in Table 3, along with a brief description of the agencies' jurisdictions, roles, activities, and programs that may pertain to groundwater management in the District. An understanding of the various agency roles in activities related to groundwater management is important to foster coordination and cooperation.

Arvin-Edison has a 37-year history of coordination and cooperation with the agencies listed in Table 3 and other agencies related to water management and groundwater management. The District participates in various meetings and cooperative programs with these agencies on an on-going basis.

The District's Water Conservation Plan is one example of a program involving a number of agencies. The Plan is required by the USBR as a condition of the Federal water supply contract. Arvin-Edison's Water Conservation Plan has been approved by the USBR, and has been implemented by the District. In addition, the District has joined the Agricultural Water Management Council, a group of agricultural water agencies that cooperatively develop water conservation best-management practices, and standardizes the preparation of water conservation plans.

Another example of Arvin-Edison's relationships with other agencies is evident in the numerous tours of the District and its facilities that are given to agencies and individuals from throughout California, the United States, and abroad. The primary purpose of these tours is to educate other agencies on the benefits associated with groundwater banking, conjunctive use, and the District's success in managing groundwater supplies. Appendix M lists tours the District conducted from January of 1999 through April of 2003.

III. Groundwater Conditions

A. Groundwater Basin Description

The District lies within the southeastern portion of the Kern County Subbasin of the San Joaquin Valley Basin (Basin 5-22.14). The Kern County Subbasin has been identified by the DWR as a basin with boundaries appropriate for groundwater management purposes, as defined in DWR Bulletin 118 "Ground Water Basins in California" (Figure 1). Bulletin 118 Basin boundaries are identified on the basis of geological and hydrological conditions as well as political boundary lines. A map of the California Basins and Subbasins is provided in Figure 7.

DWR Bulletin 118-80 "Ground Water Basins in California" identifies Kern County as Basin No. 11 and subject to a critical condition of overdraft based upon the following definition:

"A basin is subject to critical conditions of overdraft when continuation of present water management practices would probably result in significant adverse overdraft-related environmental, social or economic impacts".

According to Bulletin 118-80, this definition implies a more dire circumstance than "groundwater overdraft", which is often defined as that condition where extractions exceed groundwater replenishment over some specified period of time.

The Kern County Basin extends from the Sierra Nevada foothills on the east to the eastern boundary of the San Luis Obispo/ Santa Barbara County line on the west, and from the Southern boundary of Tulare/ Kings County line on the north to the northern boundary of the Santa Barbara/ Ventura/ Los Angeles County line on the south.

B. Physical Structure

The Kern County Basin is a large, deep asymmetric sedimentary basin consisting of deep depositional centers separated by a basement feature known as the Bakersfield Arch; located generally along the Kern River. The San Joaquin basin is bordered on the south and east by the crystalline igneous and metamorphic rocks exposed in the Sierra Nevada, Tehachapi, and San Emigdio Mountains. These rocks also underlie the basin at depth and are considered to be non-water bearing. Overlying these rocks is a thick sequence of consolidated marine sedimentary rocks exposed in the Coast Ranges to the west and the San Emigdio Mountains to the south and extending eastward to lap onto the crystalline rocks of the Sierra Nevada. The consolidated marine sedimentary deposits play no significant role in the developed part of the ground water basin.

Miocene to Pleistocene-aged continental sediments overlies the marine sedimentary rocks in the basin. These sediments are several thousand feet thick in the subsiding portions of the basin but considerably thinner where deposited on and draped over the Bakersfield Arch. In the west, these continental sediments form the Tulare Formation, a thick sequence of water-lain sands, silts, and clays exposed along the western side of the San Joaquin Valley and in the Elk Hills. In the east, continental sediments form the Kern River Formation; a westward thickening series of sands, conglomerates, and mudstones.

The geology and groundwater features of the District area were studied by the USGS and DWR in the late 1950's. Results were summarized in Geological Survey Water-Supply Paper 1656. Figure 8 (Map Insert) is a geologic map of the area, and Figure 9 is a geologic section taken from that Paper. While the field of geology has advanced tremendously since it was published, Water Supply Paper 1656 contains the last comprehensive mapping of the geology of the area. Also, USGS Water Supply Paper 1469, while covering a much larger area than the District, also provides significant comprehensive information on the geology and hydrology for that area.

There are also two faults (or fault zones) within the District. These faults, the White Wolf and the Edison, and their impact on groundwater conditions, are discussed in the following section.

C. District Aquifer Characteristics

The District's aquifer was essentially formed out of a series of coalescing alluvial fans that have been formed by streams channeling from the southernmost Sierra Nevada Mountains, Tehachapi Mountains and San Emigdio Mountains. The relatively coarse-grained alluvial deposits along the margins of the basin grade into more fine-grained deposits in the central portion of the basin. The aquifers include (from shallowest to deepest) recent alluvial deposits, older Pleistocene alluvium and the late-Tertiary Kern River and Chanac Formations. These deposits range from about 800 to 4,800 feet thick in the District. Within the District, the upper 260 to 580 feet is older and younger alluvium primarily consisting of discontinuous beds of sand, silt, clay and gravel deposited on alluvial fans. These deposits are generally coarser at the apices of the fans and become finer-grained toward the center of the valley. The Kern River

Formation consists of coarse to fine grained sand and sandy clay with lenses of gravels and cobbles. The Chanac Formation consists of continental conglomerate deposits with lenses of coarse sand and clays.

In addition, two faults, or “fault zones” that traverse the District are the White Wolf and Edison Faults. These faults are believed to impede groundwater flow and affect the movement from one side of the fault to the other. A small portion of the District lies north of the Edison Fault. Another relatively large area lies south of the White Wolf Fault. A major portion of the District lies between the two faults and comprises the majority of the District area.

While these faults do appear to provide some impediment to groundwater flow across these faults, this is a subject that may merit additional study in the future. In this regard, there has been some more recent work done in this area, such as a thesis prepared by Karin Hagan[1]. This thesis studied the White Wolf fault zone, and concluded that groundwater elevation data indicate that the fault is a “partial barrier” to groundwater flow. An analysis of groundwater quality data found little difference in water quality on either side of the fault.

In many portions of the San Joaquin Valley, the Corcoran Clay separates a generally unconfined aquifer system above and a confined aquifer system below. However, the District area and immediately neighboring areas are believed to be situated too far south for this regional confining layer to be present. However, there are other relatively fine-grained materials beneath the District that cause varying levels of confinement within different locations in the District. This confinement tends to be more pronounced towards the more central portions of the basin.

The aquifer underlying the District yields substantial amounts of water to wells. USGS Water Supply Paper 1618 tabulated average well yields by township. For the townships underlying the District, these yields range from approximately 622 gallons per minute (gpm) to1,786 gpm, and averaged 1,191 gpm.

Yields from District-owned wells vary with the depth to water. For example, early in the recent drought of the late 1980s and early 1990s, District wells produced an average of about 1,800 gpm per well. By the end of the drought, the wells yielded approximately 1,400 gpm per well. Higher well yields returned after the drought ended, with a series of wetter-than-average years and significant groundwater recharge through District recharge operations.

[1] “The Effects of the White Wolf Fault on Groundwater Hydrology in the Southern San Joaquin Valley, California” Thesis dated December 2001 for California State University Bakersfield - Masters of Science in Geology Degree

D. Groundwater Monitoring Activities

The District has an extensive groundwater monitoring program that began with District operations in the late 1960's and has evolved to its present state. Table 4 summarizes the District's present groundwater monitoring program.

The groundwater monitoring program consists of a number of different components including:

1. Well water-level[2] measurement

Selected District-owned and privately owned wells have been routinely measured since the commencement of District operations in the mid-1960s. The District staff measure water levels in selected Private and District wells on a bi-annual basis (Spring and Fall) using an electrical well sounder, an acoustic well sounder or by the use of airlines and compressed air. Water level readings are shared with the USBR, DWR, and KCWA staff as part of a multi-agency valley-wide monitoring program.

District staff also reads and records pumping or standing (static) water levels in all District production wells monthly (via airline pressure gauge reading) before, during, and after each pumping season.

2. Well water level mapping

Depth to water, change in depth-to-water and water level elevation maps are prepared annually (Spring) by an engineering consultant (Stanley Powell of SAIC) and are provided in Appendix F.

3. Well water level graphing (hydrographs)

Once a year, the engineering consultant also prepares a hydrograph showing average static depth to water in wells in the District since 1962. Hydrographs are also prepared for each of the three sub-areas of the District. These hydrographs are developed from the water level maps. In addition, every month, District staff update a hydrograph showing depth to water versus time in the District's monitoring well at the Sycamore Spreading Ponds. Hydrographs of other private and District monitoring wells have also

[2] The term "well water level" is used in this Plan, rather than the term "groundwater level", because it is a more accurate term for the measurements that are taken. The term "groundwater level" would be more appropriate for readings taken from piezometers that are screened over relatively small intervals. The term "well water level" is used for water level measurements taken in production wells that are typically screened over a relatively large interval, and therefore reflect a melded water level from a number of different layers of the aquifer adjacent to the perforations.

been prepared over time. Graphs are also prepared monthly and annually showing water levels in the District's production wells at the three spreading areas versus time. Figure 10 is an example, and shows pumping water levels for water years 2001, and 2002.

4. Recharge (spreading) water measurement

Flow measurement devices (propeller flowmeters with totalizers or overflow weirs with staff gauges) located on the turnouts to the spreading ponds, and water level gauges in the ponds are read and recorded daily during spreading operations. This information is summarized and tallied daily, monthly, and annually in Excel spreadsheets by District staff. The spreadsheets also estimate evaporation losses in the spreading ponds, and calculate net spreading amounts.

5. Recovery (extraction) water measurement

District staff also read and record well water flow measurements on all District production wells on a daily basis, when they are pumping. The readings are taken from totalizers on propeller flow meters located on the discharge of each well. This information is summarized and tallied daily, monthly, and annually in spreadsheets by District staff. A graph showing total annual spreading and extractions from District water bank facilities since 1966 is also included in Figure 11.

6. Well water quality analysis

District staff sample water withdrawn from the discharges of selected private and District wells once per year, and send the samples to a certified laboratory for irrigation water (agricultural suitability) analysis. In addition, District staff sample water from the discharge manifolds of all District wells, incoming surface water, and Intertie Pipeline flows to the Aqueduct weekly before and during recovery operations and delivery to the California Aqueduct. Samples are sent to a certified laboratory for testing of Constituents of Concern (COC) as identified by DWR. The District, MWD, and KCWA cooperatively developed and maintain a blending model spreadsheet to predict water quality going into the aqueduct under various operating scenarios in order to determine and optimize water quality.

7. Well water quality mapping and graphing

Bookman-Edmonston Engineering Company summarized well water quality data from a variety of sources on maps of the District in 1996, as part of a study to locate new water banking facilities and are provided as Figures 13 and 14. Kenneth D. Schmidt and Associates also summarized and graphed well water quality results from selected private irrigation wells and District wells in 2000 (Appendix G).

8. Well location surveys

About every 5 years, the District staff conducts a visual survey of the District and update a map showing the locations of all wells (active and inactive) in the District.

9. Hydrologic inventory

The District's groundwater consultant prepares a Hydrologic Inventory for the District annually. One use of this inventory includes water volume balance calculations to estimate with and without project average groundwater levels and pumping costs throughout the entire District, and separately, within the three sub-areas. The components of the inventory are estimated based on data collected and maintained by the District such as precipitation, water deliveries, crop surveys and recharge and recovery operations. A copy of the Hydrologic Inventory completed in 2003 is included in Appendix A, Attachment 2.

10. Groundwater modeling

Bookman-Edmonston Engineering Company (B-E) prepared a numerical groundwater model in the late 1980's to assist in the evaluation of the MWD program and to monitor the impacts of its implementation.

E. Historic and Current Conditions

1. Groundwater Levels

As seen in Figure 12, the effect of District operations, which were initiated on July 1966, is reflected by a general stabilization of groundwater levels by the late 1970's, and significant recovery since then. The water level decline shown to have occurred during the pre-project period represents a continuation of the average annual long-term decline in groundwater levels of 7 to 8.5 feet per year throughout most of the District. Under non-project conditions, it is estimated that by the end of the 2002, assuming the same amount of water that was imported was, instead, pumped from the aquifer, pumping season average static groundwater depths in the District area would have been approximately 595 feet depth to water, instead of the actual 330 feet. This represents a higher groundwater table of 265 feet. By the end of 2002, average static groundwater levels had recovered approximately 60 feet since the historic low of 390 feet reached in 1977.

Based on water level measurements in the District's wells collected in December 2002, average static water level depths below ground surface at the District's spreading grounds were as follows: 337 feet at the North Canal basins, 341 feet at the Sycamore Basins, and 414 feet at the Tejon Basins.

2. Water Quality

The District's primary surface water sources (Friant-Kern Canal, California Aqueduct, and the Kern River) have excellent water quality, and are suitable for irrigation of the crops grown in the District. California Aqueduct water typically has higher Total Dissolved Solids (TDS) than either Friant-Kern Canal or Kern River water. All three sources provide raw water suitable for drinking water supplies for other water agencies.

Groundwater quality in the District prior to the project was generally satisfactory for agricultural use in most areas. However, wells in portions of the District were affected by elevated levels of Boron, salt, and/or nitrates. Problem areas are shown in Figure 15, taken from USGS Water Supply Paper 1656.

A more current mapping of well water quality performed by B-E in 1996, is shown in Figures 13 and 14. This assessment relied on data from 1982 and older, and also shows areas with elevated levels of boron, nitrates, and salts. A small area at the north end of the District has Arsenic levels above the current MCL for drinking water. Arsenic is a naturally occurring element, commonly associated with sediments derived from the Sierra Nevada, Tehachapi, and San Emigdio Mountains.

A review of recent data from water samples taken from District well manifolds (Table 5) shows that only a few wells along the North canal have water quality concerns. Results of Constituents of Concern testing that exceed present drinking water or irrigation water standards are highlighted in yellow in Table 5. It is important to note that water from the North Canal wells blends with surface water and other well water before delivery to District customers or to the California Aqueduct.

Table 6 summarizes canal water quality from samples taken at various locations in the District canal, including incoming surface water supplies during the 2002 water year. The District has no difficulty delivering suitable water to customers throughout the District, and has been able to meet DWR requirements for the pump-in program to the Aqueduct. Users of the Aqueduct downstream of the Intertie see an overall improvement in water quality in the Aqueduct as a direct result of the District's pump-in program.

The District's conjunctive use project has improved the groundwater quality in the District, compared to what it would have been without the project. This was documented in a report by Kenneth D. Schmidt and Associates dated May 2000, which analyzed groundwater quality trends in the District (Appendix G).

F. Issues of Concern

1. Extraction and Perennial Yield

Groundwater is a key component of the District's water supplies, and the District was originally formed in part to implement a program to reduce and or mitigate overdraft conditions in the District. For the purpose of the groundwater management plan, "perennial yield" or "sustained yield" is defined as the average annual amount of groundwater pumping that can be supported over an average hydrologic base period that will not result in a long-term decline of water levels. The term "overdraft" refers to a condition where the long-term average groundwater production exceeds the perennial yield, so that there is a long-term decline in groundwater levels. Both the perennial yield and overdraft are defined on a long-term average basis, so that short-term declines in groundwater levels can occur (such as during drought years), and such short-term declines do not indicate overdraft.

Mitigation of overdraft continues to be a key issue of concern for the District because overdraft can lead to a variety of problems, such as increased pumping costs and reduced reliability of groundwater supply. Overdraft is also related to land subsidence and degradation of water quality, which are other issues of concern discussed in the sections that immediately follow.

A hydrologic inventory (mass balance) analysis has been used to estimate the perennial yield and overdraft in the District. The hydrologic inventory quantifies the various components of recharge and discharge from the aquifer underlying the District, including subsurface inflows/outflows from surrounding lands, and determines the change in storage. This analysis is presented in Appendix A-Evaluation of Perennial Yield for Arvin-Edison Water Storage District. In summary, the analysis indicates that the perennial yield for the District is about 228,000 acre-feet per year, and that there is a small estimated annual overdraft of about 4,000 – 5,000 acre-feet per year.

Avoidance of overdraft remains a key issue for the District, under both present and potential future conditions. This is based on several considerations, such as:

- **Current Overdraft Conditions within the District.** The hydrologic inventory analysis indicates that the District remains slightly in overdraft.

- **Current Overdraft Condition in the Region.** The hydrologic inventory analysis estimated the perennial yield for the District only, and depends on some assumptions about conditions in adjacent districts that can impact the perennial yield for the District through changes in subsurface inflow. On a more regional basis, it is noted that the DWR has identified the larger groundwater basin that includes the District as being subject to critical conditions of overdraft. According to DWR's California Water Plan, Bulletin 160-98, groundwater overdraft in the Kern-Tulare hydrologic region averages 745,000 acre-feet per year. A significant increase in overdraft has occurred since 1990 in the San Joaquin Valley due to Delta export conditions, CVPIA implementation and ESA requirements. Even if overdraft were eliminated within the District, the regional overdraft conditions would remain a concern.

- **Potential Changes in Imported Supply Available to the District.** The hydrologic inventory analysis relied on historical information, and therefore would not reflect future changes in the availability of imported water supplies available to the District. Changes in the availability of imported water might result from changes in the operation of the Friant Division, or changes in the operation of the District's exchange agreements.

- **Impact of Average Groundwater Levels on Perennial Yield.** The presently unfilled groundwater storage beneath the District may be used to develop water management / banking programs that could benefit the District, and at the same time help address statewide management issues. However, higher groundwater levels associated with such programs could result in reducing subsurface inflow to the District. Thus, if the program were to result in maintaining average groundwater levels higher than historical within the District, then the perennial yield available to the District could be reduced.

2. Groundwater Quality

As detailed in a prior section, the District's groundwater supply has generally proven to be suitable for agricultural use and for delivery into the California Aqueduct. Localized areas where wells have water with elevated levels of various constituents including Arsenic, Boron, salts (TDS), and/or nitrates are presently manageable by blending with surface water and other groundwater of higher quality. Arsenic may be more of a concern for the Aqueduct pump-in program in the future, if the MCL is lowered further (which is anticipated).

The District's conjunctive use project has improved groundwater quality relative to conditions that would have occurred absent the District's project. But, existing water quality monitoring and management programs will continue to be needed to track changes, assess potential threats, and assist in groundwater management.

As part of the on-going groundwater quality monitoring program, it is recommended that a hydro-geologist update District water quality maps and graphs of water quality trends every 5 years.

3. Inelastic Land Surface Subsidence

Half of the entire San Joaquin Valley has been affected by land subsidence caused by development of land and water supplies, as well as petroleum production in the San Joaquin Valley. Approximately 4,300 square miles have subsided more than 1 foot and maximum subsidence exceeds 28 feet. This subsidence results from the following four activities (although each of these activities is a net lowering of land surface, they are different in their causes and effects): 1) intensive pumping of groundwater, 2) the collapse of moisture-deficient deposits when water is first applied (hydrocompaction), 3) oxidation of organic soils, principally in the areas of the Sacramento and San Joaquin Rivers and 4) extraction of fluids from producing zones in several oil fields.

The Arvin-Maricopa area, in which three of the above types of subsidence occur, is the southern of the three principal areas of widespread subsidence in the San Joaquin Valley. The subsidence problem in this area was well documented by the USGS in Geological Survey Professional Paper 437-D, published in 1975.

As of 1970, approximately 700 square miles of agricultural land south of Bakersfield had been affected by subsidence caused by the excessive pumping of groundwater. Subsidence of this land represents approximately 60% of the Arvin-Maricopa area, and the maximum subsidence rate exceeded 0.5 feet per year. Total maximum levels approached 9 feet and total volume of subsidence was more than 1,060,000 acre-feet. Most of this was due to overdraft of groundwater, representing a one-time “mining” of the groundwater resource and a permanent decrease in the storage capacity of the area. The areas with the highest subsidence rates attributed to overdraft were centered west of the District’s boundary, within the eastern portion of Kern-Delta Water District.

USGS Professional Paper 437-D also included the following statement: “It has been clearly demonstrated in the service area of the Friant-Kern Canal that raising groundwater levels sufficiently high to eliminate all excess pore pressures in the aquitards can effectively stop subsidence. Also, it is concluded that if water levels are held at a constant low level, subsidence will stop after all lag or residual compaction has been accomplished; however, this compaction might require several decades. In conclusion, no method is known for stopping subsidence other than that of raising the head in the aquifers sufficiently to eliminate the excess pore pressures in the aquitards”

Aside from DWR’s on-going monitoring of subsidence along the California Aqueduct, an evaluation of subsidence in the District has not been performed since 1975. Since that time, however, groundwater levels have stabilized (by 1978) and have even recovered significantly. Since 1980, District staff have not observed subsidence related problems occurring in the District. It is therefore believed that subsidence problems have largely been arrested in the District due to the improvement in the water balance and stabilization of groundwater levels resulting from the District’s program. DWR surveys along the California Aqueduct generally confirm this belief, and are provided in Table 7.

IV. Basin Management Objectives

A. Federal Goals and Policy

Although not governing the use of groundwater in the District, it is noted that the objective of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) is to restore and maintain the chemical, physical and biological integrity of the nation’s waters. In order to achieve this objective, it was declared that:

- It is the national goal that the discharge of pollutants into navigable waters be eliminated by 1985
- It is the national goal that, wherever attainable, an interim goal of water quality, which provides for the protection and propagation of fish, shellfish and wildlife

and provides for recreation in and on the water, be achieved by July 1, 1983.

- It is the national policy that the discharge of toxic pollutants, in toxic amounts, be prohibited.

Under this act, the Environmental Protection Agency directs States to establish and enforce water quality objectives for waters of the United States, and to regulate the discharge of pollutants to waters of the United States.

B. State Goals and Policy

Although not governing the use of groundwater in the District, the following state goals & policies are noted which help protect groundwater quality within the District:

1. Statewide Goals and Policy

In addition to Federal Goals, The State of California has set forth environmental goals and enacted progressive legislation to protect water quality. The Porter-Cologne Water Quality Control Act states as a policy: "The quality of all the waters of the State shall be protected for use and enjoyment by the people". This law also establishes the goal of achieving the highest possible water quality consistent with all demands presently being made and to be made on those waters.

On October 28, 1968, the State Water Resources Control Board adopted Resolution No. 68-16: "Statement of Policy with Respect to Maintaining High Quality of Waters in California" (Nondegradation Policy). The policy requires the continued maintenance of existing high quality waters, but provides conditions under which a change in water quality is allowable. These changes must:

- Be consistent with maximum benefit to the people of the state.
- Not unreasonably affect present and anticipated beneficial uses of water.
- Not result in water quality less than that prescribed in water quality control plans or policies.

Regional Water Quality Control Boards (including the San Joaquin Valley Regional Water Quality Control Board) are charged with creating Basin Plans that identify beneficial uses to be protected, and water quality objectives for specific water bodies, including groundwater.

A water quality objective is a statement on the conditions to be maintained in waters of the State. The statement may be general or specific. The establishment of water quality objectives, as with other aspects of water quality control planning, has become more complex in recent years because of increasing levels of protection demanded. This is due largely to the result of public awareness of benefits associated with a clean and healthy environment.

The Regional Boards enforce water quality objectives by regulating waste discharges to waters of the State through the issuance of waste discharge permits.

The California State Water Plan (Bulletin 160) prepared by DWR and updated every 5 years establishes State direction for water resources planning in various areas of the State. Interestingly, the State Water Plan contains few, if any specific objectives that pertain to groundwater management in the State.

2. State Goals and Policy for the Tulare Lake Basin

The San Joaquin Valley Regional Water Quality Control Board has established and periodically updates the Tulare Lake Basin Water Quality Control Plan. The District lies within this area. The following objectives presently pertain to the Regional Board's jurisdiction concerning the protection of waters within the Tulare Lake Basin: General Objectives for All Waters

The following objectives shall apply to waters of the Basin:

- Waters of the Basin shall not be polluted.
- Nuisance conditions shall not be caused in any waters of the Basin.
- Wherever the existing water quality is better than the quality established herein, such existing quality shall be maintained unless otherwise provided for by sections of the State Water Resources Control Board "Statement of Policy with Respect to Maintaining High Quality of Waters in California", including any revisions thereto.
- Wherever uncontrollable factors degrade water quality below these water quality objectives, then controllable factors shall not cause any degradation of water quality.

3. Objectives for Groundwater

Water quality objectives for all groundwater in the Tulare Lake Region are provided in Appendix H. The Water Quality Objectives apply to all inland surface water and groundwater.

Table III-4 of, Appendix H, presents the maximum limits for an average annual increase of groundwater salinity, by area. These levels of increase are interim and represent the present average rate of increase for each hydrographic unit. The Tulare Lake Basin and Groundwater Hydrographic Units are provided in Figure III-1.

The most recent version of the California Water Plan (Bulletin 160-2000) contains no specific objectives for groundwater in the Tulare Lake Hydrologic Study Area (which includes the District). However, the Plan's discussion implies the following goals:

- Reducing or eliminating groundwater overdraft
- Controlling groundwater pollution and/or degradation
- Controlling land-surface subsidence

C. Kern County Water Agency Objectives

KCWA has not adopted basin management objectives that pertain to groundwater management within its boundaries (which includes the District). A review of the Act, which created the KCWA in 1961 (Water Act 99), finds no basin management objectives. However, because KCWA is an important institution for the management of water in Kern County, coordination with KCWA on projects can help in the management of water resources at a county-wide level.

The District has a 37-year history of cooperation and coordination with the KCWA. As evidence of this, the District has coordinated with KCWA and gained KCWA approval for numerous programs related to groundwater management including:

- cooperative groundwater monitoring and data sharing programs
- participation in the construction of the Cross Valley Canal
- participation in the CVC Exchange Agreements
- participation in RRBWSD Banking Exchange Program
- participation in the MWD Water Management Program
- sales of banked water to the Environmental Water Account
- water quality exchange program with MWD
- water management exchanges and transfer with a variety of Kern County Agencies and Districts
- Participation in joint applications for Prop 13 Groundwater Construction Grant funds
- participation in partnership activities between Kern County Water Agency and Friant Water User's Authority

D. District Management Objectives

Prior to the adoption of this Plan, the District has not adopted formal groundwater management objectives. However, direct and implied management objectives can be found that pertain to groundwater in the District in a number of documents. These include the following:

- Water Supply Contract with United States for Friant Water Supply
- Exchange Agreements with CVC Contractors
- District Water Conservation Plan and Updates
- Agreement with MWD for Water Management Program
- Water Service Contracts with Landowners
- District Rules and Regulations

In addition to these documents, unwritten objectives have guided groundwater management in the District through the years.

The following groundwater management objectives are proposed to be adopted by the District as part of this Groundwater Management Plan to guide future activities, programs, and projects. These objectives are intended to memorialize written and unwritten objectives that have guided the District in the past, and should serve well to guide the District in the future. As with all objectives, these should not be viewed as laws, promises, or warranties, but rather as guiding principles and targets for which to aim. Some of the objectives may not be attainable in some circumstances. In other circumstances, specific objectives may conflict with each other. In those cases, the Board of Directors and staff will determine which objectives are the most important and prioritize accordingly. Actions taken as a result of this Plan shall be conducted with the following objectives:

1) **Water Supply Reliability**

1.1 Protect the District's USBR Water Supply Contract from external threats

1.2 Maximize the use of Contract water supplies within the District

1.3 Firm up the water supplies available to District water users by utilizing groundwater in conjunction with surface water supplies via operation of water bank facilities.

1.4 Whenever economically feasible, recharge surplus water in excess of irrigation demands in years of adequate supply to be extracted and delivered to water users in years of deficient supplies.

1.5 Purchase and utilize or bank supplemental surface water supplies (Sec. 215 & Kern River or other surplus supplies) when available and when irrigation demands or recharge capacity exist within the District.

1.6 If economical, exchange or bank available water with other agencies when irrigation demands or recharge capacity in the District is insufficient.

2) **Water Supply Affordability**

2.1 Keep the cost of water supplied to District customers and water assessments to all landowners in the District affordable.

2.2 Keep the cost of water supplied to District customers available at a cost that is comparable to landowner's costs for pumping groundwater from privately owned wells, in order to offer a viable alternative to groundwater.

3) **Groundwater Overdraft**

3.1 Do not increase, and, where possible, reverse long-term groundwater overdraft within the District

3.2 Do not increase, and, where possible, reverse groundwater overdraft within any of the three groundwater zones (separated by faults) within the District

3.3 Do not increase, and where possible, reverse groundwater overdraft within the Kern Basin (as defined by DWR Bulletin 118) or neighboring basins

3.4 Do not increase the pumping costs of other well owners (by lowering well water levels) and where possible decrease them

3.5 Do not create shallow groundwater related problems to other landowners or to District facilities

4) **Groundwater Quality**

4.1 Water delivered to customers (including groundwater) shall be suitable for irrigation purposes

4.2 Water delivered to the Aqueduct shall meet applicable standards

4.3 Do not contaminate groundwater

4.4 Do not add to the degradation of groundwater quality, and where possible, improve groundwater quality

4.5 Chemicals used for weed control or other purposes in spreading basins shall be selected and applied in a manner that does not contaminate groundwater

5) **Compliance with Contracts, Agreements, Laws, and Cooperation with Other Agencies**

5.1 Comply with the provisions of contracts and agreements that the District has entered into, including, but not limited to: Water Supply Contract with USBR, CVC Participation and Exchange agreements, and AEWSD/MWD Water Management Program agreements.

5.2 Comply with applicable laws and regulations including NEPA and CEQA

5.3 Cooperate with other Federal, State, and local agencies that have jurisdiction in the District

6) **Inelastic Land Surface Subsidence**

6.1 do not cause inelastic land surface subsidence that will result in property damage

7) **Groundwater Monitoring**

7.1 conduct monitoring programs to provide the District management with sufficient information to make informed decisions on groundwater management

7.2 conduct monitoring programs to measure results of programs undertaken and the attainment of Basin Management Objectives.

A separate description of “how meeting each Management Objective will contribute to a more reliable supply for long-term beneficial uses of groundwater within the plan area” (a DWR recommended part of the Plan) is not deemed necessary, as these are self-evident.

V. Components of the Groundwater Management Plan

Management Plan Elements Allowed by AB-3030

AB-3030 allows local agencies to adopt Groundwater Management Plans to address 12 specific elements. These elements and their application in the District are discussed below. A general discussion of each AB-3030 element is given below, followed by proposed District actions related to that element (*italicized to set them apart*).

A. Control of Saline Water Intrusion

Saline water can degrade groundwater quality and ultimately render part of the groundwater unusable (without treatment). It is desirable, therefore, in some areas of California, and particularly those areas influenced by sea-water intrusion, to control the movement of saline water to preserve groundwater quality.

Saline water intrusion is not as much of a concern in the District as it is in other areas of California. However, a number of areas were identified by the USGS within and adjacent to the District with elevated levels of salt in the groundwater before the District initiated operations. See Figure 15 from USGS Water Supply Paper 1656. These areas are believed to have occurred due to operation of natural processes and oil production activities, and existed prior to the initiation of irrigation in the District. Furthermore, groundwater pumping and overdraft prior to the District’s project operations caused groundwater gradients that moved saline water into other areas of the District. The District’s project has had the effect of reducing/ reversing that trend.

A number of sources, both natural and man-made, can increase the salinity in groundwater. Salts can come from imported water, salts in the soil (leached by irrigation), animal wastes, fertilizer use, soil amendment use and municipal and industrial wastewaters. Increases in groundwater salinity have always been a natural phenomenon in closed basin areas, like the Kern County Basin. The Tulare Lake Water Quality Control Plan recognizes that there are no proven means available at present to maintain groundwater salinity at current levels throughout the Basin, and recognizes that a certain amount of degradation is likely to occur due to man’s activities. Kenneth D. Schmidt and Associates analysis of groundwater quality trends in the District (Appendix G) identifies gradual increases in groundwater salinity as an on-going concern.

In spite of the inherent difficulties of controlling groundwater salinity, the District is determined to minimize salinity degradation and migration related problems in its groundwater. The District's existing groundwater monitoring program will be continued, with improvements noted, in a manner that provides management information about salinity in the groundwater. Furthermore on-going efforts to control groundwater overdraft through the importation of high quality surface water for direct and in-lieu recharge, plus District management of extractions as provided in Section V.H. of this Plan will continue to limit saline water degradation and migration, and in some areas improve salinity of the groundwater. In addition, when alternative surface water supplies are available for importation into Arvin-Edison, the District considers not only the cost but the water quality of the alternatives. Water quality of surface supplies can also change with time and those changes are monitored by the District and scheduled, when possible, to achieve the maximum water quality benefit.

B. Identification and Management of Wellhead Protection Areas and Recharge Areas

The Federal Wellhead Protection Program was established by Section 1428 of the Safe Drinking Water Act Amendments of 1986. The purpose of the program is to protect groundwater sources of public drinking water supplies from contamination, thereby eliminating the need for costly treatment to meet drinking water standards. The program is based on the concept that the development and application of land-use controls, usually applied at the local level in California, and other preventative measures can protect groundwater. A Wellhead Protection Area (WHPA), as defined by the 1986 Amendments, is "the surface and subsurface area surrounding a water well or wellfield supplying a water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield". The WHPA may also be the recharge area that provides the water to a well or wellfield. Unlike surface watersheds that can be easily determined from topography, WHPA's can vary in size and shape depending on subsurface geologic conditions, the direction of groundwater flow, pumping rates and aquifer characteristics. There are several different methods typically used to delineate the lateral boundaries of a WHPA. Under the Act, states are required to develop an EPA-approved Wellhead Protection Program. To date, California has no state-mandated program, but instead relies on local agencies to plan and implement programs. This is one of the factors that prompted the State Legislature to enact AB-3030. Wellhead Protection Programs are not regulatory in nature, nor do they address specific sources. They are designed to focus on the management of the resource rather than control a limited set of activities or contaminant sources.

As the District does not provide public drinking water to its customers, Wellhead Protection Areas are generally not applicable to District and landowner irrigation wells. The District will, however cooperate with the Wellhead Protection programs of other overlapping or neighboring agencies with public water supply wells, to the extent that it can.

C. Regulation of the Migration of Contaminated Groundwater

Groundwater contamination can originate from many sources or activities. Clean-up of contaminated groundwater is a complex and expensive task, generally involving a number of organizations. Agencies with roles to play in mitigating groundwater contamination include the United States Environmental Protection Agency (EPA), California Regional Water Quality Control Board (RWQCB) and the California Department of Toxic Substances Control (DTSC). Each agency has its own set of regulatory authorities and expertise to contribute. The degree to which they participate depends upon the nature and magnitude of the problem.

The District cooperates with various other agencies to help insure that groundwater quality is not degraded. As an example, over the last two years, the District has intervened in and participated with the County of Kern in various lawsuits to assist the County in its efforts to insure that only the highest quality of sludge is utilized on lands overlying the groundwater basin.

The role of the District with respect to the regulation of the migration of contaminated groundwater will be to report any contamination that it discovers to the appropriate agency. Further cooperation and assistance with the responsible agencies will be given, if requested and as appropriate, according to the District's jurisdiction and authority.

D. Administration of Well Abandonment and Destruction Program

Existing State and Kern County law requires that owners or lessees properly destroy their abandoned wells. Proper destruction of abandoned wells is necessary to protect groundwater resources and public safety. Abandoned or improperly destroyed wells can result in contamination from surface sources, or water of different chemical qualities from different strata mixing in an undesired way. Either way, useable groundwater can become degraded and/ or contaminated.

This Plan recognizes that the responsibility for administration and enforcement of the County well ordinance will remain with the Kern

County Department of Health Services. The District will properly abandon its own wells when they are no longer useful. In addition, the District encourages landowners to convert useable wells to monitoring wells to become a part of the District's groundwater monitoring program. The District will continue to maintain copies of all Well Completion Reports that are filed with DWR for wells drilled in the District to facilitate evaluation of groundwater monitoring data.

E. Mitigation of Conditions of Overdraft

As mentioned in Section III. F1, overdraft of the groundwater supply can lead to a variety of problems. Groundwater overdraft is due to an imbalance in the rates of extractions and replenishment. There are several methods to correct this imbalance. The first is to decrease the extraction to match the rate of replenishment. The second is to increase groundwater replenishment to match the extraction rate and the third is a combination of the first two, to balance replenishment and extraction. Each of the methods must be applied over an extended period, making use of the storage capacity of the aquifer. Extractions can exceed replenishment in drought periods as long as replenishment equally exceeds extractions in wetter periods.

Overdraft is a significant concern in the District, and the desire to eliminate overdraft has driven many of the District's decisions and activities throughout its existence. While groundwater levels no longer have a downward trend, the District's most recent evaluation of overdraft (Appendix A, Attachment 3) shows a small amount of overdraft remaining in the District for the hydrologic period studied. In addition to this the DWR estimates the overdraft within the larger Kern-Tulare hydrologic area, which includes the District, to be approximately 745,000 acre-feet per year. Also, groundwater levels remain relatively deep in most of the District reflecting overdraft conditions present before operation of the District's project.

The District will continue to monitor, map, graph, and analyze groundwater levels and groundwater balance in the District, and its three sub-areas.

The District recognizes that any reduction in its surface water supplies, reduction of subsurface inflow, or increase in net groundwater pumping within or adjacent to the District could increase groundwater overdraft conditions in the District. The District will therefore continue to monitor these types of threats, and work toward reduction and elimination of overdraft conditions in the District and the Kern County Basin.

Furthermore, the District will continue to look for opportunities to further elevate groundwater levels within the District and reduce overdraft in the

Kern groundwater basin by participating in projects or activities that positively affect groundwater balance and are cost effective to implement.

F. Groundwater Replenishment

Replenishment of groundwater in the District occurs by both natural and artificial means and is an important technique in the management of water supplies, groundwater levels and groundwater quality, as well as for control of overdraft.

The District will continue to operate and manage existing groundwater replenishment facilities to meet the Objectives of this Plan. Furthermore, the District will continue to look for and evaluate opportunities to participate in projects or activities that further replenish groundwater. A list of potential projects and activities that would have groundwater replenishment benefits is given in Table 8.

G. Groundwater Monitoring

An effective groundwater level and storage monitoring program is a necessary part of a Groundwater Management Plan. The District's existing groundwater level and groundwater storage monitoring program has proven to be very effective. Therefore, it should be continued. A minor improvement would be to maintain more hydrographs of landowner wells in selected areas annually using water level data that is already collected. This will give a more complete picture of groundwater levels and storage in particular areas of the District.

The District will continue the current groundwater level and storage monitoring program previously described in Section III. D. In addition, hydrographs of selected landowner wells will be updated annually by District staff, and will be reported to the Board of Directors.

In addition, the District's existing groundwater quality monitoring program will be continued, with updated groundwater quality mapping by a hydro-geologist every 5 years.

H. Management of Groundwater Extractions

Management of groundwater extractions can help correct groundwater overdraft, and can also help control the migration of groundwater contaminants. The District presently manages groundwater extractions from its own wells near the District's canals, and indirectly manages extraction from some landowner wells by providing alternative supplies within the water service area. This program has proven to be effective in controlling district-wide overdraft (see Figure 12), negative localized groundwater level impacts, and contaminant migration. As can be seen, the District already practices extensive groundwater management.

The District will continue to manage extractions in its own wells through selective use of the pumps in a way that balances groundwater conditions district-wide and in the vicinity of each respective recharge area and well field.

The District will continue to indirectly manage extractions from landowner wells by providing alternative water supplies, where possible, to its surface water service area, and by continuing to manage its successful conjunctive use program. This will continue to include assessments to all District lands to generate funds for, among other things, purchasing water for spreading. Furthermore, the District will continue to evaluate opportunities to expand the surface water service area to reduce groundwater pumping particularly by providing temporary water service when available for deliveries.

I. Identification of Well Construction Policies

Improperly constructed wells may result in contaminated groundwater by establishing a pathway for pollutants entering a well through drainage from the surface, allowing mixing between aquifers of varying water quality, or the unauthorized disposal of waste into the well. The Kern County Department of Health Services has enacted and is responsible for enforcing a County Well Ordinance that regulates well construction. Owners must first obtain a well drilling permit from Kern County prior to drilling a well. The District has obtained permits for all of its wells, and will continue to do so.

This Plan recognizes that the responsibility for administration and enforcement of the County well ordinance will remain with the Kern County Department of Health Services. The District will apply for and obtain a well drilling permit for every well that it drills.

J. Construction and Operation of Groundwater Management Facilities

The successful construction and operation of the District's Project has proven to be effective toward solving groundwater related problems in the District. The District has a number of opportunities to further improve and enhance the water and groundwater supplies of its landowners and neighbors, as well as existing and potential water transfer and water banking partners. These opportunities involve a number of potential projects or activities (Table 8).

The District will continue to operate its existing groundwater management facilities for the primary benefit of its customers and landowners. Furthermore, the District will continue to participate in water transfers, water exchanges, water banking, and other water management arrangements that are mutually beneficial to the parties involved and are consistent with the Management Objectives of this Plan.

The District will continue to evaluate potential projects that would involve the construction and operation of additional groundwater management facilities. Additional groundwater management facilities can provide additional flexibility to the District to more optimally manage the groundwater

K. Development of Relationships with Federal, State and Local Regulatory Agencies

As detailed in Section II. F and Table 3, various Federal, State, and other local agencies have an involvement in groundwater management in Arvin-Edison. The District has been cooperative with these other agencies in the past, and plans to continue cooperation on a level appropriate to their various jurisdictions. The new requirements of SB-1938 concerning cooperative groundwater management within a given groundwater basin are discussed in Appendix I.

The District will continue to cooperate with, and operate under the requirements of the various Federal, State, and local agencies that have jurisdiction over various aspects of surface water and groundwater in the District. Furthermore, the District will participate in cooperative management of the Kern groundwater basin with other agencies that have jurisdiction there.

It should be stressed, however, that this Plan was formulated to ensure local control of groundwater management within the District. And, it is the intent of this Plan to foster this local control in as many aspects of groundwater management within the District as possible. This emphasis on local management is consistent with legislation authorizing development of groundwater management plans, as discussed previously in Section I.C.

L. Review of Land Use Plans and Coordination with Land Use Planning Agencies

One potential component of developing a groundwater management plan is the review of land use plans for the plan area and its surroundings and coordinating efforts with regional and local land use planning agencies. Land use planning activities in unincorporated areas of Kern County are performed by the Kern County's Planning Department and overseen by the Kern County Planning Commission. The District does not have direct land use planning authority. However, the District does have the opportunity to comment on the environmental documents for land use related activities, and comment or protest when appropriate.

Authority for land use plans will remain with the Kern County Planning Department and the Kern County Planning Commission. The District will, however, review environmental documents related to land use plans that will affect the District. Comments on the plans and/or protests will be made when land use plans conflict with Management Objectives contained in this Plan.

Program Components Required by SB-1938

Recent amendments to Water Code § 10750 resulting from the passage of SB-1938 require groundwater management plans prepared under that authority (i.e. AB-3030 Plans) to have components that address a number of issues. The SB-1938 requirements are summarized in Appendix I. A number of these components have already been addressed in the Plan above, including:

- Documentation that a written statement was provided to the public "describing the manner in which interested parties may participate in developing the groundwater management plan (Water Code § 10753.4) (See Section I. D of this Plan and Appendices C, D, and E.)
- Basin management objectives for the groundwater basin that is subject to the plan (Water Code § 10753.7 (a)(1)) (See Section IV.D).
- Components relating to the monitoring and management of groundwater levels and groundwater quality (Water Code § 10753.7 (a)(1) (See Section III.D).

In addition, the following components required by SB-1938 are included below.

M. Monitoring and Management of Inelastic Land Surface Subsidence

Water Code §10753.7 (a)(1) also requires groundwater management plans to address monitoring and management of inelastic land surface subsidence.

As discussed in Section III. F3, land surface subsidence was documented in the vicinity of the District in the 1975 USGS Professional Paper 437-D. At that time, some subsidence was observed along the western portion of the District that was attributed to overdraft. In addition, some subsidence in the vicinity of oil fields was also observed. Since that time, downward groundwater level trends have been arrested, eliminating one of the major causes of subsidence.

In recent years the District has seen no evidence of subsidence related problems in the District. This is significant because the District owns, operates, and maintains over 45 miles of concrete lined canals, 170 miles of pipelines, 72 production wells, and numerous booster pump stations. Evidence of subsidence problems would likely have been observed at District facilities, were they occurring.

While it would be an interesting exercise to document land surface elevation changes that have taken place in the District since the last USGS studies of subsidence, this is not a high priority for the District for the reasons mentioned above. Efforts to cooperate with other agencies studying land surface subsidence issues, like DWR and the USGS would be worthwhile.

Surveys by professional Land Surveyors utilizing Global Positioning Systems (GPS) could determine elevations of critical benchmarks and structures within the District with sufficient accuracy to identify significant elevation changes at relatively low cost (compared to conventional leveling techniques). Still, a separate effort to survey for subsidence related issues alone would not be worth the cost. It would be more cost-effective to have Professional Land Surveyors survey critical benchmarks and structures in Arvin-Edison as part of other land surveying efforts in the District.

The District has apparently effectively mitigated subsidence through the improvement of the water balance achieved from the District program. Maintenance and enhancement of the District management program is therefore important to continue to manage potential subsidence. Monitoring of subsidence is considered a low priority so long as the District program continues to result in relatively stable groundwater levels.

The District will cooperate with studies by other agencies (DWR and USGS in particular) of land subsidence. In addition, updated elevations of critical benchmarks and structures within the District may be conducted as part of other projects that require land surveying.

N. Changes in Surface Flow and Surface Water Quality that Directly affect Groundwater Levels or Quality or are caused by Groundwater Pumping

Water Code § 10753.7 (a)(1) also requires a groundwater management plan to address the topics given in the header above.

In some areas of the State, changes made to flows in surface streams can affect groundwater levels by changing recharge amounts from stream channels. Within the District, this is not the case, as flows in surface streams exist for extremely short durations, and diversions are generally not made from them. The District participates in the Kern County Coordinated Resource Management Program (CRMP), a program to develop funding and planning for projects that would reduce flooding problems from the streams that flow into the District from the east and south.

The District does obtain water from stream systems in other parts of the State where changes in surface flow and surface water quality could affect groundwater levels or groundwater quality in areas adjacent to the streams. Diversions made from these streams are generally made by other agencies, and management of those streams is outside of the District's jurisdiction. However, effects of changes in surface flows on these streams should be and normally are considered by these agencies during decision-making and environmental reviews.

Changes to surface water quality can also affect groundwater quality by changing the quality of water that seeps into the groundwater from the stream. The potential for groundwater contamination or degradation from eastside ephemeral streams in the District does exist. Upstream activities and/or waste discharges to these streams are a potential threat. The Regional Water Quality Control Board regulates several discharges to these streams. The District should monitor and report illegal waste discharges to these streams to the Regional Water Quality Control Board. Likewise, land use activities tributary to these streams that could impair their quality should likewise be monitored and controlled through available legal, regulatory, and planning means.

Groundwater pumping can increase seepage from surface streams in some areas. In the District, this is generally not a problem, as streamflow within the District occurs for short durations, and most of the water ends up seeping into the groundwater anyway.

The District is aware of the potential impacts that changes in surface flows may have on groundwater levels under streams that supply water to the District. The District will continue to work with agencies that have jurisdiction and decision-making authority to consider and mitigate this issue as decisions are made and environmental documents are prepared.

The District will continue to monitor activities and land use in ephemeral streams upstream of the District. Illegal discharges will be reported to the Regional Water Quality Control Board. Land uses or activities with the potential to negatively impact groundwater quality will be identified and opposed through legal, regulatory, and land use planning means available to the District.

O. Plan to Involve Other Agencies

Water Code § 10753.7 (a)(2) requires that a plan be developed by the managing entity (the District in this case) to "involve other agencies that enables the local agency to work cooperatively with other public entities whose service area or boundary overlies the groundwater basin." A local agency includes "any local public agency that provides water service to all or a portion of its service area" (Water Code § 10752 (g)).

The development of relationships (and maintenance of existing relationships) between the District and the various agencies involved in managing groundwater in the Kern basin is an important part of an effective groundwater management plan. As documented in prior sections, the District has a 37-year history of effective groundwater management that has involved cooperation with, and the involvement of, other Federal, State, and local agencies.

It is important to note that "the plan to involve other agencies" in the Kern County groundwater basin will not, however, be entirely up to the District to develop. The development of the plan will require input from other affected agencies within the basin. And, there are a large number of agencies involved (at least 30).

An important step toward the development of a coordinated plan for the Kern groundwater basin is being undertaken now as part of KCWA's "Mediated Process". This process is still being conducted, and will continue for an undetermined duration. Critical issues related to groundwater management, some of which may be controversial, are being discussed and negotiated by the various parties. The result of these discussions and negotiations will no doubt affect the plan.

The District has already established effective relationships and on-going coordination with a number of agencies involved in groundwater management in the Kern basin, including the USBR, DWR, KCWA, overlapping, and adjacent local agencies. These relationships will continue.

Furthermore, preparation and adoption of this Plan will raise other agencies' awareness of the District's groundwater management activities, and will raise the level of cooperation with other agencies that have jurisdiction, overlap, or are adjacent to the District.

The District will propose periodic meetings with overlapping and adjacent agencies for the purpose of coordinating groundwater management activities and other water management related activities that the agencies have in common.

The District will also participate in the development and implementation of Kern groundwater basin coordination plans through the KCWA Mediated Process and/or other basin-wide planning efforts.

P. Adoption of Monitoring Protocols

Water Code § 10753.7 (a)(4) requires the "adoption of Monitoring Protocols for the components in Water Code § 10753.7 (a)(1).

The District staff has already adopted and implemented monitoring protocols for the monitoring of groundwater levels and groundwater quality. These protocols are included in Appendices J and K.

Protocols for the monitoring of inelastic land surface subsidence will be developed by various government agencies that study subsidence issues in the District, like DWR and the USGS. In addition protocols for determining elevations of critical benchmarks and structures in Arvin-Edison will be developed and implemented by a Licensed Land Surveyor when and if surveys are made for that purpose in the District.

Components Recommended by DWR

In addition to the requirements of AB-3030 and SB-1938, DWR, in coordination with the Association of California Water Agencies (ACWA), has developed recommended components that a managing entity (the District) should incorporate into a groundwater management plan and is provided in Appendix I. At the time this Plan was prepared, these recommended components were in draft form (draft dated 12/23/02 was used).

The District has voluntarily incorporated DWR's recommendations into its Plan. A number of these components have been addressed in prior sections including:

- Description of the physical structure and characteristics of the aquifer system underlying the plan area in the context of the overall basin (Section III. C)
- A summary of the availability of historical data including, but not limited to, the components in Water Code § 10753.7 (a)(1) (Sections I.A, II.E1, II.E1&2)
- Issues of concern including, but not limited to, the components in Water Code § 10753.7 (a)(1) (Section F)
- A general discussion of historical and projected water demands and supplies (Section II.E)
- A description of how meeting each Management Objective (MO) will contribute to a more reliable supply for long-term beneficial uses of groundwater within the plan area (Section IV.D)
- Existing or planned management actions to achieve the MO's (note, these are included in italics in this section of the Plan)
- A map indicating the general locations of any applicable monitoring sites for groundwater levels, groundwater quality, subsidence station, or stream gauges is provided in Appendices J & K.
- A summary of monitoring sites indicating type and frequency of monitoring. For groundwater level and groundwater quality wells, indicate the depth interval(s) or aquifer zone monitored and the type of well is provided in Appendix J
- Describe any current or planned actions by the local managing entity to coordinate with other land use, zoning, or water management planning (Section V.K & L).

In addition to these, the following components are a part of this Groundwater Management Plan:

Q. Advisory Committee of Stakeholders

DWR recommends that an advisory committee of stakeholders (interested parties) within the plan area be established that will help guide the development and implementation of the plan.

Unless other appointments are made by the Board of Directors of the District, the advisory committee of stakeholders will consist of the Board of Directors of Arvin-Edison. This is appropriate, as members of the Board of Directors are elected to represent landowners in the District, the primary stakeholders in the District. Other potential stakeholders may nominate *themselves, subject to the Board's approval to serve on the Advisory Committee.*

While the Advisory Committee's input will be sought, the ultimate authority for the implementation and periodic updating of this Plan will remain with the Board of Directors.

R. Periodic Reports Summarizing Groundwater Basin Conditions and Groundwater Management Activities

DWR recommends that groundwater management plans provide for periodic reports summarizing groundwater basin conditions and groundwater management activities.

The District staff presently prepares a summary of water management program activities annually that typically includes much of the information that DWR recommends. Pursuant to this Plan, the District will incorporate the following information into annual water management reports to the Board of Directors:

- *Summary of monitoring results, including a discussion of historical trends.*
- *Summary of management actions during the year covered by the report.*
- *A discussion, supported by monitoring results, of whether management actions are achieving progress in meeting Management Objectives.*
- *Summary of proposed management actions*
- *Summary of any plan component changes, including addition or modification of Management Objectives during the year*

Each Annual Report will be prepared following the end of the Water Year (February 28 or 29) for which the Annual Report applies to. The annual report shall be completed and presented to the Advisory committee by May 31st of each year.

S. Periodic Re-Evaluation of Entire Plan

The District Board already meets monthly (at regularly scheduled and special Board meetings) to review issues of importance and make decisions with respect to the management of the District, including groundwater management issues. And, this will continue. The Board of Directors reserves the right to continue to make decisions with respect to groundwater management issues at its Board meetings in accordance with the Plan and its Management Objectives.

The Advisory Committee will meet annually (prior to July 1st of each year) to review annual reports prepared pursuant to this Plan. These meetings may (or may not) coincide with regular or special Board meetings. The Committee may recommend changes to the Plan at the annual meetings.

The entire Plan may be re-evaluated and amended at any time. Scheduled re-evaluations will be conducted every 5 years, unless the Advisory Committee elects to forgo a re-evaluation.

Significant changes to the Plan will require appropriate public notice, and the same process that was originally done for adopting the Plan.

VI. Program Costs, Funding, and Potential Fees

Initial costs to implement the program will be borne by the District. These costs are anticipated to be within existing budgets established for the District's management activities.

Other sources of funds for projects or management activities pursuant to this Plan may be sought including:

- AB-303 funding for Groundwater Management Plan Implementation
- Proposition 82 Groundwater Recharge Feasibility Study and/or Construction Loans
- Proposition 13 Groundwater Storage Feasibility Study and/or Construction Grants
- Proposition 50 Funds
- Private or Public Financing through a bank or other lending institution, Certificates of Participation, or Bonds
- The levee of benefit assessments, water toll charges, or other mechanisms consistent with the Water Code and Proposition 218 requirements

If additional funds are necessary to implement the Program and are outside the current authority of the District to raise, but within the powers granted by AB-3030, a public vote will be required. A simple majority (weighted by assessed valuation) is necessary to approve a measure to levee a fee for groundwater management.

ATTACHMENT G

Groundwater Banking Plan

(See Attachment F)

ATTACHMENT H

District Water Quality Information

EXHIBIT "C1"

ARVIN-EDISON WATER STORAGE DISTRICT

WATER SUPPLY WATER QUALITY SUMMARY

	Date	Flow	Import	Calcium		Magnesium		Sodium		Bicarbonate		Chloride		Nitrate		TDS	pH	EC	Hardness	SAR	Gypsum	Boron
		cfs	Source	mg/l	me/l	mg/l	me/l	mg/l	me/l	mg/l	me/l	mg/l	me/l	mg/l	me/l	mg/l		umhos/cm	mg/l		lbs/AF	mg/l
Intake Canal	02/12/18	210	CVC(100%)	24.0	1.20	8.2	0.67	51.0	2.20	110	1.80	67.0	1.88	4.60	0.07	240	8.2	421	94	2.3	ND	0.14
	01/03/18	130	FKC(100%)	3.3	0.17	1.0	0.08	4.2	0.18	18	0.30	3.4	0.10	0.24	0.00	24	7.2	43	12	0.5	0.23	0.01
	12/08/17	130	FKC(100%)	6.8	0.34	3.6	0.30	11.0	0.47	40	0.66	12.0	0.34	1.10	0.02	62	7.6	127	32	0.8	0.05	0.04
	11/14/17	200	FKC(73%)/CVC(27%)	6.3	0.32	3.0	0.25	13.0	0.56	32	0.52	15.0	0.42	0.43	0.01	61	7.4	119	28	1.0	ND	0.04
	10/11/17	385	FKC(68%)/CVC(32%)	8.4	0.42	4.8	0.39	18.0	0.78	45	0.74	25.0	0.70	0.75	0.01	90	7.4	187	41	1.2	ND	0.05
	09/06/17	350	FKC(64%)/CVC(36%)	2.7	0.14	0.7	0.06	2.9	0.13	24	0.39	1.7	0.05	ND	ND	22	7.6	30	10	0.4	0.87	ND
	08/09/17	500	FKC(80%)/CVC(20%)	3.4	0.17	1.3	0.11	4.8	0.21	22	0.36	4.5	0.13	0.14	0.00	28	7.0	56	14	0.6	0.40	0.03
	07/05/17	550	FKC(100%)	2.3	0.12	0.4	0.03	2.0	0.09	18	0.30	2.0	0.06	ND	ND	19	6.9	33	7	0.3	0.62	ND
	06/06/17	550	FKC(100%)	3.4	0.17	0.7	0.05	2.9	0.13	23	0.38	1.0	0.03	ND	ND	22	7.2	35	11	0.4	0.65	0.03
	05/09/17	550	FKC(64%)/KR(36%)	6.5	0.33	1.2	0.10	5.7	0.25	30	0.49	1.6	0.04	0.20	0.00	34	7.1	59	21	0.5	0.00	0.04
	04/10/17	440	FKC(100%)	4.4	0.22	0.9	0.08	3.9	0.17	23	0.38	1.7	0.05	0.22	0.00	25	7.2	48	15	0.4	0.4	0.01
	03/14/17	480	FKC(71%)/KR(29%)	5.4	0.27	1.1	0.09	4.5	0.19	32	0.52	1.9	0.05	0.52	0.01	33	7.7	61	18	0.5	0.7	0.02
	02/13/17	380	FKC(100%)	4.6	0.23	0.9	0.07	4.2	0.18	22	0.36	2.1	0.06	0.79	0.01	26	7.6	47	15	0.5	0.3	ND
	01/10/17	160	FKC(100%)	18.0	0.90	0.8	0.06	40.0	1.72	78	1.28	19.0	0.53	4.90	0.08	140	8.2	242	47	2.6	1.5	0.12
	Average			**7.1**	**0.4**	**2.0**	**0.2**	**12.0**	**0.5**	**36.9**	**0.6**	**11.3**	**0.3**	**1.3**	**0.0**	**59.0**	**7.4**	**107.7**	**26.1**	**0.9**	**0.5**	**0.0**
North Canal	02/12/18	15	CVC(100%)	9.5	0.48	1.1	0.09	12.0	0.52	45	0.74	9.1	0.26	2.10	0.03	64	7.3	124	28	0.9	0.77	0.05
	01/03/18	0	FKC(100%)	2.8	0.14	0.7	0.05	3.2	0.14	17	0.28	2.3	0.06	0.17	0.00	19	7.2	36	10	0.5	0.39	0.02
	12/08/17	30	FKC(100%)	8.4	0.42	3.9	0.32	10.0	0.43	41	0.67	14.0	0.39	1.10	0.02	66	7.5	135	37	0.7	ND	0.05
	11/14/17	30	FKC(73%)/CVC(27%)	7.6	0.38	3.7	0.30	17.0	0.73	40	0.66	22.0	0.62	0.42	0.01	79	7.6	157	34	1.3	ND	0.06
	10/11/17	80	FKC(68%)/CVC(32%)	9.3	0.47	4.9	0.40	18.0	0.78	45	0.74	25.0	0.70	0.73	0.01	91	7.7	184	43	1.2	ND	0.05
	09/06/17	175	FKC(64%)/CVC(36%)	2.1	0.11	0.4	0.03	1.7	0.07	18	0.30	1.1	0.03	ND	ND	16	7.1	25	7	0.3	0.65	ND
	08/09/17	330	FKC(80%)/CVC(20%)	4.3	0.22	1.3	0.11	5.7	0.25	24	0.39	4.8	0.13	0.12	0.00	32	7.4	64	16	0.6	0.33	0.05
	07/05/17	185	FKC(100%)	2.7	0.14	0.4	0.03	2.2	0.09	16	0.26	1.1	0.03	ND	ND	16	6.7	29	8	0.3	0.41	0.01
	06/06/17	315	FKC(100%)	5.4	0.27	0.9	0.07	3.7	0.16	23	0.38	1.1	0.03	ND	ND	25	7.3	41	17	0.4	0.17	0.04
	05/09/17	225	FKC(64%)/KR(36%)	6.7	0.34	1.2	0.10	5.5	0.24	30	0.49	1.6	0.04	0.20	0.00	34	7.5	59	22	0.5	0.26	0.04
	04/10/17	80	FKC(100%)	5.0	0.25	0.9	0.08	5.4	0.23	28	0.46	2.0	0.06	0.24	0.00	30	7.3	49	16	0.6	0.6	0.02
	03/14/17	125	FKC(71%)/KR(29%)	6.0	0.30	1.1	0.09	4.8	0.21	34	0.56	1.9	0.05	0.60	0.01	35	7.5	66	20	0.5	0.7	0.03
	02/13/17	135	FKC(100%)	4.9	0.25	0.8	0.07	4.1	0.18	23	0.38	2.0	0.06	0.65	0.01	27	7.5	48	16	0.5	0.3	ND
	01/10/17	35	FKC(100%)	38.0	1.90	5.7	0.47	40.0	1.72	120	1.97	25.0	0.70	13.00	0.21	220	8.4	364	120	1.6	ND	0.14
	Average			**8.1**	**0.4**	**1.9**	**0.2**	**9.5**	**0.4**	**36.0**	**0.6**	**8.1**	**0.2**	**1.8**	**0.0**	**53.9**	**7.4**	**98.6**	**28.1**	**0.7**	**0.5**	**0.0**
South Canal	02/12/18	0	CVC(15%)/AQ(85%)	23.0	1.15	13.0	1.07	61.0	2.63	97	1.59	91.0	2.56	3.40	0.05	290	7.9	528	110	2.6	ND	0.18
	01/03/18	0	AQ(100%)[2]	19.0	0.95	11.0	0.90	48.0	2.07	75	1.23	68.0	1.91	2.30	0.04	220	8.6	388	93	2.2	ND	0.10
	12/08/17	0	FKC(70%)/AQ(30%)	15.0	0.75	8.9	0.73	31.0	1.34	79	1.30	38.0	1.07	2.70	0.04	160	8.3	302	75	1.6	ND	0.09
	11/14/17	0	FKC(73%)/CVC(27%)	16.0	0.80	9.1	0.75	36.0	1.55	77	1.26	54.0	1.52	1.80	0.03	180	8.1	337	77	1.8	ND	0.11
	10/11/17	0	FKC(68%)/CVC(32%)	10.0	0.50	5.1	0.42	16.0	0.69	56	0.92	20.0	0.56	0.30	0.00	89	7.4	186	46	1.0	ND	0.05
	09/06/17	70	FKC(64%)/CVC(36%)	2.1	0.11	0.4	0.03	1.6	0.07	15	0.25	1.0	0.03	ND	ND	14	7.1	25	7	0.3	0.48	ND
	08/09/17	140	FKC(80%)/CVC(20%)	3.9	0.20	1.2	0.10	4.6	0.20	27	0.44	3.6	0.10	0.10	0.00	30	7.3	56	14	0.5	0.68	0.03
	07/05/17	60	FKC(100%)	2.5	0.13	0.4	0.03	1.9	0.08	17	0.28	0.8	0.02	ND	ND	15	6.8	26	8	0.3	0.50	ND
	06/06/17	90	FKC(100%)	4.5	0.23	0.7	0.06	3.2	0.14	2	0.03	1.1	0.03	ND	ND	23	7.3	41	14	0.4	0.37	0.04
	05/09/17	50	FKC(64%)/KR(36%)	7.4	0.37	1.2	0.10	5.5	0.24	42	0.69	1.4	0.04	0.23	0.00	40	7.4	62	23	0.5	0.96	0.04
	04/10/17	40	FKC(100%)	4.9	0.25	0.9	0.07	3.9	0.17	29	0.48	1.7	0.05	ND	ND	28	7.4	50	16	0.4	0.6	0.02
	03/14/17	10	FKC(71%)/KR(29%)	6.4	0.32	1.1	0.09	4.9	0.21	37	0.61	1.9	0.05	0.58	0.01	38	7.5	69	21	0.5	0.9	0.02
	02/13/17	0	FKC(100%)	5.2	0.26	0.9	0.07	4.1	0.18	24	0.39	1.9	0.05	0.75	0.01	27	7.5	48	16	0.4	0.3	ND
	01/10/17	0	FKC(100%)	25.0	1.25	2.6	0.21	31.0	1.34	91	1.49	19.0	0.53	7.70	0.12	150	8.3	265	74	1.6	0.0	0.10
	Average			**10.4**	**0.5**	**4.0**	**0.3**	**18.1**	**0.8**	**47.7**	**0.8**	**21.7**	**0.6**	**2.0**	**0.0**	**93.1**	**7.6**	**170.2**	**42.4**	**1.0**	**0.5**	**0.1**

EXHIBIT "C1"

ARVIN-EDISON WATER STORAGE DISTRICT

WATER SUPPLY WATER QUALITY SUMMARY

	Date	Flow[1]	Import	Calcium		Magnesium		Sodium		Bicarbonate		Chloride		Nitrate		TDS	pH	EC	Hardness	SAR	Gypsum	Boron
		cfs	Source	mg/l	me/l	mg/l	me/l	mg/l	me/l	mg/l	me/l	mg/l	me/l	mg/l	me/l	mg/l		umhos/cm	mg/l		lbs/AF	mg/l
Intertie Pipeline	02/12/18	100	AQ(100%)	22.0	1.10	14.0	1.15	64.0	2.76	95	1.56	92.0	2.58	3.70	0.06	290	7.9	533	110	2.6	ND	0.19
	01/03/18	60	AQ(100%)	19.0	0.95	12.0	0.98	54.0	2.33	83	1.36	78.0	2.19	3.60	0.06	240	7.9	428	96	2.4	ND	0.10
	12/08/17	15	AQ(100%)	13.0	0.65	8.2	0.67	26.0	1.12	76	1.25	34.0	0.96	3.00	0.05	140	7.9	281	66	1.4	ND	0.09
	11/14/17	75	FKC(57%)/CVC(21%)/AQ(21%)	16.0	0.80	9.8	0.80	40.0	1.72	73	1.20	59.0	1.66	2.00	0.03	190	7.8	358	81	1.9	ND	0.11
	10/11/17	100	FKC(54%)/CVC(26%)/AQ(21%)	15.0	0.75	9.2	0.75	34.0	1.47	76	1.25	54.0	1.52	2.10	0.03	180	7.5	352	76	1.7	ND	0.10
	09/06/17	60	FKC(57%)/CVC(33%)/AQ(10%)	11.0	0.55	6.1	0.50	20.0	0.86	62	1.02	26.0	0.73	0.51	0.01	110	8.0	210	52	1.2	ND	0.05
	08/09/17	60	FKC(71%)/CVC(18%)/AQ(11%)	4.1	0.21	1.1	0.09	4.4	0.19	22	0.36	3.4	0.10	0.11	0.00	27	7.6	56	15	0.5	0.31	0.03
	07/05/17	0	FKC(100%)	3.2	0.16	0.5	0.04	2.2	0.09	21	0.34	1.0	0.03	ND	ND	19	7.0	35	10	0.3	0.60	ND
	06/06/17	0	FKC(100%)	5.4	0.27	0.9	0.08	4.1	0.18	30	0.49	1.9	0.05	ND	ND	30	9.2	51	17	0.4	0.62	0.04
	05/09/17	0	FKC(64%)/KR(36%)	8.3	0.42	1.2	0.10	5.4	0.23	36	0.59	1.6	0.04	0.18	0.00	38	7.2	64	26	0.5	0.30	0.03
	04/10/17	0	FKC(100%)	7.6	0.38	1.0	0.08	4.1	0.18	36	0.59	1.9	0.05	0.13	0.00	35	7.8	64	23	0.4	0.59	0.02
	03/14/17	0	FKC(71%)/KR(29%)	6.4	0.32	1.0	0.08	4.1	0.18	35	0.57	1.8	0.05	ND	ND	34	7.8	63	20	0.4	0.72	0.02
	02/13/17	0	FKC(100%)	10.0	0.50	0.9	0.07	4.2	0.18	35	0.57	2.1	0.06	0.42	0.01	38	7.7	69	29	0.3	0.03	0.01
	01/10/17	0	FKC(100%)	22.0	1.10	6.4	0.52	49.0	2.11	94	1.54	48.0	1.35	3.60	0.06	200	8.1	354	82	2.3	ND	0.14
	Average			**11.6**	**0.6**	**5.2**	**0.4**	**22.5**	**1.0**	**55.3**	**0.9**	**28.9**	**0.8**	**1.8**	**0.0**	**112.2**	**7.8**	**208.4**	**50.2**	**1.2**	**0.5**	**0.1**

Water Supply Water Quality Note: [1] Positive flow rate is reverse flow into the District. Where the reported value is ND, the method detection limit is entered.
Water Supply Water Quality Note: [2] Reverse flow into the District South Canal (Sycamore check gate was closed).

ND: NONE DETECTED.
NA: NOT AVAILABLE OR NOT TESTED.

mg/l: MILLIGRAMS PER LITER; SAME AS PARTS PER MILLION (ppm).

me/l: MILLEQUIVALENTS PER LITER; SAME AS EQUIVALENTS PER MILLION (epm).

INTAKE: SAMPLE TAKEN AT COTTONWOOD RD. SOUTH OF PANAMA LANE.
NORTH: SAMPLE TAKEN DOWNSTREAM OF SYCAMORE CHECK GATE.
SOUTH: SAMPLE TAKEN DOWNSTREAM OF TEJON CHECK GATE.
INTERTIE: TERMINUS OF SOUTH CANAL (S93 FOREBAY).

SODIUM: FOR SURFACE IRRIGATION: SAR < 3 IS GOOD. FOR SPRINKLER IRRIGATION: SODIUM < 3 me/l IS GOOD.

NITRATE: NITRATE IN WATER SLIGHTLY REDUCES FERTILIZER REQUIREMENT.

BICARBONATE: BICARBONATE < 1.5 me/l IS SATISFACTORY FOR OVERHEAD SPRINKLERS.

CHLORIDE: FOR SURFACE IRRIGATION CHLORIDE < 4 me/l IS GOOD.

TDS: TDS < 450 IS ACCEPTABLE FOR UNRESTRICTED USE.

GYPSUM: AMOUNT OF CALCIUM SULFATE IN POUNDS PER ACRE-FOOT OF WATER APPLIED. INCREASES WATER PERMEABILITY AND HELPS CORRECT EXCESS SODIUM. INCREASES CLAY FLOCCULATION FOR INCREASING PERMEABILITY.

pH: A MEASURE OF ACIDITY. A pH < 7 IS ACIDIC, pH = 7 IS NEUTRAL, pH > 7 IS BASIC. NORMAL RANGE IS 6.5 - 8.4. A pH > 8 MAY NEED TO BE BUFFERED FOR PESTICIDE APPLICATION. AFFECTS NUTRIENT AVAILABILITY.

EC: ELECTRICAL CONDUCTIVITY. A MEASURE OF WATER SALINITY; SOIL - IN MILLIMHOS PER CENTIMETER (mmho/cm); WATER - MORE OFTEN, IN MICROMHOS PER CENTIMETER (umhos/cm). EC < 700 (umhos/cm) HAS NO RESTRICTIONS FOR AGRICULTURAL USE. EC < 200 (umhos/cm) CAN REDUCE INFILTRATION RATE.

HARDNESS: HARD WATER, INDICATING CALCIUM AND MAGNESIUM, IS BENEFICIAL FOR AGRICULTURE.

SAR: SODIUM ADSORPTION RATIO. A RATIO OF SODIUM TO CALCIUM AND MAGNESIUM.
EVALUATE WITH EC.
SAR = 0 - 3 AND EC > 400 ACCEPTABLE
SAR = 3 - 6 AND EC > 900 ACCEPTABLE

BORON: BORON < 0.50 mg/l IS SATISFACTORY FOR ALL CROPS. EXCESSIVE BORON IS PHYTOTOXIC (BURNS) TO PLANTS.

ARVIN-EDISON WATER STORAGE DISTRICT

WELL WATER QUALITY DATA

	Date	Well #	Calcium		Magnesium		Sodium		Bicarbonate		Chloride		Nitrate		SO4	TDS	pH	EC	Hardness	SAR	Gypsum	Gypsum	Boron
			mg/l	meq/L	mg/l	meq/L	mg/l	meq/L	mg/l	meq/L	mg/l	meq/L	mg/l	meq/L	mg/l	mg/l		umhos/cm	mg/l		% gyp/hr/100 ga	Tons/AF	mg/l
North Canal	6/16/16	AEN-1	99.00	4.95	20.00	1.64	56.00	2.38	230.00	3.77	57.00	1.60	34.00	0.5	170.00	550.00	7.78	898.00	330.00	1.40	0.01	0.54	0.200
	6/16/16	AEN-2	110.00	5.50	26.00	2.13	61.00	2.59	230.00	3.77	65.00	1.82	64.00	1.0	200.00	640.00	7.70	1030.00	380.00	1.40	0.01	0.54	0.260
	6/16/16	AEN-3	130.00	6.50	32.00	2.62	61.00	2.59	240.00	3.94	73.00	2.04	110.00	1.8	190.00	720.00	7.78	1150.00	440.00	1.30	0.01	0.54	0.260
	6/16/16	AEN-4	97.00	4.85	32.00	2.62	63.00	2.68	210.00	3.44	61.00	1.71	78.00	1.3	210.00	650.00	7.63	1030.00	380.00	1.40	0.01	0.54	0.310
	6/16/16	AEN-5	99.00	4.95	25.00	2.05	67.00	2.85	280.00	4.59	61.00	1.71	79.00	1.3	120.00	600.00	7.89	971.00	350.00	1.60	0.01	0.54	0.280
	6/16/16	AEN-6	59.00	2.95	8.10	0.66	86.00	3.66	210.00	3.44	67.00	1.88	19.00	0.3	90.00	440.00	8.05	757.00	180.00	2.80	0.01	0.54	0.550
	6/16/16	AEN-7	32.00	1.60	3.20	0.26	83.00	3.53	150.00	2.46	41.00	1.15	2.80	0.0	84.00	320.00	8.06	568.00	92.00	3.80	2.90	157.47	0.490
	6/16/16	AEN-8	50.00	2.50	8.40	0.69	65.00	2.76	170.00	2.79	44.00	1.23	1.30	0.0	100.00	360.00	7.88	624.00	160.00	2.20	0.01	0.54	0.480
	6/16/16	AEN-9	43.00	2.15	4.60	0.38	84.00	3.57	210.00	3.44	48.00	1.34	25.00	0.4	76.00	390.00	8.04	676.00	130.00	3.20	3.60	195.48	0.430
	6/16/16	AEN-10	19.00	0.95	0.92	0.08	90.00	3.83	140.00	2.30	44.00	1.23	22.00	0.4	64.00	310.00	8.09	551.00	51.00	5.50	5.30	287.79	0.520
	6/16/16	AEN-11	32.00	1.60	4.80	0.39	72.00	3.06	160.00	2.62	37.00	1.04	0.89	0.0	72.00	300.00	8.06	525.00	100.00	3.10	2.40	130.32	0.850
	6/16/16	AEN-12	17.00	0.85	1.40	0.11	78.00	3.32	140.00	2.30	30.00	0.84	3.40	0.1	55.00	250.00	8.16	458.00	49.00	4.80	5.40	293.22	0.640
	6/16/16	AEN-13	37.00	1.85	6.60	0.54	68.00	2.89	160.00	2.62	45.00	1.26	0.31	0.0	76.00	310.00	8.07	570.00	120.00	2.70	1.40	76.02	1.400
	6/16/16	AEN-14	77.00	3.85	13.00	1.07	92.00	3.91	250.00	4.10	72.00	2.02	59.00	1.0	120.00	560.00	7.92	939.00	250.00	2.50	0.01	0.54	0.540
	-	AEN-15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	AEN-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	AEN-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	AEN-18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Average		**64.4**	**3.22**	**13.29**	**1.09**	**73.3**	**3.11**	**199**	**3.26**	**53.2**	**1.49**	**35.6**	**0.57**	**116.2**	**457**	**7.94**	**768**	**215**	**2.69**	**1.51**	**81.76**	**0.515**
	Maximum		**130.0**	**6.50**	**32.00**	**2.62**	**92.0**	**3.91**	**280**	**4.59**	**73.0**	**2.04**	**110.0**	**1.77**	**210.0**	**720**	**8.16**	**1150**	**440**	**5.50**	**5.40**	**293.22**	**1.400**
Sycamore	6/10/16	AE-01	28.00	1.40	5.90	0.48	34.00	1.45	140.00	2.30	17.00	0.48	17.00	0.27	17.00	190.00	8.08	368.00	94.00	1.50	1.80	97.74	0.066
	6/10/16	AE-02	25.00	1.25	5.20	0.43	32.00	1.36	130.00	2.13	18.00	0.50	14.00	0.23	16.00	180.00	8.15	339.00	83.00	1.60	1.80	97.74	0.066
	6/10/16	AE-04	36.00	1.80	7.50	0.62	32.00	1.36	170.00	2.79	15.00	0.42	18.00	0.29	18.00	220.00	8.17	413.00	120.00	1.30	1.80	97.74	0.060
	6/13/16	AE-05	21.00	1.05	4.80	0.39	24.00	1.02	110.00	1.80	17.00	0.48	4.60	0.07	9.20	140.00	7.96	242.00	72.00	1.20	1.60	86.88	0.070
	-	AE-06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6/13/16	AE-07	18.00	0.90	4.00	0.33	24.00	1.02	100.00	1.64	16.00	0.45	3.60	0.06	9.50	130.00	7.85	242.00	62.00	1.30	1.70	92.31	0.067
	6/13/16	AE-08	22.00	1.10	4.50	0.37	30.00	1.28	120.00	1.97	16.00	0.45	5.70	0.09	11.00	150.00	7.92	280.00	74.00	1.50	2.20	119.46	0.081
	6/13/16	AE-09	14.00	0.70	2.70	0.22	60.00	2.55	150.00	2.46	13.00	0.36	7.40	0.12	19.00	190.00	8.24	331.00	45.00	3.90	6.60	358.38	0.140
	6/13/16	AE-10	14.00	0.70	3.20	0.26	50.00	2.13	120.00	1.97	17.00	0.48	2.20	0.04	22.00	170.00	8.36	307.00	49.00	3.10	4.60	249.78	0.170
	6/13/16	AE-11	25.00	1.25	5.90	0.48	34.00	1.45	120.00	1.97	21.00	0.59	9.30	0.15	22.00	180.00	8.09	331.00	88.00	1.60	1.10	59.73	0.110
	6/17/16	AE-12	13.00	0.65	3.30	0.27	63.00	2.68	150.00	2.46	13.00	0.36	13.00	0.21	27.00	210.00	8.37	378.00	46.00	4.10	7.00	380.10	0.350
	9/28/16	AE-13	31.00	1.55	6.40	0.52	52.00	2.21	120.00	1.97	39.00	1.09	1.10	0.02	47.00	240.00	8.22	436.00	100.00	2.20	0.01	0.54	0.430
	9/28/16	AE-14	39.00	1.95	7.20	0.59	62.00	2.64	160.00	2.62	48.00	1.34	0.52	0.01	56.00	290.00	8.26	523.00	130.00	2.40	0.17	9.23	1.000
	9/28/16	AE-15	9.80	0.49	2.80	0.23	85.00	3.61	150.00	2.46	24.00	0.67	28.00	0.45	24.00	260.00	8.52	446.00	36.00	6.20	8.20	445.26	1.100
	9/28/16	AE-16	8.70	0.44	3.30	0.27	91.00	3.87	150.00	2.46	31.00	0.87	33.00	0.53	20.00	270.00	8.61	470.00	35.00	6.70	8.40	456.12	0.570
	9/28/16	AE-17	14.00	0.70	2.70	0.22	82.00	3.49	140.00	2.30	33.00	0.92	24.00	0.39	27.00	260.00	8.37	455.00	46.00	5.30	6.50	352.95	0.850
	9/28/16	AE-18	27.00	1.35	4.30	0.35	78.00	3.32	170.00	2.79	44.00	1.23	1.20	0.02	52.00	300.00	8.27	520.00	86.00	4.00	4.20	228.06	1.500
	9/29/16	AE-20	24.00	1.20	4.10	0.34	40.00	1.70	130.00	2.13	16.00	0.45	16.00	0.26	17.00	190.00	8.25	336.00	77.00	2.00	2.70	146.61	0.079
	6/13/16	AE-21	23.00	1.15	4.70	0.39	22.00	0.94	99.00	1.62	16.00	0.45	4.80	0.08	9.50	130.00	7.87	243.00	78.00	1.10	0.29	15.75	0.060
	9/29/16	AE-22	29.00	1.45	4.90	0.40	37.00	1.57	120.00	1.97	25.00	0.70	5.20	0.08	22.00	190.00	8.22	337.00	93.00	1.60	0.77	41.81	0.063
	9/29/16	AE-23	45.00	2.25	8.20	0.67	33.00	1.40	120.00	1.97	36.00	1.01	21.00	0.34	34.00	240.00	8.20	434.00	150.00	1.20	0.01	0.54	0.048
	6/13/16	AE-24	30.00	1.50	6.10	0.50	40.00	1.70	130.00	2.13	28.00	0.78	14.00	0.23	27.00	210.00	8.15	381.00	100.00	1.70	0.47	25.52	0.150
	9/28/16	AE-25	60.00	3.00	12.00	0.98	45.00	1.91	150.00	2.46	58.00	1.62	27.00	0.44	56.00	340.00	8.17	589.00	200.00	1.40	0.01	0.54	0.250
	9/28/16	AE-26	44.00	2.20	9.30	0.76	39.00	1.66	150.00	2.46	36.00	1.01	8.20	0.13	43.00	260.00	8.18	460.00	150.00	1.40	0.01	0.54	0.310
	9/28/16	AE-28	30.00	1.50	4.50	0.37	88.00	3.74	180.00	2.95	44.00	1.23	0.87	0.01	51.00	310.00	8.15	526.00	93.00	4.00	4.40	238.92	1.500
	9/28/16	AE-29	33.00	1.65	6.30	0.52	82.00	3.49	170.00	2.79	56.00	1.57	0.38	0.01	63.00	330.00	8.30	584.00	110.00	3.40	2.50	135.75	1.600
	6/16/16	AE-31	22.00	1.10	5.30	0.43	89.00	3.78	170.00	2.79	56.00	1.57	0.35	0.01	64.00	320.00	8.11	582.00	76.00	4.50	5.20	282.36	2.000
	9/28/16	AE-32	12.00	0.60	1.40	0.11	120.00	5.10	98.00	1.61	76.00	2.13	83.00	1.34	21.00	370.00	8.47	627.00	36.00	8.70	4.40	238.92	0.960
	9/28/16	AE-33	14.00	0.70	2.80	0.23	100.00	4.25	130.00	2.13	57.00	1.60	66.00	1.06	19.00	330.00	8.20	571.00	47.00	6.50	5.30	287.79	0.670
	-	AE-34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9/28/16	AE-35	6.10	0.31	0.82	0.07	89.00	3.78	160.00	2.62	37.00	1.04	0.37	0.01	3.90	220.00	8.56	392.00	19.00	9.00	10.00	543.00	0.840
	-	AE-36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9/28/16	AE-37	11.00	0.55	1.40	0.11	110.00	4.68	160.00	2.62	66.00	1.85	0.31	0.01	19.00	300.00	8.49	529.00	33.00	8.60	9.50	515.85	2.500
	9/28/16	AE-38	6.10	0.31	1.50	0.12	98.00	4.17	160.00	2.62	40.00	1.12	7.90	0.13	13.00	260.00	8.60	448.00	22.00	9.10	10.00	543.00	0.540
	Average		**23.7**	**1.2**	**4.7**	**0.4**	**60.2**	**2.6**	**139.6**	**2.3**	**33.2**	**0.9**	**14.1**	**0.2**	**27.7**	**238.1**	**8.2**	**423.2**	**79.0**	**3.6**	**3.7**	**198.4**	**0.6**
	Maximum		**60.0**	**3.0**	**12.0**	**1.0**	**120.0**	**5.1**	**180.0**	**3.0**	**76.0**	**2.1**	**83.0**	**1.3**	**64.0**	**370.0**	**8.6**	**627.0**	**200.0**	**9.1**	**10.0**	**543.0**	**2.5**
Tejon	9/30/16	AE-71	25.0	1.25	8.1	0.66	27.0	1.15	130.0	2.13	14.0	0.39	2.5	0.04	9.9	160.0	8.2	290.0	97.0	1.2	1.20	65.16	0..069
	-	AE-72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6/17/16	AE-73	52.0	2.60	16.0	1.31	49.0	2.08	160.0	2.62	91.0	2.55	9.9	0.16	26.0	320.0	8.0	620.0	200.0	1.5	0.01	0.54	0.140
	9/30/16	AE-74	28.0	1.40	9.9	0.81	36.0	1.53	170.0	2.79	20.0	0.56	3.2	0.05	15.0	200.0	8.2	367.0	110.0	1.5	2.20	119.46	0.100
	9/30/16	AE-75	26.0	1.30	9.2	0.75	30.0	1.28	150.0	2.46	15.0	0.42	2.2	0.04	11.0	170.0	8.3	322.0	100.0	1.3	2.00	108.60	0.091
	9/29/16	AE-76	33.00	1.65	11.00	0.90	35.00	1.49	160.00	2.62	26.00	0.73	5.30	0.09	19.00	210.00	8.24	385.00	130.00	1.30	0.12	6.52	0.010
	9/30/16	AE-77	27.00	1.35	8.10	0.66	18.00	0.77	110.00	1.80	17.00	0.48	2.30	0.04	8.10	140.00	8.16	264.00	100.00	0.77	0.01	0.54	0.041
	9/30/16	AE-78	26.00	1.30	8.20	0.67	27.00	1.15	140.00	2.30	15.00	0.42	3.70	0.06	10.00	160.00	8.23	297.00	100.00	1.20	0.98	53.21	0.052
	9/30/16	AE-79	49.00	2.45	15.00	1.23	49.00	2.08	160.00	2.62	68.00	1.90	12.00	0.19	27.00	310.00	8.19	556.00	190.00	1.60	0.01	0.54	0.140
	-	AE-80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9/30/16	AE-81	29.00	1.45	8.90	0.73	38.00	1.62	170.00	2.79	15.00	0.42	2.50	0.04	12.00	190.00	8.22	351.00	110.00	1.60	2.90	157.47	0.091
	-	AE-82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	AE-83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6/17/16	AE-84	40.0	2.00	13.0	1.07	51.0	2.17	160.0	2.62	62.0	1.74	11.0	0.18	28.0	290.0	8.0	544.0	150.0	1.8	0.01	0.54	0.160
	9/30/16	AE-86	28.0	1.40	9.7	0.80	25.0	1.06	140.0	2.30	15.0	0.42	4.1	0.07	15.0	170.0	8.2	308.0	110.0	1.0	0.04	2.17	0.072
	6/17/16	AE-87	41.0	2.05	14.0	1.15	40.0	1.70	200.0	3.28	18.0	0.50	14.0	0.23	39.0	270.0	8.1	484.0	160.0	1.4	0.32	17.38	0.160
	9/30/16	AE-88	71.0	3.55	19.0	1.56	41.0	1.74	190.0	3.12	35.0	0.98	56.0	0.90	67.0	380.0	8.1	638.0	260.0	1.1	0.01	0.54	0.150
	9/30/16	AE-89	29.0	1.45	9.8	0.80	37.0	1.57	180.0	2.95	16.0	0.45	5.3	0.09	20.0	210.0	8.2	390.0	110.0	1.5	3.10	168.33	0.110
	6/17/16	AE-90	39.0	1.95	13.0	1.07	44.0	1.87	210.0	3.44	17.0	0.48	5.4	0.09	33.0	260.0	8.1	466.0	150.0	1.5	1.90	103.17	0.160
	-	AE-91	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6/17/16	AE-92	52.0	2.60	14.0	1.15	48.0	2.04	140.0	2.30	34.0	0.95	60.0	0.97	64.0	350.0	8.0	595.0	190.0	1.5	0.01	0.54	0.130
	9/30/16	AE-93	43.0	2.15	13.0	1.07	44.0	1.87	170.0	2.79	43.0	1.20	14.0	0.23	30.0	270.0	8.2	497.0	160.0	1.5	0.01	0.54	0.099
	-	AE-94	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	AE-95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6/17/16	AE-96	32.0	1.60	12.0	0.98	37.0	1.57	160.0	2.62	18.0	0.50	12.0	0.19	25.0	220.0	8.0	395.0	130.0	1.4	0.17	9.23	0.093
	-	AE-97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6/17/16	AE-98	46.0	2.30	14.0	1.15	48.0	2.04	170.0	2.79	59.0	1.65	5.0	0.08	26.0	290.0	8.1	536.0	170.0	1.6	0.00	0.00	0.140
	6/17/16	AE-99	59.0	2.95	18.0	1.48	60.0	2.55	170.0	2.79	110.0	3.08	9.9	0.16	32.0	380.0	8.0	722.0	220.0	1.8	0.00	0.00	0.170
	Average		**38.8**	**1.94**	**12.2**	**1.00**	**39.2**	**1.67**	**162.0**	**2.66**	**35.4**	**0.99**	**12.0**	**0.19**	**25.9**	**247.50**	**8.1**	**451.35**	**147.4**	**1.40**	**0.8**	**40.73**	**0.111**
	Maximum		**71.0**	**3.55**	**19.0**	**1.56**	**60.0**	**2.55**	**210.0**	**3.44**	**110.0**	**3.08**	**60.0**	**0.97**	**67.0**	**380.00**	**8.3**	**722.00**	**260.0**	**1.80**	**3.1**	**168.33**	**0.170**

Note: ND results were entered as the minimim detection limit value.

ARVIN-EDISON WATER STORAGE DISTRICT

AQUEDUCT PUMP-IN PROPOSAL

DATE: March 8, 2018

TO: Daniel Wisheropp
Department of Water Resources
Division of Operations and Maintenance
1416 9th Street, Suite 620
Sacramento, CA 95814

FROM: Jeevan Muhar, Engineer-Manager
Arvin-Edison Water Storage District
P.O. Box 175
Arvin, CA 93203

SUBJECT: Update to Aqueduct Pump-in Proposal

The Arvin-Edison Water Storage District ("Arvin and/or District") proposes to pump certain Non-Project water supplies into the California Aqueduct through its Intertie Pipeline and Pumping Plant and the accompanying Arvin Aqueduct Turnout. This memorandum is submitted consistent with the Department of Water Resources' "*Water Quality Policy and Implementation Process for Acceptance of Non-Project Water Into the State Water Project*". Furthermore, Arvin believes this action to be a continuation of previous Pump-in Proposals (beginning 2004/2005 and subsequently updated as necessary) for which Title 22 analyses and Constituents of Concern (COCs) analyses were performed on water supplies introduced into the Arvin canal distribution system.

It shall be noted that Section 3 (Arvin Source Waters to the Aqueduct) has endured the greatest change from previous Pump-in Proposals, which are herein incorporated by reference. Arvin has a single main canal which transports the water from all three well fields down to a <u>single input</u> to the California Aqueduct. It is the quality of the water at this single input (or Arvin's End-of-Canal, which is the same as Intertie Pumping Plant and the Aqueduct introduction point) that is of interest to DWR and the stakeholders. A few scenarios have been modeled and are summarized in Exhibit G.

<u>Overview</u>

I. The Arvin Pump-in component consists primarily of groundwater and at times Friant Division Central Valley Project water, during return to Metropolitan Water District of Southern California (MWD) under its AE/MWD Water Management Program, and pursuant to the Point-of-Delivery and Turnout Agreements between Arvin, Kern County Water Agency (KCWA) and Department of Water Resources (DWR). Daily average Pump-in rates are constantly communicated with KCWA and DWR but are expected to be up to 175 cfs. However, during low flow periods there may be times of zero flow.

II. As stated below in Section 10, during active Pump-in periods all input sources into Arvin's canal distribution system are tested for COCs for a minimum of once a year (including start-up) and Title 22 constituents at the End-of-Canal quarterly (including start-up). The results of such testing are incorporated into a daily blending model that is submitted frequently to KCWA and DWR. Said blending model results are compared to actual lab results of monthly COC samples at the End-of-Canal. The Arvin wells will be operated so as to meet water quality requirements at the Aqueduct Turn-in location as determined by the Pump-In Facilitation Group.

III. Some water quality constituents in Arvin wells have concentrations higher than the average ambient ("background") Aqueduct conditions, but these concentrations are **not** expected to increase the Aqueduct "background" levels above the limits or guidelines set by the Pump-in Facilitation Group. Conversely, some water quality constituents are expected to lower the average background Aqueduct conditions.

Project Proponent and Description

1. Contacts:

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2. Location: The District, located in the Southeast end of the San Joaquin Valley, extends from East Bakersfield through the Arvin area continuing southwest to the Mettler area. Arvin's Intertie Pipeline Turnout on the California Aqueduct is located in Reach 14C, at Mile Post 277, just upstream of the Teerink Pumping Plant Forebay and downstream of Buena Vista Pumping Plant (Exhibit A).

3. Arvin Source Waters to the Aqueduct: All sources to the Arvin canal distribution system, which generally consist of the Friant-Kern Canal, Cross Valley Canal, Kern River, Kern Delta Wells and Canal Interties (see Kern Delta Pump-In Proposal dated March 6, 2014), Arvin owned groundwater wells, and finally Arvin Farm Wells (see Arvin Farm Wells Pump-In Proposal dated January 15, 2015) are identified in Exhibits A through D. Any source capable of entering Arvin's canal distribution system has the potential to be subsequently delivered to the California Aqueduct. As such, all sources are tested for COC on a routine basis to compliment the Pump-in Blending Model.

The Pump-in Blending Model (Exhibit D), modeled on a first-order of approximation basis, considers all Arvin canal distribution system inputs (source waters) and outputs (irrigation demand and/or spreading facilities) for a final expected quality at the introduction point (End-of-Canal). A few scenarios have been modeled and are summarized in Exhibit G.

Since the last Pump-in Proposal, Arvin has added six (6) new wells, which are incorporated into to all relevant exhibits. Title 22 results for four (4) new wells (North 19, Tejon 98, Tejon 99 and Tejon 100) can be found in Exhibit F and an additional two (2) wells (North 20 and Sycamore 38) will be tested upon startup in 2018. While the COC data from the four (4) Balancing Reservoir wells (drilled in 2006) have been incorporated into previous proposals and blending models, these well haven't been formally presented to the Facilitation Group nor have they been approved by DWR. A few scenarios have been modeled and are summarized in Exhibit G.

The Balancing Reservoir wells discharge first into reservoir/ponding basins before they make their way into North Canal. The Balancing Reservoir facility is utilized to stabilize canal water levels and the canal water is either introduced into the reservoir when demands decrease or when demands increase, the reservoir supply is introduced into the canal. The canal water and the reservoir water can be a blended supply of various sources. Releases from the reservoir can result in short term elevated levels of Arsenic entering the Arvin canal, depending on the blend in the reservoir at that time. In addition to the blended supply, the typical operation of the Balancing Reservoir wells (collective total of less than 8 cfs) is during peak summer to meet irrigation demands and when deliveries to the California Aqueduct are the lowest (10 to 20 cfs) or non-existent.

It shall be noted that Farm wells are allowed to introduce water to the District distribution system only during times of restricted deliveries or water shortage years in order to supplement the water users' demands.

4. **Inflow operations summary:** Groundwater within Arvin boundaries, while generally meeting Title 22 standards for drinking water, in some cases, has higher concentrations of certain constituents than the ambient Aqueduct condition. However, as previously mentioned the concentration increase will not exceed the limits or guidelines set by the Pump-in Facilitation Group. Slight increases in some constituents will be offset by improvements in others. During periods of Aqueduct Pump-in, Arvin will operate its wellfields and other sources selectively so as to mitigate any adverse water quality impacts to the Aqueduct.

   During previous testing, results of Title 22 standards were met, increases to ambient concentrations from some constituents were negligible, and most constituent concentrations from the Pump-in were below ambient Aqueduct conditions.

5. **Facility details:** Arvin's sole input into the Aqueduct utilizes the Intertie Pipeline/Pumping Plant (located at the End-of-Canal) and Aqueduct Turnout facilities. All inflow into the Arvin canal distribution system is measured by propeller meters, parshall flumes or rated gates in accordance with accepted measurement standards.

6. **Water quality data:** Summarized in Exhibit D.

7. **Anticipated water quality changes within the SWP:** Refer to Exhibit G.

8. **Other relevant environmental issues:** Groundwater overdraft has been dramatically mitigated by the District's Project. Groundwater levels in the District have stabilized substantially since the late 1960s with the exception of the recent extended drought from 2012 to 2016. Representative well hydrographs are available upon request.

   Endangered species have been documented along the California Aqueduct. Prior construction within the Aqueduct right-of-way was performed using DWR and Department of Fish and Game (DFG) approved take avoidance measures, and, though not anticipated, any new activities will be similarly performed. No additional construction is anticipated at this time. Most lands adjacent to Arvin's canal distribution system are intensively farmed and provide no suitable habitat for endangered species. No incidental take of endangered species will occur as a result of the Pump-in activities.

9. Scheduled delivery rates: Deliveries to the Aqueduct are expected to be up to 175 cfs depending on the season and in-District demands. Arvin anticipates daily deliveries and monthly schedules through weekly blending models, which are submitted to KCWA and DWR.

10. Water Quality Monitoring: Multiple representative wells have been analyzed at each of Arvin's 3 wellfields in the past and have provided a historical basis for establishing the constituents of concern for the Arvin program and on a consistent, predictable basis. Arvin has a single main canal which transports the water from all three well fields down to a single input to the California Aqueduct. **It is the quality of the water at the End-of-Canal that is of interest to DWR and the stakeholders.** Because of the agricultural users along the length of the canal there is often little of the water from the northern end of the canal making it to the end of the canal (and subsequently the Aqueduct). Moreover, even if a well does exhibit higher concentrations of a contaminant, it would get blended down in the Arvin canal prior to reaching the Aqueduct. A few scenarios have been modeled and are summarized in Exhibit G.

The following is a testing summary:

1. The District will sample the COCs at each well input to Arvin's canal at program startup, and yearly thereafter (if applicable), which will be used to update the Arvin model.
2. The District will sample the COCs at the End-of-Canal (nearest the California Aqueduct) monthly. One additional Arsenic sample will be taken during the month, if and when, Balancing Reservoir wells are operating.
3. The District will conduct Title 22 sampling at the End-of-Canal at start up and quarterly thereafter.

The COCs to be sampled are as follows:

1. Arsenic
2. Bromide
3. Chromium
4. Chromium 6
5. Nitrate (as NO3)
6. Total Dissolved Solids (TDS)
7. Electric Conductivity (EC)
8. Total Organic Carbon
9. Sulfate
10. 1,2,3 Trichloropropane (TCP)

Farm wells shall also follow the same protocol as described above with District wells (COCs @ startup and yearly thereafter, if applicable).

Attachments:
Exhibit A – District Map
Exhibit B – Well Discharge Locations (map)
Exhibit B – Well Discharge Locations (table)
Exhibit C – Farm Well Pump-In Program (map)
Exhibit C – Farm Well Pump-In Program (table)
Exhibit D – Pump In Blending Model
Exhibit E – Title 22 Constituent List
Exhibit F – New Well Title 22 results
Exhibit G – Potential Blending Model scenarios

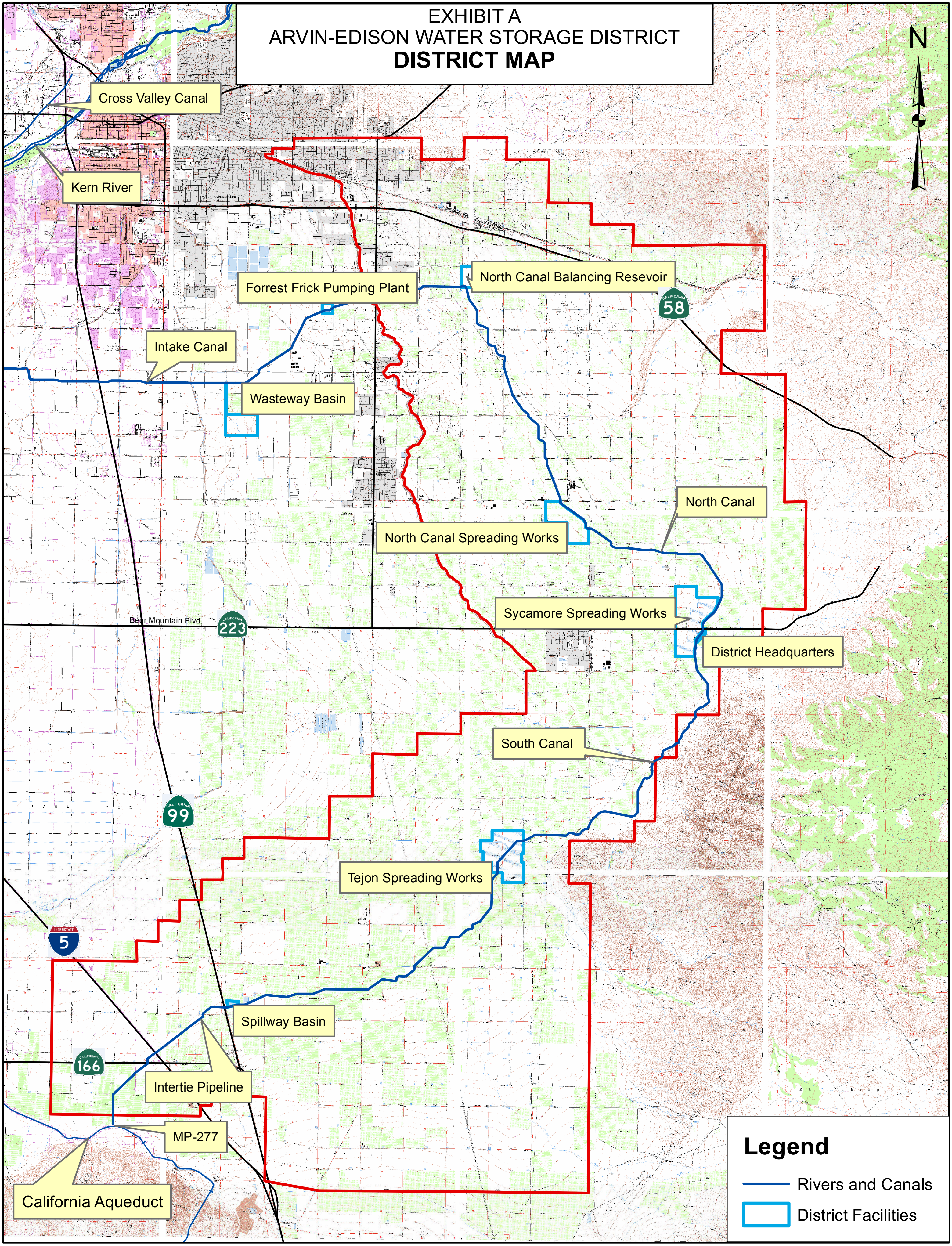


EXHIBIT A
ARVIN-EDISON WATER STORAGE DISTRICT
DISTRICT MAP
N
Cross Valley Canal
Kern River
Forrest Frick Pumping Plant
North Canal Balancing Resevoir
58
Intake Canal
Wasteway Basin
North Canal
North Canal Spreading Works
Sycamore Spreading Works
Bear Mountain Blvd.
223
District Headquarters
South Canal
99
Tejon Spreading Works
5
Spillway Basin
166
Intertie Pipeline
MP-277
California Aqueduct
Legend
Rivers and Canals
District Facilities

EXHIBIT B
ARVIN-EDISON WATER STORAGE DISTRICT
WELL DISCHARGE LOCATIONS

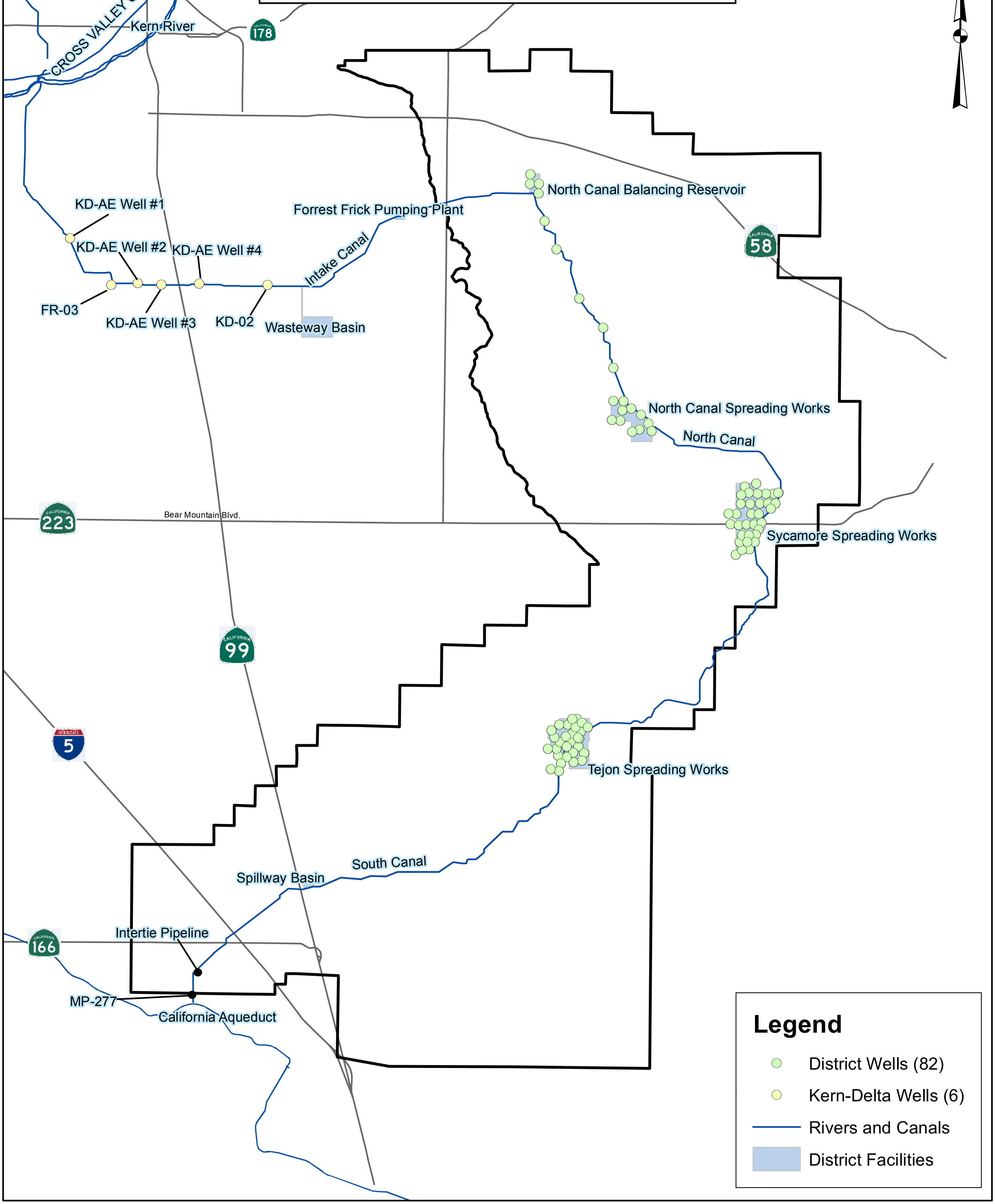


EXHIBIT B

ARVIN-EDISON WATER STORAGE DISTRICT

WELL DISCHARGE LOCATIONS

	Stationing	Canal	Wells
N. Canal Wellfield	13+00	North	N15, N16, N17, N18
	52+02	North	N1
	95+10	North	N2
	172+96	North	N3
	223+22	North	N4
	281+97	North	N5
	329+50	North	N6, N7, N14
	340+10	North	N8, N9, N10, N11, N12
	350+00	North	N19
	352+00	North	N20
	377+64	North	N13
Sycamore Wellfield	589+60	North	38
	589+61	North	35, 36, 37
	589+97	North	31, 32, 33, 34
	604+27	North	16
	604+60	North	17, 18, 28, 29
	613+47	North	15
	624+29	North	13, 14, 25, 26
	635+74	North	12
	637+63	North	10, 11, 23, 24
	646+23	North	9
	653+84	North	8
	654+14	North	6, 7, 22
	663+27	North	4
	663+57	North	1, 2, 5, 20, 21
Tejon Wellfield	418+00	South	100
	420+00	South	99
	422+08	South	78, 79, 84
	429+10	South	73
	438+44	South	77, 81, 82, 83
	440+00	South	98
	446+40	South	72
	447+13	South	92, 93, 94, 95, 96
	447+20	South	76
	455+50	South	71
	457+40	South	74, 75, 80
	457+71	South	90, 91
	471+55	South	86
	481+55	South	87
	488+51	South	89
	492+05	South	88

82	District Wells
40	Discharge Points

EXHIBIT C

ARVIN-EDISON WATER STORAGE DISTRICT

FARM WELL PUMP-IN PROGRAM

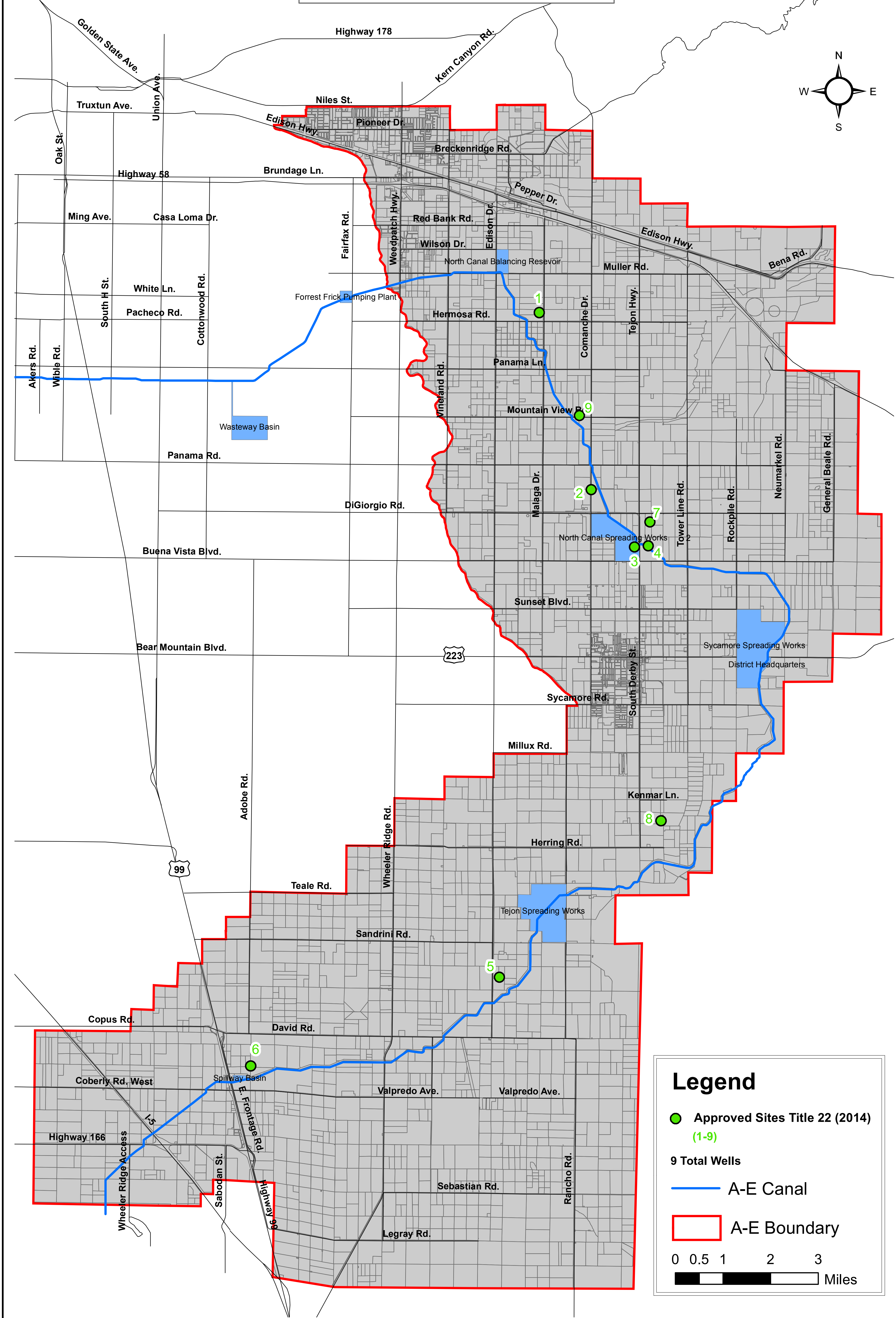


EXHIBIT C

ARVIN-EDISON WATER STORAGE DISTRICT

LANDOWNER PUMP-IN LOCATIONS

Stationing		Site	Canal
NORTH	68	1	North
	205	9	North
	298	2	North
	378	3	North
	383	4,7	North
SOUTH	289	8	South
	552	5	South
	882	6	South

9	Pump-In Wells
8	Discharge Points

EXHIBIT D
ARVIN-EDISON WATER STORAGE DISTRICT
PUMP-IN BLENDING MODEL

			Sample Date	Constituent Concentration									
				Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
				µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	umho/cm	µg/L
Intake Canal		Friant-Kern Canal	03/25/16	2.0	0.050	2.0	0.1	0.4	20		3.2		
		Cross Valley Canal (JBOX)	10/21/15	3.0	0.050	1.0	1.1	7.2	140	1.5	21.0		
		Cross Valley Canal	10/21/15	3.0	0.050	1.0	1.1	7.2	140	1.5	21.0		
		Cross Valley Canal											
		Kern River	10/21/15	11.0	0.040	1.0	0.5	0.6	230	2.3	51.0		
		Kern Delta (KD) Stine Canal											
		KD-AE Well 1	03/01/15	2.3	0.100	3.0	1.4	13.0	240	1.0	24.0		
		City of Bakersfield Well											
		KD-AE Well 2	03/01/15	6.4	0.100	3.0	1.9	7.8	130	1.0	24.0		
		KD-AE Well 3	03/01/15	7.2	0.100	3.0	1.5	9.6	260	1.0	24.0		
		KD H St.											
		KD H St.											
		KD-AE Well 4	03/01/15	9.6	0.001	3.0	1.6	7.3	220	1.0	21.0		
		KD Central Branch											
		Wasteway Basin											
North Canal	Balancing Reservoir	N1-P1											
		N-15	07/01/15	880.0	0.030	1.0	0.5	0.5	420	0.5	44.0		
		N-16	07/23/15	452.0	0.240	1.0	0.5	2.4	430	0.6	46.0		
		N-17	07/23/15	620.0	0.210	2.0	0.5	3.5	440	0.5	41.0		
		N-18	07/23/15	434.0	0.170	1.0	0.5	5.5	440	0.6	63.0		
		Canal outflow											
		Canal inflow											
		N-1	03/18/15	10.0	0.130	1.0	0.5	31.3	540	0.6	161.0		
		Farm well N-68	03/01/15	205.0	0.100	1.0	0.2	34.5	810	1.0	334.0		
		N8-P1											
		N-2	03/18/15	15.0	0.040	1.0	0.5	87.7	750	0.5	230.0		
		N-3	03/18/15	7.0	0.180	1.0	0.8	105.0	700	0.6	183.0		
		Farm well N-205	03/01/15	7.0	0.100	2.0	0.5	32.2	540		147.0		
		N-4	03/18/15	10.0	0.170	1.0	0.6	80.1	640	0.6	204.0		
		N24-P1											
		N-5	03/18/15	5.0	0.180	2.0	1.5	64.7	560	0.8	113.0		
	North Canal Spreading Works	N-6	03/22/16	12.0	0.250	1.0	0.5	16.4	480	0.5	86.0		
		N-7	03/18/15	36.0	0.160	1.0	0.5	2.5	310	0.6	81.0		
		N-14	03/18/15	13.0	0.170	3.0	3.1	61.9	570	0.5	124.0		
		N-8	03/22/15	7.0	0.210	1.0	0.5	1.3	370	0.7	95.0	*583*	
		N-9	03/18/15	19.0	0.150	1.0	0.5	25.2	390	0.5	77.0	*583*	
		N-10	03/18/15	60.0	0.160	1.0	0.5	19.9	320	0.5	64.0	*583*	
		N-11	06/07/16	8.0	0.180	1.0	0.5	0.7	320	0.6	72.0	*583*	
		N-12		46.0	0.130	1.0	0.5	3.7	240	0.6	54.0		
		N-19	03/18/15	51.0	0.120	1.0	ND	19.5	340	0.7	69.0	572	0.041
		N-20	03/18/15										
		NCSW Spreading											
		North Check Gate											
		Farm well N-298	03/01/15	4.0	0.100	2.0	1.6	98.1	670		145.0		
		N-13	03/18/15	2.0	0.150	1.0	0.5	0.5	320	0.6	69.0		
		Farm well N-378	03/01/15	6.0	0.100	3.0	2.2	14.0	360	0.4	66.0		
		Farm well N-383	03/01/15	6.0	0.100	3.0	2.2	14.0	360	0.4	66.0		
		N41-P1											
		GRAVITY											
		N55-P1											

Notes:
1. Grey cells represent canal outflows.
2. Italicized results are from a manifold discharge.

PUMP-IN BLENDING MODEL

				Constituent Concentration									
			Sample Date	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
				µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	umho/cm	µg/L
North Canal	**Sycamore Wellfield & Spreading**	38	e sampled in 2018.										
		35	03/19/15	8.0	0.120	1.0	0.5	3.9	200	0.5	12.0	*506*	
		36	03/19/15	11.0	0.260	1.0	0.5	0.5	300	0.5	44.0	*506*	
		37	03/19/15	14.0	0.220	1.0	0.5	0.5	290	0.5	35.0	*506*	
		31	03/19/15	5.0	0.310	1.0	0.5	0.5	360	0.5	92.0	*569*	
		32	03/29/15	7.0	0.260	1.0	0.5	37.0	320	0.5	33.0	*569*	
		33	03/19/15	5.0	0.180	4.0	3.6	56.7	310	0.5	22.0	*569*	
		34	01/20/14	3.0	0.140	4.0	4.4	38.8	300	0.3	21.0	*569*	
		16	03/19/15	4.0	0.100	8.0	8.7	32.1	300	0.5	25.0		
		17	03/19/15	5.0	0.080	4.0	4.3	21.5	200	0.5	24.0		
		18	01/22/14	7.0	0.080	1.0	1.4	8.1	240	0.3	42.0		
		28	03/19/15	10.0	0.180	2.0	1.6	1.6	260	0.5	48.0		
		29	03/19/15	7.0	0.210	1.0	1.4	1.5	270	0.5	60.0		
		15	01/22/14	6.0	0.040	8.0	7.6	7.8	230	0.3	1.4		
		13	07/01/15	16.0	0.030	6.0	5.8	9.9	200	0.5	24.0		
		14	03/22/15	19.0	0.110	6.0	6.4	4.3	200	0.5	26.0		
		25	03/22/15	11.0	0.180	2.0	2.0	6.1	240	0.5	33.0		
		26	03/19/15	7.0	0.140	2.0	2.5	5.4	260	0.5	40.0		
		12	03/22/15	13.0	0.050	9.0	9.6	10.1	260	0.5	26.0		
		10	03/22/15	8.0	0.100	6.0	6.6	8.6	160	0.7	18.0		
		11	03/22/15	10.0	0.060	10.0	10.6	4.9	200	0.5	19.0		
		23	03/29/15	8.0	0.130	3.0	3.0	7.2	210	0.5	21.0		
		24	03/22/15	8.0	0.080	4.0	3.9	7.0	190	0.5	19.0		
		9	03/22/15	5.0	0.100	7.0	7.2	14.1	230	0.5	24.0		
		8	03/29/15	2.0	0.100	5.0	5.3	14.3	210	0.5	21.0		
		6	03/29/15	5.0	0.100	11.0	14.9	6.7	150	0.5	16.0		
		7	03/29/15	3.0	0.110	6.0	6.8	12.8	180	0.5	17.0		
		22	03/29/15	4.0	0.120	3.0	3.4	6.7	190	0.6	19.0		
		4	03/29/15	2.0	0.120	3.0	3.3	18.9	220	0.5	18.0		
		1	03/29/15	2.0	0.11	4.0	4.5	16.6	190	0.5	18.0		
		2	03/29/15	2.0	0.120	3.0	3.5	19.9	220	0.5	19.0		
		5	03/29/15	2.0	0.110	3.0	3.4	12.0	170	0.5	15.0		
		20	04/01/15	8.0	0.110	5.0	5.7	15.5	200	0.5	18.0		
		21	03/29/15	3.0	0.09	10.0	10.4	6.8	150	0.5	15.0		
		Sycamore Spreading											
		Sycamore Check Gate											

Notes:
1. Grey cells represent canal outflows.
2. Italicized results are from a manifold discharge.

PUMP-IN BLENDING MODEL

Canal	Area	Location	Sample Date	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
				Constituent Concentration									
				µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	umho/cm	µg/L
South Canal		Farm well S-289	03/29/15	29.0	0.100	2.0	4.6	12.8	320	0.1	46.2		
South Canal		GRAVITY											
South Canal		S32-P1, GRAVITY											
South Canal		S38-P1											
South Canal	Tejon Wellfield & Spreading	100	04/11/17	2.0	0.180	10.0	8.9	8.1	300	0.3	33.8		
South Canal	Tejon Wellfield & Spreading	99	06/30/15	2.0	0.220	5.0	5.2	7.8	320	0.5	29.0	493	
South Canal	Tejon Wellfield & Spreading	78	04/01/15	2.0	0.180	5.0	4.6	6.7	250	0.5	21.0		
South Canal	Tejon Wellfield & Spreading	79	04/01/15	2.0	0.320	5.0	5.5	10.7	350	0.5	31.0		
South Canal	Tejon Wellfield & Spreading	84	04/01/15	2.0	0.230	6.0	5.7	9.7	280	0.5	30.0		
South Canal	Tejon Wellfield & Spreading	73	04/01/15	2.0	0.300	3.0	2.9	8.6	290	0.5	26.0		
South Canal	Tejon Wellfield & Spreading	98	09/25/15	2.0	0.030	1.0	0.0	0.4	40	0.5	2.0	502	0.013
South Canal	Tejon Wellfield & Spreading	77	04/01/15	2.0	0.16	5.0	4.7	6.0	220	0.5	19.0		
South Canal	Tejon Wellfield & Spreading	81	04/01/15	2.0	0.120	7.0	7.6	5.2	230	0.6	27.0		
South Canal	Tejon Wellfield & Spreading	82	07/26/09	2.0	0.070	6.0	6.3	6.4	200	0.6	27.0		
South Canal	Tejon Wellfield & Spreading	83	04/01/15	2.0	0.14	7.0	7.4	7.1	240	0.6	29.0		
South Canal	Tejon Wellfield & Spreading	92	04/29/15	3.0	0.18	5.0	4.7	61.3	370	0.6	63.0	*551*	
South Canal	Tejon Wellfield & Spreading	93	04/29/15	2.0	0.14	4.0	5.0	15.3	250	0.5	29.0	*551*	
South Canal	Tejon Wellfield & Spreading	94	04/29/15	2.0	0.350	4.0	4.2	14.4	410	0.8	41.0	*551*	
South Canal	Tejon Wellfield & Spreading	95	04/29/15	5.0	0.120	1.0	1.3	11.6	210	0.5	24.0	*551*	
South Canal	Tejon Wellfield & Spreading	96	07/01/15	3.0	0.03	3.0	2.2	8.8	220	0.5	20.0	*551*	
South Canal	Tejon Wellfield & Spreading	72	04/01/15	2.0	0.250	5.0	5.3	6.5	290	0.5	23.0		
South Canal	Tejon Wellfield & Spreading	76	04/02/15	2.0	0.090	6.0	6.1	6.6	230	0.5	22.0		
South Canal	Tejon Wellfield & Spreading	71	04/02/15	2.0	0.210	6.0	6.7	31.3	210	0.5	45.0		
South Canal	Tejon Wellfield & Spreading	74	04/02/15	2.0	0.14	8.0	8.5	6.1	220	0.5	35.0		
South Canal	Tejon Wellfield & Spreading	75	07/01/15	2.0	0.030	10.0	8.9	5.0	240	0.5	29.0		
South Canal	Tejon Wellfield & Spreading	80	04/02/15	2.0	0.14	9.0	8.9	5.9	240	0.5	24.0		
South Canal	Tejon Wellfield & Spreading	90	04/02/15	2.0	0.09	10.0	10.6	3.5	260	0.3	0.5		
South Canal	Tejon Wellfield & Spreading	91	02/06/14	5.0	0.060	5.0	4.3	9.5	240	0.3	31.0		
South Canal	Tejon Wellfield & Spreading	Tejon Check Gate											
South Canal	Tejon Wellfield & Spreading	86	04/02/15	2.0	0.110	8.0	8.9	5.8	210	0.5	36.0		
South Canal	Tejon Wellfield & Spreading	87	04/02/15	2.0	0.110	11.0	12.0	6.0	300	0.5	24.0		
South Canal	Tejon Wellfield & Spreading	89	04/02/15	2.0	0.220	11.0	12.0	69.3	240	0.6	68.0		
South Canal	Tejon Wellfield & Spreading	88	04/02/15	2.0	0.130	11.0	12.0	20.5	390	0.5	45.0		
South Canal	Tejon Wellfield & Spreading	Tejon Spreading											

Notes:
1. Grey cells represent canal outflows.
2. Italicized results are from a manifold discharge.

EXHIBIT D
ARVIN-EDISON WATER STORAGE DISTRICT
PUMP-IN BLENDING MODEL

	Sample Date	Arsenic µg/L	Bromide mg/L	Chromium µg/L	Chromium 6 µg/L	Nitrate as NO3 mg/L	TDS mg/L	Total Organic Carbon mg/L	Sulfate mg/L	EC umho/cm	1,2,3 TCP µg/L
		Constituent Concentration									
Farm well S-552	03/01/15	1.0	0.100	11.0	10.1	50.6	420	0.1	88.0		
615 Check/Pumpback											
S64-P1											
GRAVITY											
S68-P1											
S73-P1, GRAVITY											
729 Check/Pumpback											
S78 (GRAVITY)											
S88-P1, GRAVITY											
883 Check/Pumpback											
Farm well S-882	03/01/15	3.0	0.100	9.0	8.0	22.3	350	0.5	65.0		
Spillway Basin											
S93-P1, GRAVITY											
Intertie Pumping Plant											

Blended Water Quality And Outflow To Aqueduct

	Flow (cfs)	Arsenic µg/L	Bromide mg/L	Chromium µg/L	Chromium 6 µg/L	Nitrate as NO3 mg/L	TDS mg/L	Total Organic Carbon mg/L	Sulfate mg/L	EC umho/cm	1,2,3 TCP µg/L
Background Aqueduct :											
AEWSD Outflow to Aqueduct											
Blended AE w/ Aqueduct											
MCL											

Note: See Exhibit G for scenarios.

Notes:
1. Grey cells represent canal outflows.
2. Italicized results are from a manifold discharge.

EXHIBIT E
ARVIN-EDISON WATER STORAGE DISTRICT
TITLE 22 CONSITUENT LIST

Constituents To Be Sampled	Required Detection Limits
Inorganic Sampling (General Physical)	
Color	1 unit
Odor	1 TON
Turbidity	0.05 NTU
Inorganic Sampling (General Mineral)	
Bicarbonate	1 mg/L
Carbonate	1 mg/L
Total Alkalinity	1 mg/L
Calcium	1 mg/L
Cyanide	0.1 mg/L
Bromide	0.033 mg/L
Chloride	1 mg/L
Fluoride	0.1 mg/L
Foaming Agents(MBAS)	0.05 mg/L
Magnesium	0.1 mg/L
Ammonia as N	0.4 mg/L
Nitrate as N	0.4 mg/L
Nitrite as N	0.4 mg/L
Total Nitrate + Nitrite as N	0.4 mg/L
Perchlorate	0.005 mg/L
pH	pH units
Potassium	0.1 mg/L
Sodium	0.1 mg/L
Sulfate	0.5 mg/L
Specific Conductance	1 umho/cm
TDS	1 mg/L
Total Hardness	1 mg/L
Total Organic Carbon	1 mg/L
Ultraviolet Absorbance @ 254 nm	0.003 /cm
Asbestos (MFL= million fibers (> 10 µm)/liter)	0.2 MFL
Inorganic Sampling (Trace Metals)	
Aluminum	0.05 mg/L
Antimony	0.006 mg/L
Arsenic	0.002 mg/L
Barium	0.1 mg/L
Beryllium	0.001 mg/L
Boron	0.1 mg/L
Cadmium	0.001 mg/L

EXHIBIT E
ARVIN-EDISON WATER STORAGE DISTRICT
TITLE 22 CONSITUENT LIST

Constituents To Be Sampled	Required Detection Limits
Chromium Total	**1 ug/L**
Hexavalent Chromium	**0.2 ug/L**
Copper	0.01 mg/L
Iron	0.1 mg/L
Lead	0.005 mg/L
Manganese	0.02 mg/L
Mercury	0.001 mg/L
Nickel	0.01 mg/L
Selenium	0.005 mg/L
Silver	0.01 mg/L
Thallium	0.001 mg/L
Vanadium	0.05 mg/L
Zinc	0.05 mg/L
Radiological	
Gross Alpha	1 pCi/L
Gross Beta	4 pCi/L
Combined Radium 226 and Radium 228	0.5 pCi/L
Strontium-90	2 pCi/L
Tritium	1000 pCi/L
Uranium	2 pCi/L
Semivolatile Organic Compounds	
Benzo (A) Pyrene	0.0001 mg/L
Di (2-Ethylhexyl) Adipate	0.005 mg/L
Di (2-Ethylhexyl) Phthalate	0.003 mg/L
Volatile Organic Compounds	
Benzene	0.0005 mg/L
Bromodichloromethane	0.0005 mg/L
Bromoform	0.0005 mg/L
sec-Butylbenzene	0.0005 mg/L
n-Butylbenzene	0.0005 mg/L
tert-Butylbenzene	0.0005 mg/L
Carbon Tetrachloride	0.0005 mg/L
Chlorobenzene	0.0005 mg/L
Chlorodibromomethane	0.0005 mg/L
Chloroethane	0.0005 mg/L
Chloroform	0.0005 mg/L
2-Chlorotoluene or o-Chlorotoluene	0.0005 mg/L
4-Chlorotoluene or p-Chlorotoluene	0.0005 mg/L
1,2-Dichlorobenzene	0.0005 mg/L

EXHIBIT E
ARVIN-EDISON WATER STORAGE DISTRICT
TITLE 22 CONSITUENT LIST

Constituents To Be Sampled	Required Detection Limits
1,4-Dichlorobenzene	0.0005 mg/L
1,2-Dichloroethane	0.0005 mg/L
1,1-Dichloroethane	0.0005 mg/L
1,1-Dichloroethene	0.0005 mg/L
cis-1,2-Dichloroethene	0.0005 mg/L
trans-1,2-Dichloroethene	0.0005 mg/L
Dichlorodifluoromethane	0.001 mg/L
1,2-Dichloropropane	0.0005 mg/L
1,3-Dichloropropene	0.0005 mg/L
Ethylbenzene	0.0005 mg/L
Isopropylbenzene	0.0005 mg/L
Methylene Chloride	0.0005 mg/L
MTBE	0.003 mg/L
Naphthalene	0.0005 mg/L
Styrene	0.0005 mg/L
1,1,2,2-Tetrachloroethane	0.0005 mg/L
Tetrachloroethene (PCE)	0.0005 mg/L
Toluene	0.0005 mg/L
1,2,4-Trichlorobenzene	0.0005 mg/L
1,1,1-Trichloroethane	0.0005 mg/L
1,1,2-Trichloroethane	0.0005 mg/L
Trichloroethene (TCE)	0.0005 mg/L
Trichlorofluoromethane	0.005 mg/L
1,2,3-Trichloropropane	0.005 µg/L
1,1,2-Trichloro-1,2,2-trifluoroethane	0.01 mg/L
1,3,5-Trimethylbenzene	0.0005 mg/L
1,2,4-Trimethylbenzene	0.0005 mg/L
Vinyl Chloride	0.0005 mg/L
Xylenes (single isomer or sum of isomers)	0.0005 mg/L
Organochlorine Pesticides	
Alachlor	0.001 mg/L
Chlordane	0.0001 mg/L
Endrin	0.0001 mg/L
Heptachlor	0.00001 mg/L
Heptachlor Epoxide	0.00001 mg/L
Hexachlorobenzene	0.0005 mg/L
Hexachlorocyclopentadiene	0.001 mg/L
Lindane	0.0002 mg/L
Methoxychlor	0.01 mg/L
Polychlorinated Biphenyls	0.0005 mg/L
Propachlor	0.0005 mg/L

EXHIBIT E

ARVIN-EDISON WATER STORAGE DISTRICT

TITLE 22 CONSITUENT LIST

Constituents To Be Sampled	Required Detection Limits
Toxaphene	0.001 mg/L
Fumigants	
Ethylene dibromide (EDB)	0.00002 mg/L
Dibromochloropropane (DBCP)	0.00001 mg/L
Organochlorine Herbicides	
Bentazon	0.002 mg/L
2,4-D	0.01 mg/L
Dalapon	0.01 mg/L
Dinoseb	0.002 mg/L
Pentachlorophenol	0.0002 mg/L
Picloram	0.001 mg/L
Silvex	0.001 mg/L
Carbamate Pesticides	
Carbofuran	0.005 mg/L
Oxamyl	0.02 mg/L
Miscellaneous	
Diquat	0.004 mg/L
Endothall	0.045 mg/L
Glyphosate	0.025 mg/L
2,3,7,8-TCDD Dioxin	5×10^{-9} mg/L
Nitrogen/Phosphorus Pesticides	
Atrazine	0.001 mg/L
Diazinon	0.00025 mg/L
Molinate	0.002 mg/L
Simazine	0.001 mg/L
Thiobencarb	0.001 mg/L
End of Canal Samples Only	
Fecal Coliforms	MPN/100mL
Total Phosphorus	0.01 mg/L
Dissolved Reactive Phosphorus	0.01 mg/L

EXHIBIT F

ARVIN-EDISON WATER STORAGE DISTRICT

NEW WELLTITLE 22 RESULTS

			Lab	FGL	FGL	FGL	FGL
			Location	**Well 99**	**Well 98**	**N-19**	**Well 100**
			Date	6/30/2015	9/25/2015	6/7/2016	4/17/2017
			Field pH	7.70	7.89	7.70	7.52
Constituent	**PQL**	**Units**	**MCL**				
General Mineral							
Total Hardness as CaCO3	2.5	mg/L		146	135	124	135
Calcium	1	mg/L		37	36	38	36
Magnesium	1	mg/L		13	11	7	11
Potassium	1	mg/L		3	3	3	3
Sodium	1	mg/L		43	38	58	45
Total Cations		meq/L		4.9	4.4	5.1	4.7
Boron	0.05	mg/L		0.2	0.1	0.5	0.1
Copper	10	ug/L	1300	ND	ND	ND	ND
Iron	50	ug/L	300	40	40	60	ND
Manganese	10	ug/L	50	ND	ND	10	ND
Zinc	20	ug/L	5000	ND	ND	ND	ND
SAR	0.1	mg/L		1.5	1.4	2.3	1.7
Total Alkalinity (as $CaCO_3$)	10	mg/L		130	90	150	110
Hydroxide	10	mg/L		ND	ND	ND	ND
Carbonate	10	mg/L		ND	ND	ND	ND
Bicarbonate	10	mg/L		160	110	180	140
Sulfate	2	mg/L	500	29	24	69	33.8
Chloride	1	mg/L	500	54	46	26	52
Nitrate as NO3	0.5	mg/L	45	7.8	3.9	19.5	8.1
Nitirite as N	0.2	mg/L	1	ND	ND	ND	0.2
Nitrate + Nitrite as N	0.1	mg/L	10.0	1.8	1.2	4.4	1.8
Nitrate as N		mg/L	10.0	1.8	0.9	4.4	ND
Fluoride	0.1	mg/L	2	0.4	0.4	0.6	0.3
Total Anions		meq/L		4.9	3.7	5.5	4.6
pH (Field)		units		7.7	7.9	7.7	7.5
Specific Conductance	1	umhos/cm	1600	493	502	572	490
Total Dissolved Solids	40	mg/L	1000	320	260	340	300
MBAS (foaming agents)	0.1	mg/L	0.5	ND	ND	ND	ND
Aggressiveness Index	1	mg/L		11.8	11.8	11.9	11.5
Langlier Index	1	mg/L		-0.06	-0.02	0.007	-0.3
Metals, Total							
Aluminum	10	ug/L	1000	ND	ND	20	ND
Antimony	1	ug/L	6	ND	ND	2	ND
Arsenic	2	ug/L	10	ND	ND	51	ND
Barium	0	ug/L	1000	85	57	118	101
Beryllium	0.2	ug/L	4	ND	ND	ND	ND
Cadmium	0.2	ug/L	5	ND	ND	ND	ND
Chromium	1	ug/L	50	5	ND	1	10
Lead	0.2	ug/L	150	ND	ND	ND	ND
Mercury	0.02	ug/L	2	ND	ND	0.06	ND
Nickel	1	ug/L	100	ND	ND	ND	ND
Selenium	2	ug/L	50	1	2	1	2
Silver	1	ug/L	100	ND	ND	ND	ND
Thallium	0.2	ug/L	2	ND	ND	ND	ND
Vanadium	2	ug/L		12	ND	10	13
Wet Chemistry							
Color	5	units	15	ND	ND	ND	ND
Odor	1	TON	3	ND	ND	ND	ND
Turbidity	0.2	NTU	5	0.6	0.2	0.5	0.2
Ammonia Nitrogen	0.2	mg/L		ND	ND	ND	ND

EXHIBIT F

ARVIN-EDISON WATER STORAGE DISTRICT

NEW WELLTITLE 22 RESULTS

			Lab	FGL	FGL	FGL	FGL
			Location	**Well 99**	**Well 98**	**N-19**	**Well 100**
			Date	6/30/2015	9/25/2015	6/7/2016	4/17/2017
			Field pH	7.70	7.89	7.70	7.52
Constituent	**PQL**	**Units**	**MCL**				
Bromide	0.03	mg/L		0.22	0.2	0.12	ND
Chromium VI	0.02	ug/L		5.20	4.70	ND	8.90
Cyanide, Total	5	mg/L	150	ND	ND	ND	ND
Nitrate as NO3	0.4	mg/L	45.0	7.8	3.9	4.4	8.1
Phosphate -P Diss.	0.1	mg/L		ND	ND	ND	ND
Phosphorus, Total	0.1	mg/L		0.1	ND	0.2	0.1
Perchlorate	2	ug/L		ND	ND	ND	ND
EPA 504.1							
1,3 Dibromopropane-Surrogate	70-130	% Rec	560	112	111	102	96.1
DBCP	0.01	ug/L	0.2	ND	ND	0.02	ND
EDB	0.02	ug/L	0.05	ND	ND	ND	ND
1,2,3, Trichloropropane	0.005	ug/L	0.005	ND	0.013	0.041	0.026
EPA 508 or 505	MDL						
Aldrin	0.0009	ug/l		ND	ND	ND	ND
Aroclor 1016	0.022	ug/l		ND	ND	ND	ND
Aroclor 1221	0.084	ug/l		ND	ND	ND	ND
Aroclor 1232	0.064	ug/l		ND	ND	ND	ND
Aroclor 1242	0.07	ug/l		ND	ND	ND	ND
Aroclor 1248	0.049	ug/l		ND	ND	ND	ND
Aroclor 1254	0.068	ug/l		ND	ND	ND	ND
Aroclor 1260	0.02	ug/l		ND	ND	ND	ND
Chlordane (tech)	0.066	ug/l	1	ND	ND	ND	ND
Chlorothanonil	0.002	ug/l		ND	ND	ND	ND
Dieldrin	0.002	ug/l		ND	ND	ND	ND
Endrin	0.002	ug/l	2	ND	ND	ND	ND
gamma-BHC (Lindane)	0.0015	ug/l	0.2	ND	ND	ND	ND
Heptachlor	0.0009	ug/l	0.01	ND	ND	ND	ND
Heptachlor epoxide	0.0011	ug/l	0.01	ND	ND	ND	ND
Hexachlorobenzene	0.003	ug/l	1	ND	ND	ND	ND
Hexachlorocyclopentadiene	0.014	ug/l	50	ND	ND	ND	ND
Methoxychlor	0.0044	ug/l	30	ND	ND	ND	ND
PCBs, Total	0.049	ug/l	0.5	ND	ND	ND	ND
Propachlor	0.01	ug/l		ND	ND	ND	ND
Toxaphene	0.066	ug/l	3	ND	ND	ND	ND
EPA 515.3							
2,4-DCAA-Surrogate	70-130	% Rec		110	71.5	99.3	117
Bentazon	2	ug/L	18	ND	ND	ND	ND
2,4-D	2	ug/L	70	ND	ND	ND	ND
Dalapon	10	ug/L	200	ND	ND	ND	ND
Dicamba	1	ug/L		ND	ND	ND	ND
Dinoseb	2	ug/L	7	ND	ND	ND	ND
Pentachlorophenol	0.2	ug/L	1	ND	ND	ND	ND
Picloram	1	ug/L	500	ND	ND	ND	ND
2,4,5-TP (Silvex)	1	ug/L	50	ND	ND	ND	ND
2,4,5-T	1	ug/L		ND	ND	ND	ND
EPA 524.2							
4-Bromofluorobenzene-Surrogate	70-130	% Rec		105	85	97	102
1,2-Dichlorobenzene-d4-Surrogate	70-130	% Rec		81	77	90	95
Benzene	0.5	ug/L	1	ND	ND	ND	ND
Bromobenzene	0.5	ug/L		ND	ND	ND	ND
Bromochloromethane	0.5	ug/L		ND	ND	ND	ND

EXHIBIT F
ARVIN-EDISON WATER STORAGE DISTRICT
NEW WELLTITLE 22 RESULTS

			Lab	FGL	FGL	FGL	FGL
			Location	**Well 99**	**Well 98**	**N-19**	**Well 100**
			Date	6/30/2015	9/25/2015	6/7/2016	4/17/2017
			Field pH	7.70	7.89	7.70	7.52
Constituent	**PQL**	**Units**	**MCL**				
Bromodichloromethane	0.5	ug/L		ND	ND	ND	ND
Bromoform	0.5	ug/L		ND	ND	ND	ND
Bromomethane	0.5	ug/L		ND	ND	ND	ND
n-Butylbenzene	0.5	ug/L		ND	ND	ND	ND
sec-Butylbenzene	0.5	ug/L		ND	ND	ND	ND
tert-Butylbenzene	0.5	ug/L		ND	ND	ND	ND
Carbon Tetrachloride	0.5	ug/L	0.5	ND	ND	ND	ND
Chlorobenzene	0.5	ug/L	70	ND	ND	ND	ND
Chloroethane	0.5	ug/L		ND	ND	ND	ND
Chloroform	0.5	ug/L		ND	ND	ND	ND
Chloromethane	0.5	ug/L		ND	ND	ND	ND
2-Chlorotolune	0.5	ug/L		ND	ND	ND	ND
4-Chlorotoluene	0.5	ug/L		ND	ND	ND	ND
Dibromochloromethane (Chlorodibr	0.5	ug/L		ND	ND	ND	ND
Dibromomethane	0.5	ug/L		ND	ND	ND	ND
1,2-Dichlorobenzene	0.5	ug/L	600	ND	ND	ND	ND
1,3-Dichlorobenzene	0.5	ug/L		ND	ND	ND	ND
1,4-Dichlorobenzene	0.5	ug/L	5	ND	ND	ND	ND
Dichlorodifluoromthane	0.5	ug/L		ND	ND	ND	ND
1,1-Dichloroethane	0.5	ug/L	5	ND	ND	ND	ND
1,2-Dichloroethane	0.5	ug/L	0.5	ND	ND	ND	ND
1,1-Dichloroethylene	0.5	ug/L	6	ND	ND	ND	ND
cis-1,2-Dichloroethylene	0.5	ug/L	6	ND	ND	ND	ND
trans-1,2-Dichloroethylene	0.5	ug/L	10	ND	ND	ND	ND
1,2-Dichloropropane	0.5	ug/L	5	ND	ND	ND	ND
1,3-Dichloropropane	0.5	ug/L		ND	ND	ND	ND
Dichloromethane (Methylene Chlor	0.5	ug/L	5	ND	ND	ND	ND
2,2-Dichloropropane	0.5	ug/L		ND	ND	ND	ND
1,1-Dichloropropene	0.5	ug/L		ND	ND	ND	ND
cis-1,3-Dichloropropene	0.5	ug/L		ND	ND	ND	ND
trans-1,3-Dichloroprppene	0.5	ug/L		ND	ND	ND	ND
Di-isopropyl ether (DIPE)	3	ug/L		ND	ND	ND	ND
Ethyl Benzene	0.5	ug/L	300	ND	ND	ND	ND
Ethyl tyert-Butyl Ether (ETBE)	3	ug/L		ND	ND	ND	ND
Hexachlorobutadiene	0.5	ug/L		ND	ND	ND	ND
Isopropylbenzene	0.5	ug/L		ND	ND	ND	ND
p-Isopropyltoluene	0.5	ug/L		ND	ND	ND	ND
Methyl tert-Butyl Ether (MTBE)	3	ug/L	13	ND	ND	ND	ND
Naphthalene	0.5	ug/L	5	ND	ND	ND	ND
n-Propylbenzene	0.5	ug/L		ND	ND	ND	ND
Styrene	0.5	ug/L	100	ND	ND	ND	ND
Tert-anyl-methyl Ether (TAME)	3	ug/L		ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	0.5	ug/L		ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.5	ug/L	1	ND	ND	ND	ND
Tetrachloroethane	0.5	ug/L	5	ND	ND	ND	ND
Toluene	0.5	ug/L	150	ND	ND	ND	ND
1,2,3-Trichlorobenzene	0.5	ug/L		ND	ND	ND	ND
1,2,4-Trichlorobenzene	0.5	ug/L	5	ND	ND	ND	ND
1,1,1-Trichloroethane	0.5	ug/L	200	ND	ND	ND	ND
1,1,2-Trichloroethane	0.5	ug/L	5	ND	ND	ND	ND
Trichloroethylene	0.5	ug/L	5	ND	ND	ND	ND
Trichlorofluoromethane (Freon 11)	0.5	ug/L	150	ND	ND	ND	ND

EXHIBIT F
ARVIN-EDISON WATER STORAGE DISTRICT
NEW WELLTITLE 22 RESULTS

			Lab	FGL	FGL	FGL	FGL
			Location	**Well 99**	**Well 98**	**N-19**	**Well 100**
			Date	6/30/2015	9/25/2015	6/7/2016	4/17/2017
			Field pH	7.70	7.89	7.70	7.52
Constituent	**PQL**	**Units**	**MCL**				
1,1,2-Trichlorotrifluoroethane	0.5	ug/L	1200	ND	ND	ND	ND
1,2,4-Trimethylbenzene	0.5	ug/L		ND	ND	ND	ND
1,3,5-Trimethylbenzene	0.5	ug/L		ND	ND	ND	ND
Vinyl Chloride	0.5	ug/L	0.5	ND	ND	ND	ND
Xylenes (Total)	0.5	ug/L	1750	ND	ND	ND	ND
Total Trihalomethanes	0.5	ug/L	80	ND	ND	ND	ND
EPA 525.2							
Alachlor	0.022	ug/l	2	ND	ND	ND	ND
Atrazine IN 507	0.034	ug/l	1	ND	ND	ND	ND
Benzo (a) pyrene	0.07	ug/l	0.2	ND	ND	ND	ND
Bis(2-ethylhexyl) adipate	0.1	ug/l	400	ND	ND	ND	ND
Bis(2-ethylhexyl) phthalate	1.1	ug/l	4	ND	ND	ND	ND
Bromacil	0.038	ug/l		ND	ND	ND	ND
Butachlor	0.017	ug/l		ND	ND	ND	ND
Captan	0.86	ug/l		NR	NR	NR	NR
Chloropropham	0.01	ug/l		NR	NR	NR	NR
Cyanazine	0.024	ug/l		ND	ND	ND	ND
Diazinon IN 507	0.096	ug/l		ND	ND	ND	ND
Dimethoate	0.024	ug/l		ND	ND	ND	ND
Diphenamid	0.024	ug/l		NR	NR	NR	NR
Disulfoton	0.031	ug/l		NR	NR	NR	NR
EPTC	0.017	ug/l		NR	NR	NR	NR
Malathion	0.01	ug/l		NR	NR	NR	NR
Metolachlor	0.012	ug/l		ND	ND	ND	ND
Metribuzin	0.015	ug/l		ND	ND	ND	ND
Molinate	0.039	ug/l	20	ND	ND	ND	ND
Prometon	0.024	ug/l		NR	NR	NR	NR
Prometryn IN 507	0.036	ug/l		ND	ND	ND	ND
Simazine	0.015	ug/l	4	ND	ND	ND	ND
Terbacil	0.55	ug/l		NR	NR	NR	NR
Thiobencarb	0.025	ug/l	70	ND	ND	ND	ND
Trithion	0.012	ug/l		NR	NR	NR	NR
Surrogate: 1,3-Dimethyl-2-nitroben:	NA	% Rec		NR	NR	NR	NR
Surrogate: Perylene-d12	NA	% Rec		NR	NR	NR	NR
Surrogate: Triphenyl phosphate	NA	% Rec		112%	73%	118%	96%
EPA 531.1							
Aldicarb	3	ug/L	3	ND	ND	ND	ND
Aldicarb Sulfone	2	ug/L	4	ND	ND	ND	ND
Aldicarb Sulfoxide	3	ug/L	3	ND	ND	ND	ND
Carbaryl	5	ug/L		ND	ND	ND	ND
Carbofuran	5	ug/L	18	ND	ND	ND	ND
3-Hydroxycarbofuran	10	ug/L	3	ND	ND	ND	ND
Methomyl	5	ug/L		ND	ND	ND	ND
Oxamyl	5	ug/L	50	ND	ND	ND	ND
Propoxur (Baygon)	5	ug/L		NR	ND	ND	ND
EPA 547							
Glyphosate	20	ug/L	700	ND	ND	ND	ND
EPA 548.1							
Endothall	40	ug/L	100	ND	ND	ND	ND
EPA 549							
Diaquat	2	ug/L	20	ND	ND	ND	ND
Paraquat	0.5	ug/L		ND	ND	ND	ND

EXHIBIT F

ARVIN-EDISON WATER STORAGE DISTRICT

NEW WELLTITLE 22 RESULTS

			Lab	FGL	FGL	FGL	FGL
			Location	**Well 99**	**Well 98**	**N-19**	**Well 100**
			Date	6/30/2015	9/25/2015	6/7/2016	4/17/2017
			Field pH	7.70	7.89	7.70	7.52
Constituent	**PQL**	**Units**	**MCL**				
EPA 632							
Diuron	0.1	ug/L		ND	ND	ND	ND
TOC							
TOC	0.5	mg/L		ND	ND	0.7	0.3
Radio Chemistry 2A120426	MDA						
Gross Alpha	1.4	pCi/L	15	0.582	0.392	3.98	1.32
Alpha Radium(226)	0.32	pCi/L	5	0.00	0.22	0.23	0.00
Uranium	0.34	pCi/L	20	1.53	0.745	1.2	1.17
Gross Beta	0.86	pCi/L	50.00	NR	NR	NR	NR
Radon	18.4	pCi/L		106.0	18.3	199.0	71.9
Strontium 90	0.607	pCi/L	8.000	NR	NR	NR	NR
Tritium	434.0	pCi/L	20000	NR	NR	NR	NR
Bacteria SM9221B, SM9215							
Coliform Total		MPN/100ml	1.1	<1.8	<2	<2	<2
Coliform Fecal		MPN/100ml	<2	<1.8	<2	<2	<2
E. Coli - **SM9223B**[1]		MPN/100ml	<1	<1	<1	ND	<1
Heterotrophic		CFU/ml	500	27	45	19	20
Method 1613B, Dioxins/Fur	EDL						
2,3,7,8-TCDD	3.1	pg/L	$3x10^{-8}$	ND	ND	ND	ND
Asbestos EPA-600	MDL						
Drinking water	0.2	MF/L	7	ND	NR	NR	ND
UV 254	MDL						
UV254	0.003	1/cm		ND	0.013	0.024	0.01

NR=Not Required due to previous low result

[1] SM 9223B is Generic E. Coli specific for Fecal

EXHIBIT G

ARVIN-EDISON WATER STORAGE DISTRICT

BLENDING MODEL SCENARIOS

Scenario 1: All Wells ON - No Import

DWR Max - A-E Min

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	2,747	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	10	3.1	141	6.1	6.2	10.6	236	0.5	26	119	0.0011
Blended AE w/ Aqueduct	2,757	2.0	270	1.0	1.0	3.3	274	3.2	34	492	0.0010
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

DWR Max - A-E Max

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	2,747	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	160	14.1	138	4.3	4.3	14.4	268	0.5	42	136	0.0017
Blended AE w/ Aqueduct	2,907	2.7	263	1.2	1.2	3.9	274	3.1	34	473	0.0010
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

DWR Min - A-E Min

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	200	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	10	3.1	141	6.1	6.2	10.6	236	0.5	26	119	0.0011
Blended AE w/ Aqueduct	210	2.1	264	1.2	1.2	3.6	272	3.1	34	475	0.0010
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

DWR Min - A-E Max

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	200	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	160	14.1	138	4.3	4.3	14.4	268	0.5	42	136	0.0017
Blended AE w/ Aqueduct	360	7.4	211	2.5	2.5	8.2	271	2.0	37	334	0.0013
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

EXHIBIT G

ARVIN-EDISON WATER STORAGE DISTRICT

BLENDING MODEL SCENARIOS

Scenario 2: All Wells ON (Except N-15 Through N-18) - No Import

DWR Max - A-E Min

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	2,747	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	10	2.9	141	6.2	6.3	10.7	236	0.5	26	123	0.0012
Blended AE w/ Aqueduct	2,757	2.0	270	1.0	1.0	3.3	274	3.2	34	492	0.0010
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

DWR Max - A-E Max

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	2,747	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	160	8.1	137	4.4	4.4	14.0	262	0.5	40	139	0.0017
Blended AE w/ Aqueduct	2,907	2.3	263	1.2	1.2	3.9	273	3.1	34	474	0.0010
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

DWR Min - A-E Min

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	200	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	10	2.9	141	6.2	6.3	10.7	236	0.5	26	123	0.0012
Blended AE w/ Aqueduct	210	2.0	264	1.2	1.2	3.6	272	3.1	34	476	0.0010
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

DWR Min - A-E Max

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	200	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	160	8.1	137	4.4	4.4	14.0	262	0.5	40	139	0.0017
Blended AE w/ Aqueduct	360	4.7	211	2.5	2.5	8.0	268	2.0	37	336	0.0013
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

EXHIBIT G

ARVIN-EDISON WATER STORAGE DISTRICT

BLENDING MODEL SCENARIOS

Scenario 3: All Wells ON (Except N-19) - No Import

DWR Max - A-E Min

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	2,747	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	10	3.0	140	6.1	6.3	10.7	236	0.5	26	121	0.0012
Blended AE w/ Aqueduct	2,757	2.0	270	1.0	1.0	3.3	274	3.2	34	492	0.0010
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

DWR Max - A-E Max

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	2,747	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	160	16.9	138	4.4	4.4	14.3	268	0.5	42	123	0.0006
Blended AE w/ Aqueduct	2,907	2.8	263	1.2	1.2	3.9	274	3.1	34	473	0.0010
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

DWR Min - A-E Min

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	200	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	10	3.0	140	6.1	6.3	10.7	236	0.5	26	121	0.0012
Blended AE w/ Aqueduct	210	2.0	264	1.2	1.3	3.7	272	3.1	34	475	0.0010
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

DWR Min - A-E Max

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	20	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	160	16.9	138	4.4	4.4	14.3	268	0.5	42	123	0.0006
Blended AE w/ Aqueduct	180	15.2	153	4.0	4.0	13.1	268	0.8	41	164	0.0007
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

ARVIN-EDISON WATER STORAGE DISTRICT

BLENDING MODEL SCENARIOS

Scenario 4: All Wells ON - 250 cfs Friant-Kern Import

DWR Max - A-E Min

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	2,747	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	10	10.7	120	4.3	3.9	10.0	205	0.4	28	103	0.0010
Blended AE w/ Aqueduct	2,757	2.0	269	1.0	1.0	3.3	274	3.2	34	492	0.0010
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

DWR Max - A-E Max

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	2,747	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	160	14.0	106	3.5	2.8	9.0	177	0.3	27	84	0.0010
Blended AE w/ Aqueduct	2,907	2.7	261	1.1	1.1	3.6	269	3.0	34	470	0.0010
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

DWR Min - A-E Min

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	200	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	10	10.7	120	4.3	3.9	10.0	205	0.4	28	103	0.0010
Blended AE w/ Aqueduct	210	2.4	263	1.2	1.1	3.6	271	3.1	34	474	0.0010
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

DWR Min - A-E Max

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	200	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	160	14.0	106	3.5	2.8	9.0	177	0.3	27	84	0.0010
Blended AE w/ Aqueduct	360	7.3	197	2.1	1.8	5.8	231	1.9	31	311	0.0010
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

EXHIBIT G

ARVIN-EDISON WATER STORAGE DISTRICT

BLENDING MODEL SCENARIOS

Scenario 5: All Wells ON (Except N-15 Through N-18) - 250 cfs Friant-Kern Import

DWR Max - A-E Min

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	2,747	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	10	5.2	120	4.3	3.9	10.0	202	0.4	28	104	0.0011
Blended AE w/ Aqueduct	2,757	2.0	269	1.0	1.0	3.3	274	3.2	34	492	0.0010
		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

DWR Max - A-E Max

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	2,747	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	160	5.5	105	3.6	2.9	9.1	173	0.3	27	85	0.0010
Blended AE w/ Aqueduct	2,907	2.2	261	1.1	1.1	3.6	268	3.0	34	471	0.0010
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

DWR Min - A-E Min

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	200	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	10	5.2	120	4.3	3.9	10.0	202	0.4	28	104	0.0011
Blended AE w/ Aqueduct	210	2.2	263	1.2	1.1	3.6	271	3.1	34	474	0.0010
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

DWR Min - A-E Max

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	200	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	160	5.5	105	3.6	2.9	9.1	173	0.3	27	85	0.0010
Blended AE w/ Aqueduct	360	3.6	197	2.1	1.8	5.9	229	1.9	31	312	0.0010
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

EXHIBIT G

ARVIN-EDISON WATER STORAGE DISTRICT

BLENDING MODEL SCENARIOS

Scenario 6: All Wells ON - 250 cfs Friant-Kern, 20 cfs CVC Import

DWR Max - A-E Min

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	2,747	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	10	11.2	116	4.1	3.7	9.8	198	0.4	28	98	0.0010
Blended AE w/ Aqueduct	2,757	2.0	269	1.0	1.0	3.3	274	3.2	34	492	0.0010
		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

DWR Max - A-E Max

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	2,747	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	160	13.6	105	3.5	2.8	9.0	177	0.4	27	82	0.0010
Blended AE w/ Aqueduct	2,907	2.6	261	1.1	1.1	3.6	269	3.0	34	470	0.0010
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

DWR Min - A-E Min

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	200	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	10	11.2	116	4.1	3.7	9.8	198	0.4	28	98	0.0010
Blended AE w/ Aqueduct	210	2.4	263	1.1	1.1	3.6	270	3.1	34	474	0.0010
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

DWR Min - A-E Max

	Flow	Arsenic	Bromide	Chromium	Chromium 6	Nitrate as NO3	TDS	Total Organic Carbon	Sulfate	EC	1,2,3 TCP
	(cfs)	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µmho/cm	µg/L
Background Aqueduct :	200	2.0	270	1.0	1.0	3.3	274	3.2	34	493	0.0010
AEWSD Outflow to Aqueduct	160	13.6	105	3.5	2.8	9.0	177	0.4	27	82	0.0010
Blended AE w/ Aqueduct	360	7.1	197	2.1	1.8	5.8	231	1.9	31	311	0.0010
MCL		10	None	50	Formerly 10	45	500	None	250	1000	0.0050

ATTACHMENT I

Notices of District Education Programs & Services Available to Customers

Board
FeB

North West Kern
Resource
Conservation
District

North West Kern Resource Conservation District
5000 California Ave. #100
Bakersfield, CA 93309
(661) 336-0967 ext. 2746
(844) 206-6892 fax

RECEIVED
JAN 26 2018
A.E.W.S.D.

January 24, 2018

David Nixon, Deputy General Manager
Arvin-Edison Water Storage District
P.O. Box 175
Arvin, CA 93203-0175

Dear Steve,

The RCD is again seeking your financial support to maintain this vital program for the water users in your area. With the current water conservation plans that are required of various districts, the Mobile Lab has provided assistance to help fulfill the technical aspect of those plans.

We are asking the Arvin-Edison Water Storage District to contribute a minimum of $6000.00 to the work of the Mobile Lab for the coming year. This will help the district in the day to day financial obligations that we are faced with in the operation of the lab.

Thank you for your participation in this program.

Sincerely,

Brian W. Hockett, District Manager

CONSERVATION ● DEVELOPMENT ●SELF-GOVERNMENT

North West Kern
Resource
Conservation
District

North West Kern Resource Conservation District
5000 California Ave. #100
Bakersfield, CA 93309
(661) 336-0967 ext. 2746
(844) 206-6892 fax

January 23, 2018

David Nixon, Deputy General Manager
Arvin-Edison Water Storage District
P.O. Box 175
Arvin, CA 93203-0175

Dear Dave,

Enclosed is a copy of the annual report for the North West Kern Resource Conservation District. The period covered is from January 1, 2017 through December 31, 2017.

The following table summarizes the evaluations that were conducted by the Mobile Irrigation Lab in the Arvin-Edison WSD during the 2017 irrigation season.

Table 1. 2017 irrigation season

Grower	System Type	Crop	Acres	DU
Grapery, Inc.	Micro/drip	grapes	36	87
Mike Cauzza	Micro/drip	cherries	38	95
Total Acres			**74**	

The North West Kern RCD would like to thank the Arvin-Edison WSD for their participation in the Mobile Lab program. We look forward to working with the land owners in your district in the upcoming season.

Sincerely,

Brian W. Hockett

Brian W. Hockett, District Manager

2017

Annual Report

of the

North West Kern

Resource Conservation District

2017 ANNUAL REPORT

of the

NORTH WEST KERN

RESOURCE CONSERVATION DISTRICT

5000 California Avenue, Suite #100

Bakersfield, CA 93309

DISTRICT DIRECTORS

President	- *Craig Fulwyler*
Vice-President	- *Jim Grundt*
Secty-Treasurer	- *Stephen Fanucchi (1)*
Director	- *Bryan Bone*
Director/Secty-Treasurer	- *Gabriel Giesick (2)*
Director	- *Don Palla*
Director	- *Matthew Haddon*

DISTRICT EMPLOYEES

District Manager	- *Brian Hockett*
District Secretary	- *Christine Aguirre*
Irrigation Technician	- *Stephen Hiebert*
Irrigation Technician	- *Mason Gonzalez*

NATURAL RESOURCES CONSERVATION SERVICE PERSONNEL

District Conservationist	- *Brandon Bates (3)*
Soil Conservationist	- *James Booth*
Soil Conservationist	- *Caleb Griffin*
Soil Conservationist	- *Amy Rocha*
Soil Conservationist	- *Joyce Bassett (4)*
Soil Conservationist	- *Emmanuel Hinojosa (5)*
Conservation Specialist	- *Raul Ramirez*
Agricultural Engineer	- *Marcos Perez*
Ag/Civil Engineer	- *Javier Flores*
WRP Engineer	- *Jose Lule*
Farm Bill Assistant	- *Kathy Fuller (6)*
Farm Bill Assistant	- *Ashanti Robertson (7)*

(1) Stephen Fanucchi resigned in early August leaving his position vacant.
(2) Gabriel Giesick was voted in as Secretary-Treasurer.
(3) Brandon Bates took over as District Conservationist on October 2nd.
(4) Joyce Bassett started on January 23rd and left on November 9th.
(5) Emmanuel Hinojosa started on January 23rd.
(6) Kathy Fuller retired on September 6th.
(7) Ashanti Robertson started on August 30th.

GENERAL INFORMATION

The North West Kern Resource Conservation District (RCD) has pursued the goals of the District's Long Range Work Plan throughout the course of the year, emphasizing Irrigation Water Management (IWM). The district consists of 594,360 acres, reaching as far west as the north western portion of Kern County, then along the county line east of Delano, and then almost as far south as Taft, with areas in between that are not included in the boundaries.

ACKNOWLEDGMENT

The Natural Resources Conservation Service (NRCS) provided assistance to the RCD through in-kind services, of which involved the usage of office space, information, materials within the office and office personnel.

ASSISTANCE

The RCD provided secretarial assistance to the NRCS to process 104 incoming Environmental Quality Incentive Program (EQIP) applications, of which 66 were funded for a total of $4,637,725.00. The RCD also assisted in handling various tasks that occurred on a daily basis with the help of the district's secretary.

CONFERENCES

Attended the California Irrigation Institute's Annual Conference in Sacramento on January 30-31. Attended the California Association of Resource Conservation District's Annual Conference on November 15-17 in Sacramento, CA.

MEETINGS

1. Regular meetings of the RCD were held on the third Wednesday of the month.

2. Participated in steering committee meetings for the Poso Creek Integrated Regional Water Management Group on the 1st Tuesday of each month when available.

COOPERATIVE EFFORTS

1. Conducted seven evaluations in Madera County at the request of the NRCS under the Environmental Quality Incentives Program (EQIP).

AGREEMENTS

The RCD has two agreements; one which provides assistance to the NRCS through the Environmental Quality Incentive Program, and one with the California Department of Food and Agriculture:

1. Cooperative Agreement No. 68-9104-16-533 ($75,000.00 for three years) to accelerate implementation of USDA Farm Bill Programs; Environmental Quality Incentive Program (EQIP), Kern County, dated September 23, 2016 through September 30, 2019.

2. Standard Agreement No. 16-0360 ($36,000.00) to verify under CDFA's State Water Efficiency and Enhancement Program (SWEEP) that projects under this program were implemented in a manner consistent with what was proposed in the approved project scope of work and was functional after implementation. These projects consisted of not only the installation of a new water conserving irrigation system, but mostly the installation and use of other water conservation measures.

POSO CREEK

The creek started running in early January with all of the heavy rains that were falling. Flooding started on January 6th near the Kern National Wildlife Refuge in areas where there were weak spots in the levees. Land owners adjacent to the creek near Gun Club Road were able to patch holes in the levees, thus preventing any flooding from occurring in their vicinity. However, there were a number of breaches that went unchecked further to the west, allowing water to flow for a long period of time, thus impacting land owners in the flood plain. Water flowed down and out of the creek for a couple of months after the rain had stopped due to the melting snow pack.

With the issuance of a natural disaster, paperwork was filed with FEMA to help in the relief effort. This was a long process with no assistance being provided as of the end of the calendar year.

In December of the year, after the creek had long since dried up, CalFire crews were employed to conduct a clean-up project. They started by removing down trees and limbs that had fallen throughout the year, but clean-up was minimal because they had to re-locate to the fires in Southern California. The crews were made up of prisoners from a minimum security camp outside of Springville.

FUNDING

The Mobile Lab is funded through a fee for service. Support from local water districts keeps this fee affordable. In addition, funding is received from the Natural Resources Conservation Service and the California Department of Food and Agriculture, as mentioned above under 'Agreements.'

Contributions from water districts to the Mobile Lab for the 2017-2018 fiscal year were as follows:

1. Semitropic WSD	$	10,000.00
2. Arvin-Edison WSD	$	6,000.00
3. North Kern Water Storage District	$	8,500.00
4. Shafter-Wasco ID	$	6,000.00
5. Belridge WSD	$	5,000.00
6. Berrenda Mesa Water District	$	5,000.00
7. Buena Vista Water Storage District	$	2,500.00
8. Cawelo Water District	$	5,000.00
9. Wheeler Ridge-Maricopa WSD	$	5,000.00
10. Lost Hills Water District	$	5,000.00
11. Kern Delta Water District	$	4,000.00
12. Southern San Joaquin MUD	$	4,000.00
13. Delano-Earlimart Irrigation District	$	2,500.00
13. Henry Miller Water District	$	2,500.00
14. Rosedale Rio-Bravo WSD	$	1,500.00
15. Kern-Tulare Water District	$	750.00
Total contributions -	$	73,250.00

MOBILE LAB PROGRAM
ANNUAL PROGRESS REPORT

For services performed from January 1, 2017 to December 31, 2017.

IRRIGATION SYSTEM EVALUATIONS

A total of 165 evaluations were conducted on 18,882 acres during the 2017 irrigation season, with 22 of these being conducted under the NRCS EQIP program.

Table 1. Summary of evaluations conducted in 2017.

System Type	Crop	Number of Evaluations	Acres Evaluated	Average DU (%)
Drip	Almonds	29	3,309	90.3
	Cherries	1	38	95
	Citrus	1	115	99
	Grapes	14	934	88.5
	Pistachios	33	4,674	91
	Pomegranates	1	303	92
	Total	79	9,373	
	Overall average DU for drip			92.6
Micro Sprinkler	Almonds	47	7,778	87.7
	Citrus	33	1,380	81.5
	Kiwi	3	143	81
	Pistachios	2	132	78.5
	Walnuts	1	76	81
	Total	86	9,509	
	Overall average DU for micro/sprinkler			81.9

OBSERVATIONS AND RECOMMENDATIONS

Micro-Irrigation Systems

The main cause of non-uniformity during the irrigation season was due to a variation in system pressures. These variations were typically due to improperly set control valves, plugged hose screens and/or debris that had accumulated in the sub-mains and manifolds causing a reduction in pressure. By resetting valves and cleaning hose screens, most of the problems that occurred in these systems were corrected. With the elimination of these problems, overall system uniformity improved dramatically, as shown through later tests.

Other observations and recommendations made during the season included:

1. Installation or replacement of flow meter – The flow meter is an indispensable management tool that can help to monitor the amount of water applied throughout the season. Also, checking the flow meter frequently can help to detect system problems. For example, a steady decline in flow rate may indicate pump wear or a drop in the water level of a well. A slight decline in flow rate can indicate emitter plugging as well.

2. Opening Flush-outs – Upon opening some of the manifold flush outs, it was discovered that the water was very dirty in some systems. Manifold flush-outs should be opened periodically to flush out silt and debris that was not removed by the filters. The frequency at which this should occur will depend on the quality of the irrigation water and the effectiveness of the filters.

3. Hose Flushing – Most water users were very good about flushing hose ends, but in some cases the water coming out the end of the hose was very dirty. With micro-irrigation systems, it is very important to periodically undo the ends of each individual line and flush the dirt and debris from it. If this is not done on a regular basis, the dirty water in the hoses can plug the emitters. Hoses should be flushed as often as necessary depending on the quality of the irrigation water.

4. Emitter Plugging – This was found to be a problem in many situations. With micro-irrigation systems, bacteria and algae can build up inside the hoses and emitters and may eventually cause plugging. This can be avoided by regularly injecting chlorine or acid into the system, or some type of material that will promote the breakdown of these clogging agents. Emitters can also be replaced where needed.

5. Hose Screens – Hose screens are valuable for removing large particles that may have escaped from the filter system. However, they can become plugged with algae or debris, thus reducing pressure to a given hose line, and thereby decreasing uniformity to the overall irrigation system. This was found to be the case in several situations throughout the irrigation season. Chlorine/acid injection can help to prevent this from occurring, however, hose screens should be checked periodically for clogging. If they are clogged, they can be rinsed clean or replaced. Not all systems have hose screens installed in order to avoid this potential plugging problem. Even in a large number of the older systems, the screens had been taken out.

6. Leaks – It is important that irrigation workers are aware of leaks due to damaged hoses, missing emitters, broken valves, etc. Even a small leak can reduce the pressure in a line and cause a non-uniform application of water. On several occasions, leaks were a contributing factor in the overall non-uniformity of the system.

7. Different Emitter Types – Mixing emitters can adversely affect the distribution uniformity by applying more or less water to those plants with different emitters. Emitters are often mixed accidentally by irrigation workers when they come across a broken or plugged emitter in the field. When repairing these emitters, they may sometimes substitute a different emitter type because it is the only one available at the time. It is essential in this situation to match the replacement emitter with the existing ones in the field in order to maintain the proper flow and uniformity of the irrigation system. Most of the time, there may be one additional type of emitter due to the above mentioned situation. On various occasions however, there were several different emitter types in the field, lending to severe non-uniformity.

Preparing for the 2018 irrigation season

As growers are getting ready for the upcoming season, the Mobile Lab will be available to assist them with their irrigation needs. Being an efficient irrigation water manager is essential in today's water environment, as we are faced with many water related challenges that will impact the way we do business in the future.

ARVIN-EDISON WATER STORAGE DISTRICT
YEARLY MEMBERSHIPS & CONTRIBUTIONS
THROUGH JULY 2018

Month Approved	Name	2018	2017	2016	2015	2014	2013	2012
Nov	Kern County Farm Bureau	$ 250	$ 220	$ 220	$ 220	$ 170	$ 170	$ 170
Feb	North West Kern RCD (Mobile Lab)	$ 6,000	$ 6,000	$ 6,000	$ 6,000	$ 6,000	$ 6,000	$ 6,000
Feb	Kern Groundwater Authority	$ 114,268	$ 28,156	$ 19,440	$ 8,984	$ 10,000	$ -	$ -
Mar/Sept	Friant Water Authority (FWA)	$ 269,714	$ 425,187	$ 423,813	$ 262,880	$ 152,965	$ 167,586	$ 190,332
Mar	Teachers Ag Seminar	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500
Mar	San Joaquin Valley Ag Water Committee	$ 100	$ 100		$ 100		$ 100	
May	Western Growers Assoc.	$ 400	$ 400	$ 400	$ 400	$ 400	$ 400	$ 400
Mar	Agricultural Energy Consumers Assoc.		$ 4,625	$ 4,625	$ 4,625	$ 4,625	$ 4,625	$ 4,625
Oct	Water Association of Kern County		$ 3,960	$ 3,960	$ 1,500	$ 1,500	$ 2,000	$ 1,500
Feb	Family Farm Alliance	$ 5,068	$ 5,068	$ 5,068	$ 6,000	$ 6,000	$ 6,000	$ 6,000
July	Southern California Water Committee				$ -	$ 850	$ 850	$ 850
July	Committee For Delta Reliability (WRMWSD)			$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000
Sept	Kern Co. Auditor-Controller (LAFCO)	$ 5,952	$ 5,584	$ 6,190	$ 5,047	$ 4,176	$ 3,871	$ 3,197
Feb	Valley Ag Water Coalition	$ 6,000	$ 6,000	$ 6,000	$ 6,000	$ 6,000	$ 5,000	$ 5,000
Sept	Pacific Legal Foundation		$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000
Oct	Kern Ag Foundation	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250	$ 250
Nov	ACWA	$ 23,800	$ 24,366	$ 23,952	$ 22,088	$ 19,322	$ 19,322	$ 19,322
Dec	California Farm Water Coalition	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000
Dec	Water Education Foundation	$ 2,592	$ 2,254	$ 1,960	$ 1,960	$ 1,704	$ 1,482	$ 1,289
Dec	California Special Districts Assn	$ 6,842	$ 6,485	$ 6,089	$ 5,691	$ 2,206	$ 4,925	$ -
	TOTALS	$ 451,736	$ 534,155	$ 543,467	$ 367,245	$ 251,668	$ 258,081	$ 274,435

List of Vendors for Pump Testing

PG&E has an agricultural pump testing program through 2017. The program is administered by Fresno State University and operated by CIT. The contact phone number is (800) 845-6038.

ITRC at Cal Poly in San Luis Obispo offers training for pump testers.

Southern California Edison offers pump testing but only within their service area.

The following is a list of pump testers:

Pacific Irrigation, Inc.
11845 School Street
Bakersfield , CA 93307-9128
661.366.5555 (Voice)
661.366.0721 (Fax)
Contact - David Hines

Farm Pump & Irrigation Co., Inc.
535 N Shafter Avenue
Shafter, CA 93263
661.746.3376

Irrigation Concepts
32151 Elmo Highway
McFarland , CA 93250-9617
661.792.1886 (Voice)
661.792.1817 (Fax)
Contact - Ed Valov

Kaweah Pump
15499 Avenue 280
Visalia , CA 93292
559.747.0755 (Voice)
559.747.3881 (Fax)
Contact - Clyde Leischner

Valley Pump and Dairy Systems
2280 South "K" Street
Tulare , CA 93274
559.686.2000 (Voice)
559.686.4180 (Fax)
Contact - David Warren

SA Camp Pump Company
17876 Zerker Road
Bakersfield , CA 93308
661.399.2976 (Voice)
661.399.8063 (Fax)
Contact - John Reiland

Pistacchio Pump Company, Inc.
139 S Academy Avenue
Sanger , CA 93657
559.875.4528 (Voice)
559.875.2688 (Fax)
Contact - Larry Pistacchio

Myers Pump Testing Services
2183 Spanish Bay Court
Merced , CA 95340
209.723.7007 (Voice and Fax)
209.777.7171 (Cell)
Contact - Ron Myers

Raymond Marciano Pump Test Services
2011 Oak Street
Selma , CA 93662
559.896.9661 (Voice)
Contact - Ray Marciano

Reineke Pump Testing Services
731 E. Yosemite Avenue, Suite B #315
Merced, CA 95340
209.617.8810 (Voice)
209.383.4333 (Fax)
Contact - Jeff Reineke

ATTACHMENT J

District Water Order Form

ARVIN-EDISON WATER STORAGE DISTRICT
WATER ORDER

DATE: ____________

TIME: ____________

☐ MAGNICIDE	☐ HARVEST	☐ USER ADJUST	☐ EMERGENCY OFF
☐ G.P.M.	☐ INCREASE	☐ WIND	☐ PESTICIDE
☐ C.F.S.	☐ DECREASE	☐ HEAT	☐ FERTILIZER
☐ A.F.	☐ FROST	☐ TEST	☐ GERMINATION

TURNOUT ________ REQUESTED FLOW ________ ON ________ DATE OFF ________ DATE ON ________ DATE OFF ________ DATE ☐ DAILY

TURNOUT ________ REQUESTED FLOW ________ ON ________ DATE OFF ________ DATE ON ________ DATE OFF ________ DATE ☐ DAILY

TURNOUT ________ REQUESTED FLOW ________ ON ________ DATE OFF ________ DATE ON ________ DATE OFF ________ DATE ☐ DAILY

TURNOUT ________ REQUESTED FLOW ________ ON ________ DATE OFF ________ DATE ON ________ DATE OFF ________ DATE ☐ DAILY

TURNOUT ________ REQUESTED FLOW ________ ON ________ DATE OFF ________ DATE ON ________ DATE OFF ________ DATE ☐ DAILY

TURNOUT ________ REQUESTED FLOW ________ ON ________ DATE OFF ________ DATE ON ________ DATE OFF ________ DATE ☐ DAILY

ORDERED BY: ____________ FOR: ____________ Ph # ____________

COMMENTS: ____________

DISPATCHER: ____________

ARVIN-EDISON WATER STORAGE DISTRICT
WATER ORDER

DATE: ____________

TIME: ____________

☐ MAGNICIDE	☐ HARVEST	☐ USER ADJUST	☐ EMERGENCY OFF
☐ G.P.M.	☐ INCREASE	☐ WIND	☐ PESTICIDE
☐ C.F.S.	☐ DECREASE	☐ HEAT	☐ FERTILIZER
☐ A.F.	☐ FROST	☐ TEST	☐ GERMINATION

TURNOUT ________ REQUESTED FLOW ________ ON ________ DATE OFF ________ DATE ON ________ DATE OFF ________ DATE ☐ DAILY

TURNOUT ________ REQUESTED FLOW ________ ON ________ DATE OFF ________ DATE ON ________ DATE OFF ________ DATE ☐ DAILY

TURNOUT ________ REQUESTED FLOW ________ ON ________ DATE OFF ________ DATE ON ________ DATE OFF ________ DATE ☐ DAILY

TURNOUT ________ REQUESTED FLOW ________ ON ________ DATE OFF ________ DATE ON ________ DATE OFF ________ DATE ☐ DAILY

TURNOUT ________ REQUESTED FLOW ________ ON ________ DATE OFF ________ DATE ON ________ DATE OFF ________ DATE ☐ DAILY

TURNOUT ________ REQUESTED FLOW ________ ON ________ DATE OFF ________ DATE ON ________ DATE OFF ________ DATE ☐ DAILY

ORDERED BY: ____________ FOR: ____________ Ph # ____________

COMMENTS: ____________

DISPATCHER: ____________

ATTACHMENT K

Drainage Problem Report

The vast majority of soils within the Arvin-Edison Water Storage District are well drained or somewhat excessively drained, so no drainage report is required. Also, Arvin-Edison Water Storage District in not on the list of distrticts that have drainage problems.

ATTACHMENT L

Climate Data

Monthly Report

California Irrigation Management Information System (CIMIS)

Rendered in ENGLISH Units.

January 2012 - February 2018

Printed on Tuesday, August 21, 2018

Arvin-Edison - San Joaquin Valley - Station 125

Month Year	Total ETo (in)	Total Precip (in)	Avg Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Avg Max Air Temp (°F)	Avg Min Air Temp (°F)	Avg Air Temp (°F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (°F)	Avg Wind Speed (mph)	Avg Soil Temp (°F)
Jan 2012	2.05 K	0.00 L	256 L	7.9 L	56.9 L	37.7 L	48.8 L	88 L	38 L	66 L	37.6 L	2.9 L	47.8 L
Feb 2012	2.90 K	0.31 L	362 L	7.8 L	64.0 L	41.1 L	53.6 L	83 L	37 L	57 L	37.3 L	3.9 L	52.0 L
Mar 2012	4.34 K	1.54	439 K	8.8 K	68.7 K	43.2 K	55.9	85	35	57 K	40.6 K	4.1	59.0
Apr 2012	5.24 K	1.61 K	493	11.4 K	74.1 K	48.8 K	61.9 K	87 K	39 K	59 K	46.9 K	4.0 K	64.6 K
May 2012	8.36 K	0.00	659	10.5	84.0	54.9	70.6	69	25	41	45.7	4.3	72.6
Jun 2012	8.88	0.00	696 K	11.9	89.2 K	59.6	75.7	70	25	40	48.9	4.7	75.8
Jul 2012	9.14	0.00	661	13.9	95.3	64.1 K	81.0	67	25	39	53.0	4.0	79.9
Aug 2012	8.75	0.00	579	14.4	98.2	67.5 K	83.5	62	22	37	54.0	3.7	81.0
Sep 2012	6.37	0.00	487 K	13.3	93.9 K	61.9 K	78.2	68	24	41	52.1	3.4	75.5
Oct 2012	4.21 K	0.00	373 K	11.9	79.5 K	51.2 K	65.2	82	36	56	48.7	3.5	67.6
Nov 2012	2.03 L	0.24 L	248 L	10.9 L	70.0 L	44.3 L	56.5 L	90 L	46 L	70 J	46.5 J	3.1 L	59.8 L
Dec 2012	1.15 K	2.40 K	158 K	10.0 K	58.4 K	39.7 K	48.6 K	97 K	62 K	84 L	43.4 L	3.1 K	53.3 K

Monthly Report

Tots/Avgs	63.42	6.1	451	11.1	77.7	51.2	65.0	79	35	54	46.2	3.7	65.7

Arvin-Edison - San Joaquin Valley - Station 125

Month Year	Total ETo (in)	Total Precip (in)	Avg Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Avg Max Air Temp (°F)	Avg Min Air Temp (°F)	Avg Air Temp (°F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (°F)	Avg Wind Speed (mph)	Avg Soil Temp (°F)
Jan 2013	1.56	1.61	223 K	8.1 K	57.3	34.1	44.6	95	54	79 K	38.4 K	2.9	47.0
Feb 2013	2.57	0.67	334 K	8.2	62.6	37.3	49.7	91	43	67	38.8	3.4	51.4
Mar 2013	4.31	0.91	426 K	10.6	71.4 K	46.7 K	59.5	86	41	61	45.6	3.7	60.3
Apr 2013	6.25	0.16	550 K	10.3	78.2	50.5	65.0	79	30	49	44.6	4.3	67.1 K
May 2013	8.01	0.55	620 K	10.7 K	83.2	55.4	70.6	70	27	42 K	45.4 K	4.7	72.9
Jun 2013	8.79	0.04	662	14.1 K	92.0	62.5 K	78.4	69	26	42 K	52.8 K	4.3	78.5
Jul 2013	8.74	0.00	593 K	14.6	99.3 K	68.1 K	84.7	61	22	36	54.3	3.7	80.8
Aug 2013	8.32 K	0.00	572	14.1	94.7 K	63.6 K	80.0	67	25	40	53.4	3.9	77.5
Sep 2013	5.90	0.16	469	13.5	87.9 K	58.9 K	73.8	73	30	47	52.0	3.7	73.6
Oct 2013	4.36 K	0.16 K	383 K	9.0 K	78.9	46.5	62.4	77 K	28 K	48 K	41.5 K	3.3	64.3 K
Nov 2013	2.54	0.87	252	8.9	69.3 K	41.9	54.7	86	39	62	41.0	3.4 K	57.7
Dec 2013	1.80	0.20	233	6.6	59.6	30.9 K	43.5	90	41	68	33.6	3.0	49.6
Tots/Avgs	63.15	5.3	443	10.7	77.9	49.7	63.9	79	34	53	45.1	3.7	65.1

Arvin-Edison - San Joaquin Valley - Station 125

Month Year	Total ETo (in)	Total Precip	Avg Sol Rad	Avg Vap Pres	Avg Max Air Temp	Avg Min Air Temp	Avg Air Temp	Avg Max Rel Hum	Avg Min Rel Hum	Avg Rel Hum	Avg Dew Point	Avg Wind Speed	Avg Soil Temp

Monthly Report

		(in)	(Ly/day)	(mBars)	(°F)	(°F)	(°F)	(%)	(%)	(%)	(°F)	(mph)	(°F)
Jan 2014	2.63 K	0.08	238	6.8 K	66.8 K	36.3 K	50.9 K	77 K	36 K	56 K	34.2 K	3.8 K	51.7
Feb 2014	2.74	0.31	297	9.3	67.5 K	43.6 K	55.6	84	42	62	42.2	3.7	55.1
Mar 2014	4.84 K	0.87 L	432 L	9.0 L	73.4 L	46.3 L	60.8 L	77 L	32 L	50 L	41.1 L	4.1 L	60.9 L
Apr 2014	6.18 K	0.75 K	544 K	10.3 K	77.5 K	51.3 K	64.9 K	80 K	31 K	50	45.1	4.3 K	67.5 K
May 2014	8.41 K	0.04	633	9.6	85.2	56.0 K	71.9	63	22	37	42.9	4.6	72.0
Jun 2014	9.39	0.31 K	687	10.9	93.2 K	60.5	78.9 K	59	19	32 K	46.5 K	4.2 K	77.7
Jul 2014	8.99	25.71 K	613	15.0	97.4	68.8 K	84.5	60	25	38	55.0	3.8	81.3
Aug 2014	8.53 K	27.52 K	579 K	14.0 K	95.3 K	65.0 K	81.5 K	63 K	24 K	38	53.2	3.8 K	78.5 K
Sep 2014	6.28	1.34 K	490 K	13.9	91.0	62.3	77.3	66	30	44	53.0	3.5	75.7 K
Oct 2014	4.61	0.71	383	11.1	83.2	52.4	67.5	75	31	50	47.1	3.4 K	69.0
Nov 2014	2.22 K	0.04	254	11.3 K	69.5	44.4 K	56.0 K	93	49	73 K	47.2 K	3.0	60.5
Dec 2014	1.39	2.05 K	183	10.8 K	62.5 K	41.7 K	51.1 K	97	59	83 L	45.6 L	2.8	55.1
Tots/Avgs	66.21	59.7	444	11.0	80.2	52.4	66.7	75	33	51	46.1	3.7	67.1

Arvin-Edison - San Joaquin Valley - Station 125

Month Year	Total ETo (in)	Total Precip (in)	Avg Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Avg Max Air Temp (°F)	Avg Min Air Temp (°F)	Avg Air Temp (°F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (°F)	Avg Wind Speed (mph)	Avg Soil Temp (°F)
Jan 2015	1.33 K	0.51	196 K	10.3 K	58.6	40.3 K	48.6 K	97	68	86 K	44.5 K	2.5	51.2
Feb 2015	2.59 K	1.14	331 K	11.2	70.9 K	45.6	57.5 K	93 K	46 K	70 K	47.5 K	2.3	57.1

Mar 2015	4.33 K	0.28	434	11.0	76.5 K	49.1 K	62.9 K	85	36	57 K	46.9 K	2.0 K	61.8
Apr 2015	5.76 K	0.20	541	9.1	77.2	48.2	63.9	75	27	45	41.3	2.9 K	67.8
May 2015	7.21	0.71	589 K	11.4	79.9	54.7	67.7	77	32	50	47.5	4.1	70.4
Jun 2015	8.85	0.20	646	13.5 K	94.8 K	63.6 K	80.6	66	23	38 K	51.9 K	4.2	78.0
Jul 2015	8.69 K	0.67	623 K	16.5 K	94.8 K	67.3 K	82.0 K	71 K	29 K	42 L	56.7 L	4.3 K	78.8
Aug 2015	8.31	0.79	574	15.1	95.8 K	65.5	81.4	68	27	41	55.4	3.6 K	78.7
Sep 2015	6.33	0.12	486	12.9 K	92.4	61.1	77.2	68	25	41 K	51.0 K	3.4	74.3
Oct 2015	4.17	0.59	357	14.4 K	83.1	56.5 K	69.2 K	86	37	58 L	53.3 L	3.4 K	69.8
Nov 2015	2.21	0.91	270	9.0	65.1 K	38.6	50.3	95	44	72	41.5	3.1 K	56.9
Dec 2015	1.37	0.62	189	8.1 K	57.7 K	34.1 K	45.0	96	53	79 K	38.7 K	2.9	49.8
Tots/Avgs	61.15	6.7	436	11.9	78.9	52.1	65.5	81	37	57	48.0	3.2	66.2

Arvin-Edison - San Joaquin Valley - Station 125

Month Year	Total ETo (in)	Total Precip (in)	Avg Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Avg Max Air Temp (°F)	Avg Min Air Temp (°F)	Avg Air Temp (°F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (°F)	Avg Wind Speed (mph)	Avg Soil Temp (°F)
Jan 2016	1.32 K	3.07	171 K	10.2	61.3	41.1	50.3	97	59	82	44.7	3.2	50.5
Feb 2016	2.80	0.31	333	10.7	68.8 K	41.6	54.5	95	48	73	45.9	3.2	53.8
Mar 2016	4.37	1.03	414	10.6	71.6 K	46.3 K	58.9	90	38	62	45.8	4.0 K	60.2
Apr 2016	5.47	1.62	493 K	11.4 K	77.1	51.0 K	64.1	87	35	56 L	47.1 L	4.1 K	65.9
May 2016	7.20	0.38	547	12.6	83.3	57.7	71.1	80	31	49	50.5	4.3	73.9

Monthly Report

Jun 2016	9.00	0.13	672 K	12.9	94.1 K	63.8 K	80.5 K	66	22	37 K	51.1 K	4.3 K	79.6 K
Jul 2016	9.78	0.00	695 K	12.6 K	98.3 K	65.7 L	83.7	57	19	32 K	50.6 K	4.0 K	82.2 K
Aug 2016	8.83	0.00	598	12.6 K	97.7 K	63.9	82.0	59	20	34 K	50.5 K	3.6	81.6
Sep 2016	6.52	0.00	503	11.3 K	90.8 K	57.8 K	74.8 K	65	23	38 K	47.6 K	3.6 K	74.4
Oct 2016	4.02 K	0.00 K	355 K	12.0 K	78.7 K	51.1 K	64.9 K	83 L	37 L	57 L	48.9 L	3.5 K	67.3 K
Nov 2016	2.25	0.00	243	10.7 K	69.6 K	42.7	55.3 K	92	48	72 K	45.8 K	3.0	59.6
Dec 2016	1.20	0.00	174	9.7 K	58.2	38.0	47.4	97	65	85 K	43.1 K	3.0	51.5
Tots/Avgs	62.76	6.5	433	11.4	79.1	51.7	65.6	81	37	56	47.6	3.7	66.7

Arvin-Edison - San Joaquin Valley - Station 125

Month Year	Total ETo (in)	Total Precip (in)	Avg Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Avg Max Air Temp (°F)	Avg Min Air Temp (°F)	Avg Air Temp (°F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (°F)	Avg Wind Speed (mph)	Avg Soil Temp (°F)
Jan 2017	1.35 K	0.00	178	9.9 K	58.2 K	40.9 K	48.4 L	97 K	63 K	85 L	44.0 L	3.4 K	50.8
Feb 2017	1.99 K	0.00 K	260 K	11.9 K	64.3	46.1 K	54.9 K	96 K	60 K	80 K	48.6 K	3.8 K	55.8 K
Mar 2017	4.07	0.00	426 K	11.6 K	70.7	44.6 K	58.2	93	45	69 K	47.9 K	3.8 K	59.1
Apr 2017	5.85 K	0.00	520	10.3 K	76.4	48.2	63.1 K	82 K	32 K	53 K	44.9 K	4.7 K	67.4
May 2017	7.47	0.02	570	11.3	84.1 K	55.9 K	71.3 K	69	28	44 K	47.4 K	4.2	78.3 K
Jun 2017	9.05	0.00	676 K	13.9 K	94.7 K	65.2 L	81.2 L	62 K	24 K	38 L	52.4 L	4.1 K	87.0 K
Jul 2017	9.81	0.00	655	13.8	100.8	71.5 K	87.5 K	52	19	31 K	53.1 K	3.9	92.6 K
Aug 2017	8.63 K	0.00	561	15.4	99.1 K	71.2 L	86.1 K	58 K	23 K	36 K	56.0 K	3.7	91.0 K

Monthly Report

Sep 2017	6.13 K	0.31	476	14.1 K	90.6 K	62.2 K	76.6 K	71 K	26 K	43 L	51.8 L	3.9 K	83.8 L
Oct 2017	4.78	0.00	383 K	8.7 K	81.7	50.2 K	66.0 K	67	25	41 K	40.1 K	3.8 K	72.2 K
Nov 2017	2.29	0.10	252	10.8	70.2 K	44.5	56.9 K	91	47	69 K	46.5 K	3.1 K	63.9 K
Dec 2017	1.98	0.06	233	6.2 K	62.8	32.0	45.7	83	35	59 K	31.9 K	3.2 K	52.1 L
Tots/Avgs	63.40	0.5	433	11.5	79.5	52.7	66.3	77	36	54	47.1	3.8	71.2

Arvin-Edison - San Joaquin Valley - Station 125

Month Year	Total ETo (in)	Total Precip (in)	Avg Sol Rad (Ly/day)	Avg Vap Pres (mBars)	Avg Max Air Temp (°F)	Avg Min Air Temp (°F)	Avg Air Temp (°F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (°F)	Avg Wind Speed (mph)	Avg Soil Temp (°F)
Jan 2018	1.41 K	1.32	186	10.9 K	62.2 K	41.5 K	50.9 K	97 K	64 K	84 K	46.4 K	3.3 K	53.9 L
Feb 2018	2.89	0.32	337	7.5 K	66.1 K	36.6 K	51.6 K	82	33	56 K	35.9 K	3.8 K	55.5 L
Tots/Avgs	4.30	1.6	262	9.2	64.2	39.1	51.3	90	49	70	41.2	3.6	54.7

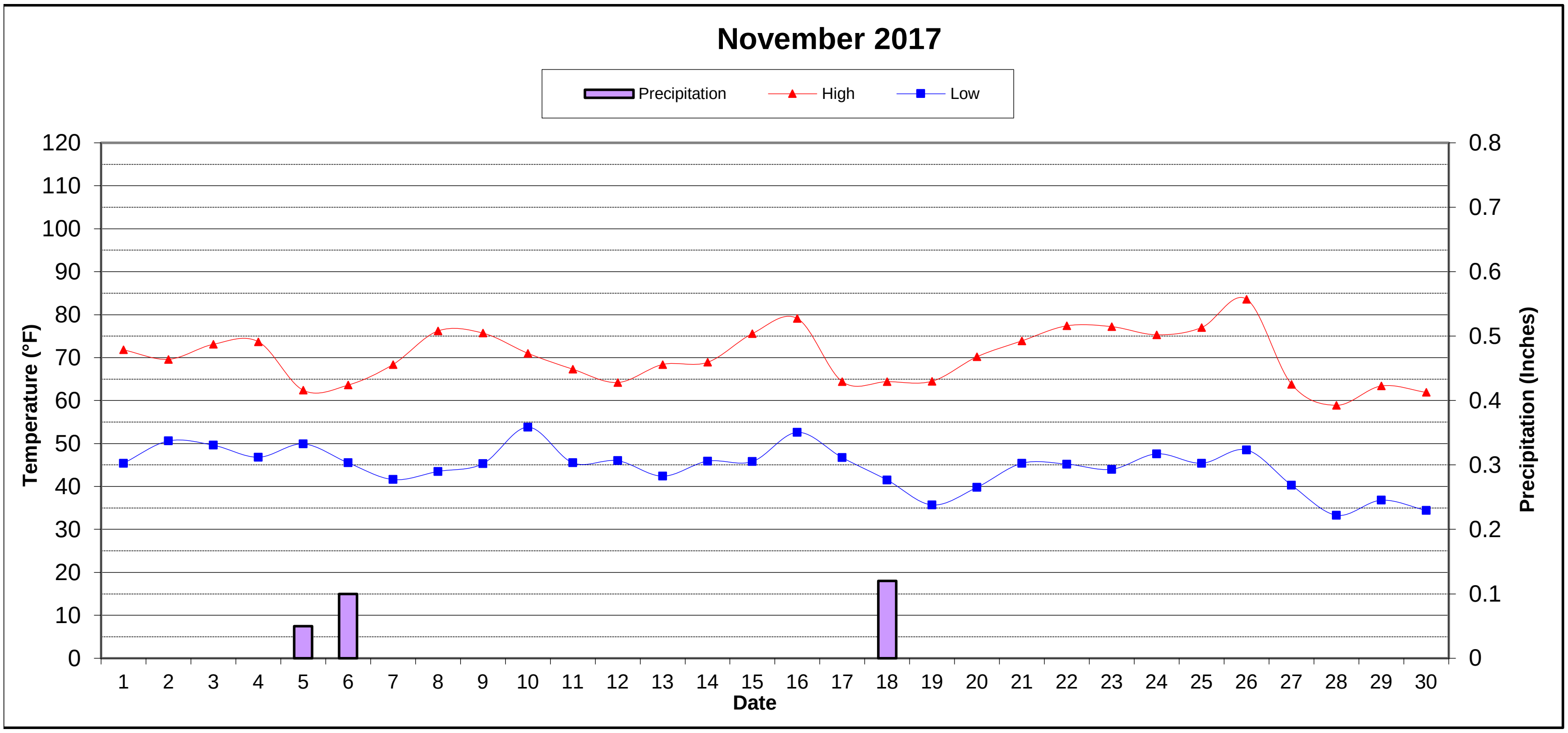
Flag Legend	
M - All Daily Values Missing	K - One or More Daily Values Flagged
J - One or More Daily Values Missing	L - Missing and Flagged Daily Values

Conversion Factors		
W/sq.m = Ly/day/2.065	inches * 25.4 = mm	(F-32) * 5/9 = c
	mBars * 0.1 = kPa	--

EXHIBIT "D"

ARVIN-EDISON WATER STORAGE DISTRICT

SUMMARY OF CLIMATOLOGICAL OBSERVATIONS



PRECIPITATION	OFFICE (1)		SYCAMORE (2)		TEJON (3)	
	INCHES	% OF AVG.	INCHES	% OF AVG.	INCHES	% OF AVG.
AVG. MONTHLY	0.84		0.86		0.78	
AVG. YEAR TO DATE	1.55		1.58		1.40	
CURRENT MONTH	0.27	32%	0.26	30%	0.29	37%
CUMULATIVE (07/01/17 - 06/30/18)	0.60	39%	0.58	37%	0.57	41%

TEMPERATURE (4)	(ºF)	DATE	TIME
MAXIMUM TEMPERATURE	83	11/26/2017	3:00 PM
AVERAGE MAXIMUM TEMPERATURE	70		
# DAYS THIS MONTH ABOVE 100 ºF	0		
MINIMUM TEMPERATURE	36	11/28/2017	7:00 AM
AVERAGE MINIMUM TEMPERATURE	45		
# DAYS THIS MONTH BELOW 32 ºF	0		

WIND (4)	M.P.H.	DATE	TIME	DIRECTION
MAXIMUM WIND SPEED	8.7	11/27/2017	10:00 AM	NW
AVERAGE WIND SPEED	3.1			
AVERAGE WIND SPEED @ 8:00 AM	2.8			

BAROMETRIC PRESSURE (5)	IN. HG	DATE	TIME
AVERAGE PRESSURE @ 8:00 AM	30.11		
MAXIMUM PRESSURE	30.25	11/18/2017	8:00 AM
MINIMUM PRESSURE	29.88	11/1/2017	4:00 PM

NOTES

(1) 1975 to Present data gathered from District rain gauges

(2) 1968 to Present data gathered from District rain gauges

(3) 1967 to Present data gathered from District rain gauges

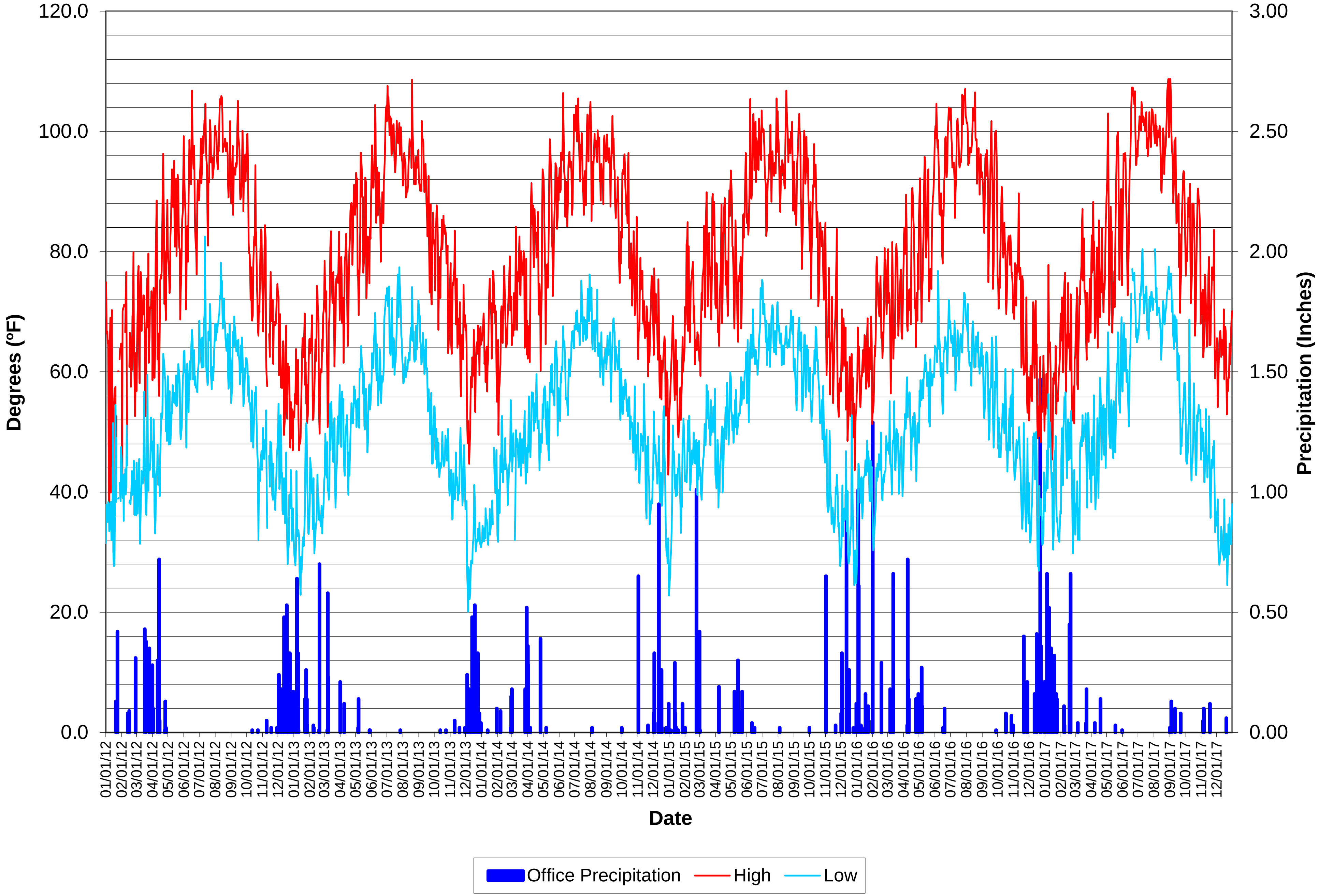
(4) Data retrieved from CIMIS (http://www.cimis.water.ca.gov/WSNReportCriteria.aspx)

(5) Data retrieved from Weather Underground (https://www.wunderground.com/us/ca/arvin/zmw:93203.1.99999)

Precipitation Day is 8:00 AM to 8:00 AM

Arvin-Edison Water Storage District

Daily Climatological Data (2012 - 2017)



OFFICE

ARVIN-EDISON WATER STORAGE DISTRICT
PRECIPITATION FOR DISTRICT OFFICE STATION

SEASON	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
1974-75	0.00	0.00	0.00	0.00	0.00	0.16	0.22	1.56	1.77	1.71	0.00	0.00	5.42
1975-76	0.00	0.19	0.06	1.02	0.16	0.25	0.15	1.12	0.42	1.05	0.32	0.06	4.80
1976-77	0.00	0.00	2.16	1.59	0.71	0.01	0.49	0.20	2.42	0.01	0.70	0.04	8.33
1977-78	0.00	0.88	0.03	0.00	0.12	1.93	1.20	5.00	3.71	1.02	0.05	0.00	13.94
1978-79	0.00	0.00	1.34	0.09	0.73	0.77	2.15	1.77	3.01	0.10	0.10	0.00	10.06
1979-80	0.00	0.00	0.11	1.29	0.27	0.21	3.00	0.90	1.88	1.83	0.20	0.00	9.69
1980-81	0.00	0.00	0.00	0.08	0.07	0.39	1.36	1.50	3.71	1.47	0.79	0.00	9.37
1981-82	0.00	0.00	0.00	0.81	0.60	0.13	1.56	0.61	2.20	1.44	0.00	0.75	8.10
1982-83	0.00	0.02	1.43	1.18	1.54	0.88	2.52	1.94	4.05	0.77	0.05	0.00	14.38
1983-84	0.00	1.02	0.16	0.91	2.38	1.22	0.08	0.32	0.85	1.15	0.00	0.11	8.20
1984-85	0.09	0.00	0.26	0.06	1.57	1.29	1.18	1.15	0.98	0.00	0.23	0.38	7.19
1985-86	0.03	0.00	0.60	0.82	2.67	0.34	1.01	0.79	2.01	0.58	0.12	0.00	8.97
1986-87	0.08	0.00	0.03	0.00	1.04	0.90	2.63	0.53	1.45	0.93	0.00	0.14	7.73
1987-88	0.00	0.00	0.06	0.76	4.15	1.52	1.64	0.31	0.18	1.65	0.75	0.31	11.33
1988-89	0.00	0.00	0.00	0.00	1.23	1.13	0.90	1.22	0.84	0.25	0.45	0.00	6.02
1989-90	0.00	0.00	0.28	0.28	0.05	0.00	2.19	1.56	0.36	0.28	0.83	0.00	5.83
1990-91	0.00	0.17	0.17	0.05	0.73	0.26	1.00	0.06	5.16	0.02	0.01	0.02	7.65
1991-92	0.00	0.00	0.00	1.16	0.04	1.15	1.61	2.35	2.02	0.29	0.15	0.00	8.77
1992-93	0.01	0.00	0.00	1.37	0.00	2.49	3.11	1.42	1.78	0.13	0.00	1.10	11.41
1993-94	0.00	0.00	0.00	0.04	0.55	1.27	0.84	1.44	0.60	1.07	0.45	0.00	6.26
1994-95	0.00	0.00	0.17	0.15	2.03	1.94	3.33	1.53	4.56	1.54	0.79	0.16	16.20
1995-96	0.00	0.00	0.00	0.00	0.04	1.79	1.18	3.80	0.63	0.20	0.20	0.00	7.84
1996-97	0.00	0.00	0.00	0.87	1.04	1.95	2.92	0.96	0.06	0.00	0.00	0.00	7.80
1997-98	0.00	0.00	0.15	0.05	1.61	0.43	1.96	5.22	4.85	3.03	1.15	0.26	18.71
1998-99	0.00	0.00	0.52	0.46	1.12	1.12	3.23	0.90	0.27	0.62	0.00	0.00	8.24
1999-00	0.00	0.00	0.00	0.00	0.69	0.09	1.18	2.46	1.42	0.60	0.05	0.07	6.56
2000-01	0.00	0.13	0.00	0.72	0.00	0.00	2.86	1.92	0.70	0.88	0.00	0.00	7.21
2001-02	0.00	0.00	0.00	0.15	1.72	1.28	0.83	0.10	0.57	0.92	0.28	0.00	5.85
2002-03	0.00	0.00	0.00	0.00	1.30	1.83	0.21	2.09	0.80	1.60	0.00	0.00	7.83
2003-04	0.06	0.10	0.00	0.01	0.40	2.41	0.70	3.66	0.45	0.00	0.00	0.00	7.79
2004-05	0.00	0.00	0.00	1.35	0.08	0.88	2.07	1.09	1.16	1.07	1.87	0.04	9.61
2005-06	0.00	0.00	0.10	1.06	0.29	1.85	0.86	0.12	2.36	1.57	0.06	0.00	8.27
2006-07	0.00	0.00	0.00	0.24	0.12	1.18	0.69	2.38	1.27	1.48	0.00	0.00	7.36
2007-08	0.01	0.00	0.22	0.08	0.13	1.01	1.12	1.46	0.14	0.33	0.16	0.00	4.66
2008-09	0.00	0.00	0.00	0.01	1.49	1.80	0.91	1.24	0.40	0.63	0.24	0.19	6.91
2009-10	0.00	0.00	0.00	0.02	0.35	1.69	1.97	2.75	1.19	2.08	0.11	0.00	10.16
2010-11	0.00	0.00	0.00	1.04	1.23	5.68	0.57	1.49	2.10	0.20	0.70	0.03	13.04
2011-12	0.00	0.00	0.03	0.97	0.93	0.10	0.56	0.55	1.42	1.85	0.00	0.00	6.41
2012-13	0.00	0.00	0.00	0.02	0.10	2.46	1.68	0.76	0.82	0.33	0.18	0.00	6.35
2013-14	0.01	0.00	0.00	0.07	0.91	0.18	0.11	0.26	0.96	1.05	0.02	0.00	3.57
2014-15	0.00	0.02	0.00	0.02	0.68	2.12	0.54	1.08	0.43	0.19	0.77	0.06	5.91
2015-16	0.72	0.00	0.18	0.70	0.95	0.69	2.02	1.58	1.01	1.54	0.38	0.06	9.83
2016-17	0.00	0.00	0.01	0.18	0.70	2.81	2.96	1.25	0.26	0.18	0.04	0.00	8.39
2017-18	0.00	0.00	0.33	0.00	0.27	0.06	1.55	0.33	3.26	0.36	0.00	0.00	6.16
2018-19	0.00												
Average (monthly)	0.02	0.06	0.19	0.45	0.84	1.17	1.47	1.47	1.60	0.86	0.28	0.09	8.50

ARVIN-EDISON WATER STORAGE DISTRICT
PRECIPITATION FOR DISRICT OFFICE STATION
(CUMULATIVE)

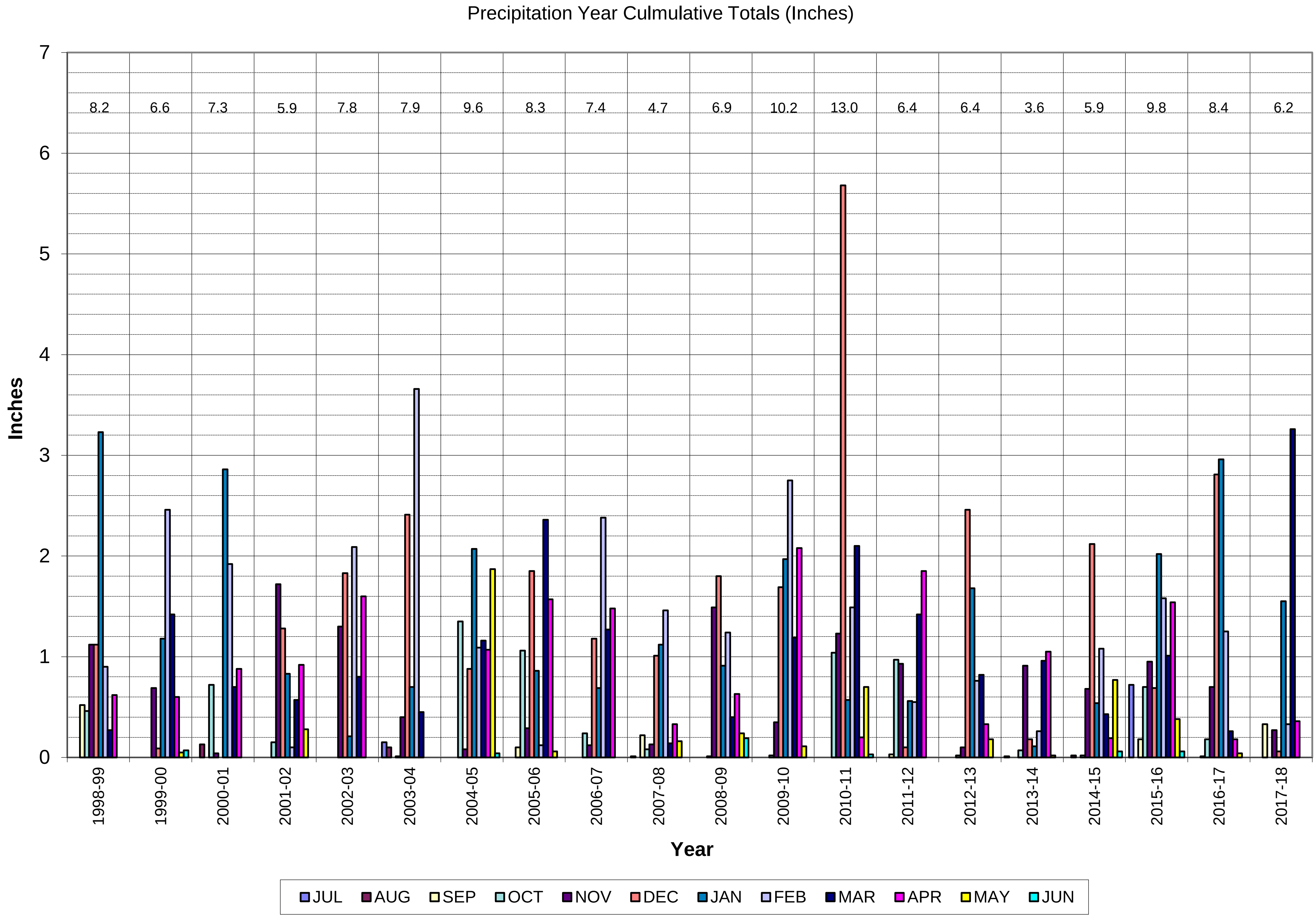
SEASON	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
1974-75	0.00	0.00	0.00	0.00	0.00	0.16	0.38	1.94	3.71	5.42	5.42	5.42
1975-76	0.00	0.19	0.25	1.27	1.43	1.68	1.83	2.95	3.37	4.42	4.74	4.80
1976-77	0.00	0.00	2.16	3.75	4.46	4.47	4.96	5.16	7.58	7.59	8.29	8.33
1977-78	0.00	0.88	0.91	0.91	1.03	2.96	4.16	9.16	12.87	13.89	13.94	13.94
1978-79	0.00	0.00	1.34	1.43	2.16	2.93	5.08	6.85	9.86	9.96	10.06	10.06
1979-80	0.00	0.00	0.11	1.40	1.67	1.88	4.88	5.78	7.66	9.49	9.69	9.69
1980-81	0.00	0.00	0.00	0.08	0.15	0.54	1.90	3.40	7.11	8.58	9.37	9.37
1981-82	0.00	0.00	0.00	0.81	1.41	1.54	3.10	3.71	5.91	7.35	7.35	8.10
1982-83	0.00	0.02	1.45	2.63	4.17	5.05	7.57	9.51	13.56	14.33	14.38	14.38
1983-84	0.00	1.02	1.18	2.09	4.47	5.69	5.77	6.09	6.94	8.09	8.09	8.20
1984-85	0.09	0.09	0.35	0.41	1.98	3.27	4.45	5.60	6.58	6.58	6.81	7.19
1985-86	0.03	0.03	0.63	1.45	4.12	4.46	5.47	6.26	8.27	8.85	8.97	8.97
1986-87	0.08	0.08	0.11	0.11	1.15	2.05	4.68	5.21	6.66	7.59	7.59	7.73
1987-88	0.00	0.00	0.06	0.82	4.97	6.49	8.13	8.44	8.62	10.27	11.02	11.33
1988-89	0.00	0.00	0.00	0.00	1.23	2.36	3.26	4.48	5.32	5.57	6.02	6.02
1989-90	0.00	0.00	0.28	0.56	0.61	0.61	2.80	4.36	4.72	5.00	5.83	5.83
1990-91	0.00	0.17	0.34	0.39	1.12	1.38	2.38	2.44	7.60	7.62	7.63	7.65
1991-92	0.00	0.00	0.00	1.16	1.20	2.35	3.96	6.31	8.33	8.62	8.77	8.77
1992-93	0.01	0.01	0.01	1.38	1.38	3.87	6.98	8.40	10.18	10.31	10.31	11.41
1993-94	0.00	0.00	0.00	0.04	0.59	1.86	2.70	4.14	4.74	5.81	6.26	6.26
1994-95	0.00	0.00	0.17	0.32	2.35	4.29	7.62	9.15	13.71	15.25	16.04	16.20
1995-96	0.00	0.00	0.00	0.00	0.04	1.83	3.01	6.81	7.44	7.64	7.84	7.84
1996-97	0.00	0.00	0.00	0.87	1.91	3.86	6.78	7.74	7.80	7.80	7.80	7.80
1997-98	0.00	0.00	0.15	0.20	1.81	2.24	4.20	9.42	14.27	17.30	18.45	18.71
1998-99	0.00	0.00	0.52	0.98	2.10	3.22	6.45	7.35	7.62	8.24	8.24	8.24
1999-00	0.00	0.00	0.00	0.00	0.69	0.78	1.96	4.42	5.84	6.44	6.49	6.56
2000-01	0.00	0.13	0.13	0.85	0.85	0.85	3.71	5.63	6.33	7.21	7.21	7.21
2001-02	0.00	0.00	0.00	0.15	1.87	3.15	3.98	4.08	4.65	5.57	5.85	5.85
2002-03	0.00	0.00	0.00	0.00	1.30	3.13	3.34	5.43	6.23	7.83	7.83	7.83
2003-04	0.06	0.16	0.16	0.17	0.57	2.98	3.68	7.34	7.79	7.79	7.79	7.79
2004-05	0.00	0.00	0.00	1.35	1.43	2.31	4.38	5.47	6.63	7.70	9.57	9.61
2005-06	0.00	0.00	0.10	1.16	1.45	3.30	4.16	4.28	6.64	8.21	8.27	8.27
2006-07	0.00	0.00	0.00	0.24	0.36	1.54	2.23	4.61	5.88	7.36	7.36	7.36
2007-08	0.01	0.01	0.23	0.31	0.44	1.45	2.57	4.03	4.17	4.50	4.66	4.66
2008-09	0.00	0.00	0.00	0.01	1.50	3.30	4.21	5.45	5.85	6.48	6.72	6.91
2009-10	0.00	0.00	0.00	0.02	0.37	2.06	4.03	6.78	7.97	10.05	10.16	10.16
2010-11	0.00	0.00	0.00	1.04	2.27	7.95	8.52	10.01	12.11	12.31	13.01	13.04
2011-12	0.00	0.00	0.03	1.00	1.93	2.03	2.59	3.14	4.56	6.41	6.41	6.41
2012-13	0.00	0.00	0.00	0.02	0.12	2.58	4.26	5.02	5.84	6.17	6.35	6.35
2013-14	0.01	0.01	0.01	0.08	0.99	1.17	1.28	1.54	2.50	3.55	3.57	3.57
2014-15	0.00	0.02	0.02	0.04	0.72	2.84	3.38	4.46	4.89	5.08	5.85	5.91
2015-16	0.72	0.72	0.90	1.60	2.55	3.24	5.26	6.84	7.85	9.39	9.77	9.83
2016-17	0.00	0.00	0.01	0.19	0.89	3.70	6.66	7.91	8.17	8.35	8.39	8.39
2017-18	0.00	0.00	0.33	0.33	0.60	0.66	2.21	2.54	5.80	6.16	6.16	6.16
2018-19	0.00											
Average (YTD)	0.02	0.08	0.27	0.72	1.55	2.73	4.20	5.67	7.28	8.14	8.42	8.50

* PRECIPITATION YEAR: JULY 1 THROUGH JUNE 30

Arvin-Edison Water Storage District

Historical Precipitation Years

District Office



SYCAMORE

ARVIN-EDISON WATER STORAGE DISTRICT
PRECIPITATION RECORD FOR SYCAMORE STATION

SEASON	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
1967-68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.93	3.54	0.34	0.03	4.84
1968-69	0.00	0.00	0.00	2.18	1.21	1.43	2.87	4.19	2.19	1.24	0.05	0.01	15.37
1969-70	0.00	0.00	0.00	0.00	0.75	0.56	0.85	0.98	1.47	0.35	0.00	0.00	4.96
1970-71	0.01	0.00	0.00	0.00	2.54	1.78	1.02	0.48	0.34	0.66	1.07	0.00	7.90
1971-72	0.00	0.17	0.02	0.11	0.71	1.28	0.00	0.07	0.00	0.13	0.00	0.11	2.60
1972-73	0.00	0.01	0.03	1.87	1.20	1.85	2.23	0.83	2.83	0.06	0.11	0.06	11.08
1973-74	0.00	0.00	0.00	0.21	1.50	1.44	1.10	0.14	1.41	0.89	0.11	0.00	6.80
1974-75	0.09	0.00	0.00	1.16	0.51	0.89	0.17	1.41	1.50	1.77	0.00	0.00	7.50
1975-76	0.00	0.16	0.06	0.95	0.10	0.27	0.15	1.14	0.42	1.11	0.33	0.04	4.73
1976-77	0.00	0.00	2.09	2.19	0.81	0.01	0.50	0.10	2.37	0.00	0.70	0.01	8.78
1977-78	0.00	0.85	0.02	0.00	0.11	1.81	1.17	4.92	3.35	0.85	0.03	0.00	13.11
1978-79	0.00	0.00	1.23	0.02	0.54	0.80	2.00	1.72	2.86	0.02	0.11	0.00	9.30
1979-80	0.00	0.00	0.04	1.27	0.27	0.21	2.88	0.87	1.71	1.61	0.17	0.00	9.03
1980-81	0.00	0.00	0.00	0.03	0.08	0.35	1.26	1.35	3.47	1.38	0.62	0.00	8.54
1981-82	0.00	0.00	0.00	0.96	0.56	0.41	1.42	0.55	2.13	1.52	0.00	0.56	8.11
1982-83	0.00	0.02	1.44	1.11	1.38	0.85	2.38	1.88	3.90	0.54	0.03	0.00	13.53
1983-84	0.00	1.16	0.15	0.91	2.23	1.16	0.08	0.31	0.84	1.00	0.00	0.10	7.94
1984-85	0.06	0.00	0.25	0.04	1.54	1.20	1.25	1.10	1.01	0.02	0.22	0.38	7.07
1985-86	0.00	0.00	0.58	0.70	2.52	0.34	0.78	0.80	2.05	0.57	0.12	0.00	8.46
1986-87	0.02	0.00	0.04	0.00	1.08	0.80	2.50	0.58	1.46	0.79	0.00	0.15	7.42
1987-88	0.00	0.00	0.05	0.74	4.02	1.33	1.69	0.25	0.16	1.63	0.82	0.31	11.00
1988-89	0.00	0.00	0.00	0.00	1.20	0.91	0.85	1.25	0.84	0.24	0.45	0.00	5.74
1989-90	0.00	0.00	0.25	0.30	0.05	0.00	2.20	1.23	0.33	0.27	0.83	0.00	5.46
1990-91	0.00	0.17	0.11	0.08	0.82	0.19	0.82	0.05	5.14	0.02	0.00	0.02	7.42
1991-92	0.00	0.00	0.00	1.16	0.04	1.10	1.56	2.35	2.21	0.29	0.15	0.00	8.86
1992-93	0.01	0.00	0.00	1.24	0.00	2.32	3.19	1.24	1.59	0.00	0.00	1.08	10.67
1993-94	0.00	0.00	0.00	0.04	0.58	1.27	0.98	1.44	0.60	1.12	0.48	0.00	6.51
1994-95	0.00	0.00	0.16	0.01	1.80	1.99	2.98	1.37	4.11	1.28	0.63	0.14	14.47
1995-96	0.00	0.00	0.00	0.00	0.05	1.73	1.07	3.68	0.56	0.15	0.16	0.00	7.40
1996-97	0.00	0.00	0.00	0.90	1.03	1.77	2.80	0.95	0.05	0.00	0.00	0.00	7.50
1997-98	0.00	0.00	0.12	0.04	1.61	0.41	1.86	4.95	4.57	3.02	1.10	0.22	17.90
1998-99	0.00	0.00	0.52	0.48	1.01	0.96	3.09	0.91	0.23	0.62	0.00	0.00	7.82
1999-00	0.00	0.00	0.00	0.00	0.65	0.09	1.16	2.34	1.31	0.62	0.05	0.04	6.26
2000-01	0.00	0.12	0.00	0.71	0.00	0.00	2.76	1.88	0.69	0.92	0.00	0.00	7.08
2001-02	0.00	0.00	0.00	0.14	1.67	1.22	0.80	0.09	0.63	0.85	0.31	0.00	5.71
2002-03	0.00	0.00	0.00	0.00	1.27	1.77	0.16	1.99	0.79	1.55	0.00	0.00	7.53
2003-04	0.06	0.15	0.00	0.01	0.40	2.39	0.64	3.21	0.44	0.00	0.00	0.00	7.30
2004-05	0.00	0.00	0.00	1.27	0.07	0.89	2.12	1.13	1.19	1.12	1.72	0.04	9.55
2005-06	0.00	0.00	0.10	1.04	0.27	1.75	0.91	0.12	2.26	1.50	0.03	0.00	7.98
2006-07	0.00	0.00	0.00	0.24	0.14	1.12	0.64	2.50	1.26	1.20	0.00	0.00	7.10
2007-08	0.01	0.00	0.21	0.07	0.12	0.92	1.10	1.34	0.16	0.32	0.13	0.00	4.38
2008-09	0.00	0.00	0.00	0.01	1.50	1.73	0.78	1.36	0.38	0.66	0.23	0.17	6.82
2009-10	0.00	0.00	0.00	0.01	0.32	1.70	1.91	2.56	1.08	1.98	0.11	0.00	9.67
2010-11	0.00	0.00	0.00	0.99	1.16	5.43	0.53	1.40	1.94	0.18	0.66	0.03	12.32
2011-12	0.00	0.00	0.04	0.90	0.89	0.09	0.53	0.49	1.34	1.68	0.00	0.00	5.96
2012-13	0.00	0.00	0.00	0.02	0.09	2.29	1.57	0.71	0.76	0.38	0.18	0.00	6.00
2013-14	0.01	0.00	0.00	0.08	1.02	0.20	0.10	0.23	0.93	1.06	0.02	0.00	3.65
2014-15	0.00	0.02	0.00	0.02	0.73	2.10	0.54	1.01	0.34	0.18	0.76	0.06	5.76
2015-16	0.68	0.00	0.17	0.58	0.84	0.62	1.89	1.48	0.99	1.68	0.33	0.06	9.32
2016-17	0.00	0.00	0.00	0.18	0.68	2.75	2.89	1.16	0.25	0.20	0.05	0.00	8.16
2017-18	0.00	0.00	0.32	0.00	0.26	0.07	1.45	0.40	3.13	0.37	0.00	0.00	6.00
2018-19	0.00												
Average (monthly)	0.02	0.06	0.16	0.49	0.86	1.15	1.38	1.34	1.50	0.85	0.26	0.07	8.12

ARVIN-EDISON WATER STORAGE DISTRICT
PRECIPITATION RECORD FOR SYCAMORE STATION
(CUMULATIVE)

SEASON	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
1966-67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.93	4.47	4.81	4.84
1968-69	0.00	0.00	0.00	2.18	3.39	4.82	7.69	11.88	14.07	15.31	15.36	15.37
1969-70	0.00	0.00	0.00	0.00	0.75	1.31	2.16	3.14	4.61	4.96	4.96	4.96
1970-71	0.01	0.01	0.01	0.01	2.55	4.33	5.35	5.83	6.17	6.83	7.90	7.90
1971-72	0.00	0.17	0.19	0.30	1.01	2.29	2.29	2.36	2.36	2.49	2.49	2.60
1972-73	0.00	0.01	0.04	1.91	3.11	4.96	7.19	8.02	10.85	10.91	11.02	11.08
1973-74	0.00	0.00	0.00	0.21	1.71	3.15	4.25	4.39	5.80	6.69	6.80	6.80
1974-75	0.09	0.09	0.09	1.25	1.76	2.65	2.82	4.23	5.73	7.50	7.50	7.50
1975-76	0.00	0.16	0.22	1.17	1.27	1.54	1.69	2.83	3.25	4.36	4.69	4.73
1976-77	0.00	0.00	2.09	4.28	5.09	5.10	5.60	5.70	8.07	8.07	8.77	8.78
1977-78	0.00	0.85	0.87	0.87	0.98	2.79	3.96	8.88	12.23	13.08	13.11	13.11
1978-79	0.00	0.00	1.23	1.25	1.79	2.59	4.59	6.31	9.17	9.19	9.30	9.30
1979-80	0.00	0.00	0.04	1.31	1.58	1.79	4.67	5.54	7.25	8.86	9.03	9.03
1980-81	0.00	0.00	0.00	0.03	0.11	0.46	1.72	3.07	6.54	7.92	8.54	8.54
1981-82	0.00	0.00	0.00	0.96	1.52	1.93	3.35	3.90	6.03	7.55	7.55	8.11
1982-83	0.00	0.02	1.46	2.57	3.95	4.80	7.18	9.06	12.96	13.50	13.53	13.53
1983-84	0.00	1.16	1.31	2.22	4.45	5.61	5.69	6.00	6.84	7.84	7.84	7.94
1984-85	0.06	0.06	0.31	0.35	1.89	3.09	4.34	5.44	6.45	6.47	6.69	7.07
1985-86	0.00	0.00	0.58	1.28	3.80	4.14	4.92	5.72	7.77	8.34	8.46	8.46
1986-87	0.02	0.02	0.06	0.06	1.14	1.94	4.44	5.02	6.48	7.27	7.27	7.42
1987-88	0.00	0.00	0.05	0.79	4.81	6.14	7.83	8.08	8.24	9.87	10.69	11.00
1988-89	0.00	0.00	0.00	0.00	1.20	2.11	2.96	4.21	5.05	5.29	5.74	5.74
1989-90	0.00	0.00	0.25	0.55	0.60	0.60	2.80	4.03	4.36	4.63	5.46	5.46
1990-91	0.00	0.17	0.28	0.36	1.18	1.37	2.19	2.24	7.38	7.40	7.40	7.42
1991-92	0.00	0.00	0.00	1.16	1.20	2.30	3.86	6.21	8.42	8.71	8.86	8.86
1992-93	0.01	0.01	0.01	1.25	1.25	3.57	6.76	8.00	9.59	9.59	9.59	10.67
1993-94	0.00	0.00	0.00	0.04	0.62	1.89	2.87	4.31	4.91	6.03	6.51	6.51
1994-95	0.00	0.00	0.16	0.17	1.97	3.96	6.94	8.31	12.42	13.70	14.33	14.47
1995-96	0.00	0.00	0.00	0.00	0.05	1.78	2.85	6.53	7.09	7.24	7.40	7.40
1996-97	0.00	0.00	0.00	0.90	1.93	3.70	6.50	7.45	7.50	7.50	7.50	7.50
1997-98	0.00	0.00	0.12	0.16	1.77	2.18	4.04	8.99	13.56	16.58	17.68	17.90
1998-99	0.00	0.00	0.52	1.00	2.01	2.97	6.06	6.97	7.20	7.82	7.82	7.82
1999-00	0.00	0.00	0.00	0.00	0.65	0.74	1.90	4.24	5.55	6.17	6.22	6.26
2000-01	0.00	0.12	0.12	0.83	0.83	0.83	3.59	5.47	6.16	7.08	7.08	7.08
2001-02	0.00	0.00	0.00	0.14	1.81	3.03	3.83	3.92	4.55	5.40	5.71	5.71
2002-03	0.00	0.00	0.00	0.00	1.27	3.04	3.20	5.19	5.98	7.53	7.53	7.53
2003-04	0.06	0.21	0.21	0.22	0.62	3.01	3.65	6.86	7.30	7.30	7.30	7.30
2004-05	0.00	0.00	0.00	1.27	1.34	2.23	4.35	5.48	6.67	7.79	9.51	9.55
2005-06	0.00	0.00	0.10	1.14	1.41	3.16	4.07	4.19	6.45	7.95	7.98	7.98
2006-07	0.00	0.00	0.00	0.24	0.38	1.50	2.14	4.64	5.90	7.10	7.10	7.10
2007-08	0.01	0.01	0.22	0.29	0.41	1.33	2.43	3.77	3.93	4.25	4.38	4.38
2008-09	0.00	0.00	0.00	0.01	1.51	3.24	4.02	5.38	5.76	6.42	6.65	6.82
2009-10	0.00	0.00	0.00	0.01	0.33	2.03	3.94	6.50	7.58	9.56	9.67	9.67
2010-11	0.00	0.00	0.00	0.99	2.15	7.58	8.11	9.51	11.45	11.63	12.29	12.32
2011-12	0.00	0.00	0.04	0.94	1.83	1.92	2.45	2.94	4.28	5.96	5.96	5.96
2012-13	0.00	0.00	0.00	0.02	0.11	2.40	3.97	4.68	5.44	5.82	6.00	6.00
2013-14	0.01	0.01	0.01	0.09	1.11	1.31	1.41	1.64	2.57	3.63	3.65	3.65
2014-15	0.00	0.02	0.02	0.04	0.77	2.87	3.41	4.42	4.76	4.94	5.70	5.76
2015-16	0.68	0.68	0.85	1.43	2.27	2.89	4.78	6.26	7.25	8.93	9.26	9.32
2016-17	0.00	0.00	0.00	0.18	0.86	3.61	6.50	7.66	7.91	8.11	8.16	8.16
2017-18	0.00	0.00	0.32	0.32	0.58	0.65	2.10	2.50	5.63	6.00	6.00	6.00
2018-19												
Average (YTD)	0.02	0.07	0.23	0.72	1.58	2.73	4.11	5.45	6.95	7.79	8.05	8.12

* PRECIPITATION YEAR: JULY 1 THROUGH JUNE 30

ARVIN-EDISON WATER STORAGE DISTRICT
PRECIPITATION RECORD FOR TEJON STATION

TEJON

SEASON	JUL	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
1969-70	0.00	0.00	0.00	0.00	0.57	0.61	0.57	0.63	1.15	0.29	0.00	0.00	3.82
1970-71	0.00	0.00	0.00	0.00	2.19	1.09	0.71	0.14	0.29	0.94	1.03	0.00	6.39
1971-72	0.00	0.00	0.04	0.13	0.76	1.07	0.00	0.07	0.00	0.10	0.00	0.37	2.54
1972-73	0.00	0.00	0.04	0.70	0.93	1.73	1.95	1.00	2.95	0.19	0.07	0.07	9.63
1973-74	0.00	0.00	0.00	0.16	0.90	1.03	1.07	0.10	1.34	0.59	0.77	0.00	5.96
1974-75	0.00	0.00	0.00	1.54	0.65	0.92	0.06	1.46	1.32	1.91	0.00	0.00	7.86
1975-76	0.00	0.10	0.14	0.95	0.15	0.30	0.08	1.85	0.20	0.89	0.27	0.10	5.03
1976-77	0.00	0.00	1.31	1.79	0.71	0.01	0.42	0.08	2.55	0.00	1.47	0.00	8.34
1977-78	0.00	0.78	0.00	0.00	0.12	1.92	1.13	4.24	3.19	1.01	0.04	0.00	12.43
1978-79	0.00	0.00	1.16	0.03	0.20	0.53	1.70	1.37	1.59	0.09	0.25	0.00	6.92
1979-80	0.00	0.00	0.00	0.56	0.12	0.27	2.37	0.74	1.97	1.50	0.11	0.00	7.64
1980-81	0.00	0.00	0.00	0.03	0.00	0.50	1.01	0.88	4.08	1.11	1.29	0.00	8.90
1981-82	0.00	0.00	0.00	0.68	0.64	0.25	1.02	0.62	2.35	1.48	0.00	0.50	7.54
1982-83	0.00	0.08	1.48	0.81	0.90	0.56	2.06	2.06	3.31	0.44	0.18	0.00	11.88
1983-84	0.00	0.66	0.10	1.58	2.34	0.95	0.05	0.09	0.64	0.92	0.00	0.05	7.38
1984-85	0.00	0.00	0.30	0.00	1.44	1.50	0.81	0.71	1.05	0.00	0.30	0.46	6.57
1985-86	0.00	0.00	0.60	0.42	2.22	0.23	0.60	0.60	1.88	0.44	0.00	0.00	6.99
1986-87	0.02	0.00	0.02	0.00	1.05	0.86	2.34	0.63	1.26	0.48	0.00	0.12	6.78
1987-88	0.00	0.00	0.00	0.71	3.36	1.32	1.40	0.20	0.22	1.31	0.37	0.23	9.12
1988-89	0.00	0.00	0.00	0.00	0.72	0.72	0.75	1.29	0.44	0.00	0.98	0.00	4.90
1989-90	0.00	0.00	0.33	0.22	0.00	0.00	1.74	1.04	0.27	0.34	0.57	0.00	4.51
1990-91	0.00	0.00	0.08	0.08	0.62	0.14	1.00	0.08	3.75	0.06	0.00	0.00	5.81
1991-92	0.00	0.00	0.00	0.92	0.00	1.10	1.33	2.26	1.11	0.26	0.20	0.00	7.18
1992-93	0.04	0.00	0.00	0.82	0.00	1.96	3.18	0.81	1.31	0.00	0.00	1.34	9.46
1993-94	0.00	0.00	0.00	0.00	0.48	0.98	0.70	0.98	0.82	1.01	0.37	0.00	5.34
1994-95	0.00	0.00	0.11	0.10	1.58	2.62	2.82	1.50	3.40	1.64	0.54	0.08	14.39
1995-96	0.00	0.00	0.00	0.00	0.07	0.86	1.15	3.04	0.54	0.13	0.12	0.00	5.91
1996-97	0.00	0.00	0.00	1.07	0.90	1.59	2.56	1.38	0.08	0.00	0.00	0.00	7.58
1997-98	0.00	0.00	0.10	0.05	1.18	0.45	1.79	4.21	3.44	1.62	1.22	0.05	14.11
1998-99	0.00	0.00	1.00	0.57	1.31	0.89	2.52	0.57	0.31	1.27	0.00	0.00	8.44
1999-00	0.00	0.00	0.00	0.00	0.57	0.04	1.04	1.97	1.28	0.50	0.03	0.05	5.48
2000-01	0.00	0.10	0.00	0.61	0.00	0.00	2.15	2.08	0.86	0.79	0.00	0.00	6.59
2001-02	0.00	0.00	0.00	0.26	1.52	1.48	0.75	0.18	0.61	0.78	0.20	0.00	5.78
2002-03	0.00	0.00	0.00	0.00	1.62	1.72	0.04	2.50	0.57	1.56	0.00	0.00	8.01
2003-04	0.06	0.06	0.00	0.01	0.36	2.35	0.75	3.14	0.31	0.00	0.00	0.00	7.04
2004-05	0.00	0.00	0.00	1.30	0.07	0.74	2.13	1.14	1.49	1.27	1.59	0.01	9.74
2005-06	0.00	0.00	0.11	1.06	0.24	1.23	0.79	0.06	1.62	0.95	0.11	0.00	6.17
2006-07	0.00	0.00	0.00	0.15	0.15	0.50	0.89	2.26	0.94	0.62	0.00	0.00	5.51
2007-08	0.01	0.00	0.21	0.21	0.14	0.85	1.04	1.27	0.13	0.55	0.10	0.00	4.51
2008-09	0.00	0.00	0.00	0.02	1.28	1.42	0.72	1.31	0.36	0.35	0.30	0.07	5.83
2009-10	0.00	0.00	0.00	0.00	0.28	1.62	1.85	1.80	0.60	1.56	0.13	0.00	7.84
2010-11	0.00	0.00	0.00	1.10	1.09	4.65	0.39	1.24	1.91	0.08	0.45	0.04	10.95
2011-12	0.00	0.00	0.04	0.73	0.78	0.05	0.60	0.33	0.96	1.88	0.00	0.00	5.37
2012-13	0.00	0.00	0.00	0.08	0.07	1.88	0.99	0.45	0.90	0.41	0.26	0.00	5.04
2013-14	0.02	0.00	0.00	0.04	0.73	0.20	0.02	0.18	0.76	0.83	0.01	0.00	2.79
2014-15	0.00	0.00	0.01	0.03	0.51	1.63	0.83	1.36	0.47	0.12	0.73	0.04	5.73
2015-16	0.97	0.00	0.02	0.23	1.07	0.54	1.31	1.35	0.79	1.31	0.47	0.04	8.10
2016-17	0.00	0.00	0.08	0.26	1.11	2.03	2.13	0.94	0.39	0.16	0.00	0.00	7.10
2017-18	0.00	0.02	0.22	0.04	0.29	0.09	1.03	0.28	2.85	0.19	0.00	0.00	5.01
2018-19	0.00												
Average (monthly)	0.02	0.04	0.15	0.41	0.78	1.02	1.19	1.19	1.32	0.69	0.30	0.07	7.18

ARVIN-EDISON WATER STORAGE DISTRICT
PRECIPITATION RECORD FOR TEJON STATION
(CUMULATIVE)

SEASON	JUL	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
1969-70	0.00	0.00	0.00	0.00	0.57	1.18	1.75	2.38	3.53	3.82	3.82	3.82
1970-71	0.00	0.00	0.00	0.00	2.19	3.28	3.99	4.13	4.42	5.36	6.39	6.39
1971-72	0.00	0.00	0.04	0.17	0.93	2.00	2.00	2.07	2.07	2.17	2.17	2.54
1972-73	0.00	0.00	0.04	0.74	1.67	3.40	5.35	6.35	9.30	9.49	9.56	9.63
1973-74	0.00	0.00	0.00	0.16	1.06	2.09	3.16	3.26	4.60	5.19	5.96	5.96
1974-75	0.00	0.00	0.00	1.54	2.19	3.11	3.17	4.63	5.95	7.86	7.86	7.86
1975-76	0.00	0.10	0.24	1.19	1.34	1.64	1.72	3.57	3.77	4.66	4.93	5.03
1976-77	0.00	0.00	1.31	3.10	3.81	3.82	4.24	4.32	6.87	6.87	8.34	8.34
1977-78	0.00	0.78	0.78	0.78	0.90	2.82	3.95	8.19	11.38	12.39	12.43	12.43
1978-79	0.00	0.00	1.16	1.19	1.39	1.92	3.62	4.99	6.58	6.67	6.92	6.92
1979-80	0.00	0.00	0.00	0.56	0.68	0.95	3.32	4.06	6.03	7.53	7.64	7.64
1980-81	0.00	0.00	0.00	0.03	0.03	0.53	1.54	2.42	6.50	7.61	8.90	8.90
1981-82	0.00	0.00	0.00	0.68	1.32	1.57	2.59	3.21	5.56	7.04	7.04	7.54
1982-83	0.00	0.08	1.56	2.37	3.27	3.83	5.89	7.95	11.26	11.70	11.88	11.88
1983-84	0.00	0.66	0.76	2.34	4.68	5.63	5.68	5.77	6.41	7.33	7.33	7.38
1984-85	0.00	0.00	0.30	0.30	1.74	3.24	4.05	4.76	5.81	5.81	6.11	6.57
1985-86	0.00	0.00	0.60	1.02	3.24	3.47	4.07	4.67	6.55	6.99	6.99	6.99
1986-87	0.02	0.02	0.04	0.04	1.09	1.95	4.29	4.92	6.18	6.66	6.66	6.78
1987-88	0.00	0.00	0.00	0.71	4.07	5.39	6.79	6.99	7.21	8.52	8.89	9.12
1988-89	0.00	0.00	0.00	0.00	0.72	1.44	2.19	3.48	3.92	3.92	4.90	4.90
1989-90	0.00	0.00	0.33	0.55	0.55	0.55	2.29	3.33	3.60	3.94	4.51	4.51
1990-91	0.00	0.00	0.08	0.16	0.78	0.92	1.92	2.00	5.75	5.81	5.81	5.81
1991-92	0.00	0.00	0.00	0.92	0.92	2.02	3.35	5.61	6.72	6.98	7.18	7.18
1992-93	0.04	0.04	0.04	0.86	0.86	2.82	6.00	6.81	8.12	8.12	8.12	9.46
1993-94	0.00	0.00	0.00	0.00	0.48	1.46	2.16	3.14	3.96	4.97	5.34	5.34
1994-95	0.00	0.00	0.11	0.21	1.79	4.41	7.23	8.73	12.13	13.77	14.31	14.39
1995-96	0.00	0.00	0.00	0.00	0.07	0.93	2.08	5.12	5.66	5.79	5.91	5.91
1996-97	0.00	0.00	0.00	1.07	1.97	3.56	6.12	7.50	7.58	7.58	7.58	7.58
1997-98	0.00	0.00	0.10	0.15	1.33	1.78	3.57	7.78	11.22	12.84	14.06	14.11
1998-99	0.00	0.00	1.00	1.57	2.88	3.77	6.29	6.86	7.17	8.44	8.44	8.44
1999-00	0.00	0.00	0.00	0.00	0.57	0.61	1.65	3.62	4.90	5.40	5.43	5.48
2000-01	0.00	0.10	0.10	0.71	0.71	0.71	2.86	4.94	5.80	6.59	6.59	6.59
2001-02	0.00	0.00	0.00	0.26	1.78	3.26	4.01	4.19	4.80	5.58	5.78	5.78
2002-03	0.00	0.00	0.00	0.00	1.62	3.34	3.38	5.88	6.45	8.01	8.01	8.01
2003-04	0.06	0.12	0.12	0.13	0.49	2.84	3.59	6.73	7.04	7.04	7.04	7.04
2004-05	0.00	0.00	0.00	1.30	1.37	2.11	4.24	5.38	6.87	8.14	9.73	9.74
2005-06	0.00	0.00	0.11	1.17	1.41	2.64	3.43	3.49	5.11	6.06	6.17	6.17
2006-07	0.00	0.00	0.00	0.15	0.30	0.80	1.69	3.95	4.89	5.51	5.51	5.51
2007-08	0.01	0.01	0.22	0.43	0.57	1.42	2.46	3.73	3.86	4.41	4.51	4.51
2008-09	0.00	0.00	0.00	0.02	1.30	2.72	3.44	4.75	5.11	5.46	5.76	5.83
2009-10	0.00	0.00	0.00	0.00	0.28	1.90	3.75	5.55	6.15	7.71	7.84	7.84
2010-11	0.00	0.00	0.00	1.10	2.19	6.84	7.23	8.47	10.38	10.46	10.91	10.95
2011-12	0.00	0.00	0.04	0.77	1.55	1.60	2.20	2.53	3.49	5.37	5.37	5.37
2012-13	0.00	0.00	0.00	0.08	0.15	2.03	3.02	3.47	4.37	4.78	5.04	5.04
2013-14	0.02	0.02	0.02	0.06	0.79	0.99	1.01	1.19	1.95	2.78	2.79	2.79
2014-15	0.00	0.00	0.01	0.04	0.55	2.18	3.01	4.37	4.84	4.96	5.69	5.73
2015-16	0.97	0.97	0.99	1.22	2.29	2.83	4.14	5.49	6.28	7.59	8.06	8.10
2016-17	0.00	0.00	0.08	0.34	1.45	3.48	5.61	6.55	6.94	7.10	7.10	7.10
2017-18	0.00	0.02	0.24	0.28	0.57	0.66	1.69	1.97	4.82	5.01	5.01	5.01
2018-19												
Average (YTD)	0.02	0.06	0.21	0.62	1.40	2.42	3.61	4.80	6.12	6.81	7.11	7.18

* PRECIPITATION YEAR: JULY 1 THROUGH JUNE 30

WEDNESDAY WATER DATA REPORT

AS OF DATE August 15, 2018

FRIANT WATER AUTHORITY
SAN JOAQUIN RIVER AND ASSOCIATED WATER DATA

		THIS YEAR 08/15/18	LAST WEEK	LAST YEAR 08/16/17
RESERVOIR STORAGE (A.F.)	CAPACITY	STORAGE		
Southern California Edison:				
Vermillion (Edison)	125,000	81,433	84,809	112,024
Florence	64,400	31,981	39,942	14,449
Huntington	89,000	87,483	86,406	88,051
Shaver	135,300	122,407	122,250	128,937
Sub-total (Big Creek)	413,700	323,304	333,407	343,461
Mammoth Pool	122,000	50,301	58,572	112,283
Redinger	26,100	23,563	23,218	24,118
Sub-total Southern California Edison	561,800	397,168	415,197	479,862
Pacific Gas & Electric:				
Crane Valley (Bass Lake)	45,400	44,348	44,527	46,046
Kerckhoff	4,200	3,454	3,728	3,529
Sub-total P G & E	49,600	47,802	48,255	49,575
TOTAL UPSTREAM STORAGE	611,400	444,970	463,452	529,437
MILLERTON LAKE	520,500	306,782	325,097	461,859
TOTAL STORAGE	1,131,900	751,752	788,549	991,296
INFLOW & RELEASE DATA (C.F.S.)				
Millerton Releases:				
Madera Canal		295	378	700
Friant-Kern Canal		2,335	2,319	3,650
San Joaquin River		434	435	350
Spillway		0	0	0
Total Millerton Releases		3,064	3,132	4,700
Actual Millerton Inflow		1,599	1,822	3,139
Computed Natural River (@Friant)		591	137	1,643
SAN JOAQUIN RIVER (A.F.)				
This Month:				
Actual to-date		14,700	8,981	78,553
Forecasted DWR 50% forecasts.		21,000	14,000	790,000
April/July Period:				
Actual to-date		947,685	947,685	2,641,089
Forecasted DWR 50% forecasts.		950,000	950,000	2,520,000
Last Year Actual				2,641,089
Water Year:				
Actual to-date		1,330,796	1,325,077	4,304,691
Forecasted DWR 50% forecasts.		1,395,000	1,395,000	4,195,000
Last Year Actual				4,395,400
ESTIMATED WATER YET TO BE DELIVERED (A.F.)				
Contract Year Ending February 28		254,304*	284,385*	438,304

*Figure is based on 85% Class I, Uncontrolled Class II, minus District usage. (Uncontrolled Water Season)

FRIANT WATER AUTHORITY
SAN JOAQUIN RIVER AND ASSOCIATED WATER DATA

PRECIPITATION DATA

REPORTING STATIONS:	AVERAGE (INCHES)	THIS YEAR 08/15/18 ACCUMULATIVE TO DATE (INCHES/PERCENT AVG)		LAST YEAR 08/16/17 ACCUMULATIVE TO DATE (INCHES/PERCENT AVG)	
HUNTINGTON					
This Month	0.19	0.04 /	21	0.00 /	0
Seasonal Average*	0.49	0.04 /	8	0.00 /	0
Annual Average	42.65	0.04 /	0	0.00 /	0
CRANE VALLEY					
This Month	0.07	0.02 /	29	0.00 /	0
Seasonal Average*	0.13	0.02 /	15	0.00 /	0
Annual Average	40.54	0.02 /	0	0.00 /	0
FRIANT					
This Month	0.02	0.00 /	0	0.00 /	0
Seasonal Average*	0.03	0.00 /	0	0.00 /	0
Annual Average	14.49	0.00 /	0	0.00 /	0

* Seasonal Average (July - June) is through the current month
** SCE updated Huntington Precipitation

MISC RIVER/RESERVOIR	CAPACITY (A.F.)	STORAGE (A.F.)	RELEASE (C.F.S.)	INFLOW (C.F.S.)
Chowchilla/Buchanan	150,000	63,377	546	58
Fresno/Hidden	90,000	16,514	125	9
Kings/Pine Flat	1,000,000	357,844	4,147	1,182
Kaweah/Terminus	185,000	18,941	132	0
Tule/Success	82,314	10,551	91	2
Kern/Isabella	570,000	123,943	1,299	388

FRIANT WATER AUTHORITY
SAN JOAQUIN RIVER AND ASSOCIATED WATER DATA

CVP/SWP SAN LUIS OPERATIONS

		THIS YEAR 08/15/18	LAST WEEK FLOWRATE (C.F.S.)	LAST YEAR 08/16/17 Average
PUMPING	MAX. FLOWRATE (C.F.S.)			
INSTANTANEOUS				
Tracy P.P.	4,600	4,251	4,262	4,371
Banks P.P.	10,000	6,460	6,555	6,634
MONTH TO DATE				
Tracy P.P.		117,773	59,146	129,203
Banks P.P.		153,423	63,347	210,946
SEASON TO DATE (Since October 1)				
Tracy P.P.		1,906,884	1,848,257	2,325,118
Banks P.P.		1,587,684	1,440,816	3,045,957
SAN LUIS RESERVOIR	CAPACITY (A.F.)		(A.F.)	
Federal	980,000	325,960	394,269	761,430
State	1,060,000	589,762	498,615	1,120,140
Total	2,040,000	915,722	892,884	1,881,570
SAN LUIS RESERVOIR				
Federal		(1,395)	22,881	(4,383)
State		5,862	(77,289)	48

SACRAMENTO-SAN JOAQUIN DELTA FLOW INDICES

	FLOWRATE (C.F.S.)
Delta Outflow Index	6,157
Sacramento River @ Freeport	19,020
San Joaquin River @ Vernalis	609
Total Delta Inflow	20,579

FRIANT WATER AUTHORITY
SAN JOAQUIN RIVER AND ASSOCIATED WATER DATA

CIMIS EVAPOTRANSPIRATION RATES

REPORTING STATION #	REPORTING STATION	YESTERDAY 8/14/2018 (Inches)	TOTAL PAST 7 DAYS (Inches)	NORMAL PAST 7 DAYS (Inches)	VARIANCE FROM NORMAL (%)	NORMAL NEXT 7 DAYS* (Inches)
5	Shafter	0.26	1.85	1.69	9	1.65
15	Stratford	0.23	1.67	1.89	2	1.82
39	Parlier	0.26	1.79	1.65	8	1.60
80	Fresno State	0.28	1.87	1.82	3	1.75
86	Lindcove	0.26	1.79	1.68	7	1.62
125	Arvin-Edison	0.31	2.17	1.98	10	1.91
142	Orange Cove	0.30	1.97	1.89	4	1.82
148	Merced	0.25	1.75	1.79	2	1.71
169	Porterville	0.26	1.77	1.68	5	1.62
182	Delano	0.26	1.82	1.75	1	1.68
188	Madera II	0.23	1.62	1.62	0	1.61

FRIANT WATER AUTHORITY
SAN JOAQUIN RIVER AND ASSOCIATED WATER DATA

CROP COEFFICIENTS 15-Aug-18

Crop (Description)	Today	Avg. Prev. 7 Days	Avg. Next 7 Days
Alfalfa (average)	0.95	0.95	0.95
Almonds (Feb. 20 leafout, Nov. 15 leafdrop)	0.93	0.94	0.92
Almonds (Mar. 1 leafout, Nov. 15 leafdrop)	0.93	0.94	0.93
Beans (Apr. 1 plant date, Aug. 1 harvest)	0.00	0.00	0.00
Beans (May 1 plant date, Aug. 15 harvest)	0.30	0.43	0.00
Beans (Jun. 1 plant date, Sep. 15 harvest)	1.11	1.11	1.09
Citrus (year round)	0.65	0.65	0.65
Corn (Apr. 15 plant date, Sep. 15 harvest)	0.97	1.03	0.91
Cotton (Apr. 1 plant date, Sep. 20 defoliate)	1.00	1.08	0.92
Cotton (Apr. 15 plant date, Oct. 1 defoliate)	1.21	1.24	1.13
Cotton (May 1 plant date, Oct. 1 defoliate)	1.24	1.25	1.20
Wheat, Oats, Barley (Dec. 1 plant date, Jun. 1 harvest)	0.00	0.00	0.00
Grapes, Raisin (Mar. 15 leafout, Oct. 15 leafdrop)	0.63	0.63	0.62
Grapes, Table (Mar. 15 leafout, Oct. 15 leafdrop)	0.80	0.80	0.79
Kiwi (Mar. 15 leafout, Nov. 1 leafdrop)	1.00	1.00	0.99
Melons (Apr. 1 plant date, Jul. 15 harvest)	0.00	0.00	0.00
Melons (May 1 plant date, Aug. 15 harvest)	0.10	0.28	0.00
Melons (Jun. 1 plant date, Sep. 20 harvest)	0.90	0.89	0.90
Melons (Jul. 1 plant date, Oct. 10 harvest)	0.39	0.29	0.50
Olives (year round)	0.75	0.75	0.75
Pasture Grass	0.84	0.85	0.83
Pistachio (Apr. 1 leafout, Nov. 15 leafdrop)	1.12	1.14	1.10
Safflower (Mar. 1 plant date, Aug. 1 harvest)	0.00	0.00	0.00
Low Chilling Stone Fruit (Feb. 15 leafout, Dec. 1 leafdrop)	0.95	0.95	0.95
Stone Fruit (Mar.1 leafout, Nov. 15 leafdrop)			
[Peach, Nectarine, Plum, Apricot]	0.95	0.95	0.95
Late Stone Fruit (Mar. 16 leafout, Nov. 1 leafdrop)	0.95	0.95	0.95
Soft Fruit (Apr. 1 leafout, Nov. 15 leafdrop)			
[Apple, Pear]	0.98	0.97	0.98
Tomato (Mar. 1 plant date, Jul. 20 harvest)	0.00	0.00	0.00
Tomato (Apr. 1 plant date, July 30 harvest)	0.00	0.00	0.00
Walnut, Early (Mar. 15 leafout, Nov. 1 leafdrop)	1.15	1.15	1.15
Walnut, Late (Apr. 1 leafout, Nov. 1 leafdrop)	1.15	1.15	1.15

NOTE: *This information is a reproduction of information compiled by Kings River Conservation District. This information is provided as a general guideline and may not exactly be reflective of all locations or varieties.*

ATTACHMENT M

Summary of Land Use

ARVIN-EDISON WATER STORAGE DISTRICT

2017 LAND USE SURVEY

June 4, 2018

Introduction to the 2017 Land Use Survey

Prepared by Engineering Technician Micah Clark

This report summarizes the completed Spring and Fall 2017 Land Use Surveys for the Arvin-Edison Water Storage District (AEWSD or District). The District's Engineering Department collects both Spring data (April through July) and Fall data (October through December), through field observations. The data is collected and entered in an ArcGIS geodatabase, with aerial photography, by field, in order to produce maps and summarize data.

Land Use Classes were categorized according to the State of California's Department of Water Resources (DWR) "Standard Land Use Legend" as updated in February 2009 (enclosed within). The DWR Standard Land Use Legend categorizes land use into four major classes: Agricultural, Semi-Agricultural, Urban, and Native. These classes are further subdivided by land use. Agricultural lands are subdivided by crop and irrigation method.

AEWSD is composed of two main water service areas covering 131,660 acres of predominantly agricultural lands.The Surface Water Service Area (SWSA) conjunctively serves 51,420 acres (39%) with surface water, and/or previously banked and extracted groundwater, through the District's canal and pipeline system to on-farm turnouts. Private farm wells and temporary water service from the District (when available), are both utilized to irrigate in the Groundwater Service Area (GWSA) to supply the agricultural demand for up to 68,225 acres (52%). In 2017, the GWSA had about 57,472 annual irrigated acres. Also, within the GWSA, there are about 1,500 acres (1%) of the District's spreading basins and 10,515 acres (8%) of mainly urban land uses and small acreage areas, which generally occur within the GWSA.

Land Use Surveys are required by the District's Repayment Water Service Contract with the Bureau of Reclamation (USBR). Section 31 (a) on page 65 of the Repayment Contract states, "The Contractor shall establish and maintain accounts and other books and records pertaining to administration of the terms and conditions of this Contract, including: the Contractor's financial transactions, water supply data, and Project land and right-of-way agreements; **the water users' land-use (crop census)**, land ownership, land-leasing and water use data; and other matters that the Contracting Officer may require. Reports thereon shall be furnished to the Contracting Officer in such form and on such date or dates as the Contracting Officer may require…"

Additional uses of the Land Use Survey are utilized to meet DWR requirements, provide information to JMLord Inc. for the annual "Assessment of Reasonable Water Requirements" for the entire District (SWSA and GWSA) and for inclusion into the District's Water Management Plan (another USBR requirement). This information is also provided, upon request, to water users/producers within the District for their personal use as well as the Kern County Water Agency for their county-wide summaries. In addition, District staff and its' consultants use this report for various purposes, including but not limited to, Hydrologic Balance, Groundwater Management Plan including SGMA compliance, Water Use Reviews, Lateral Prorate Studies.

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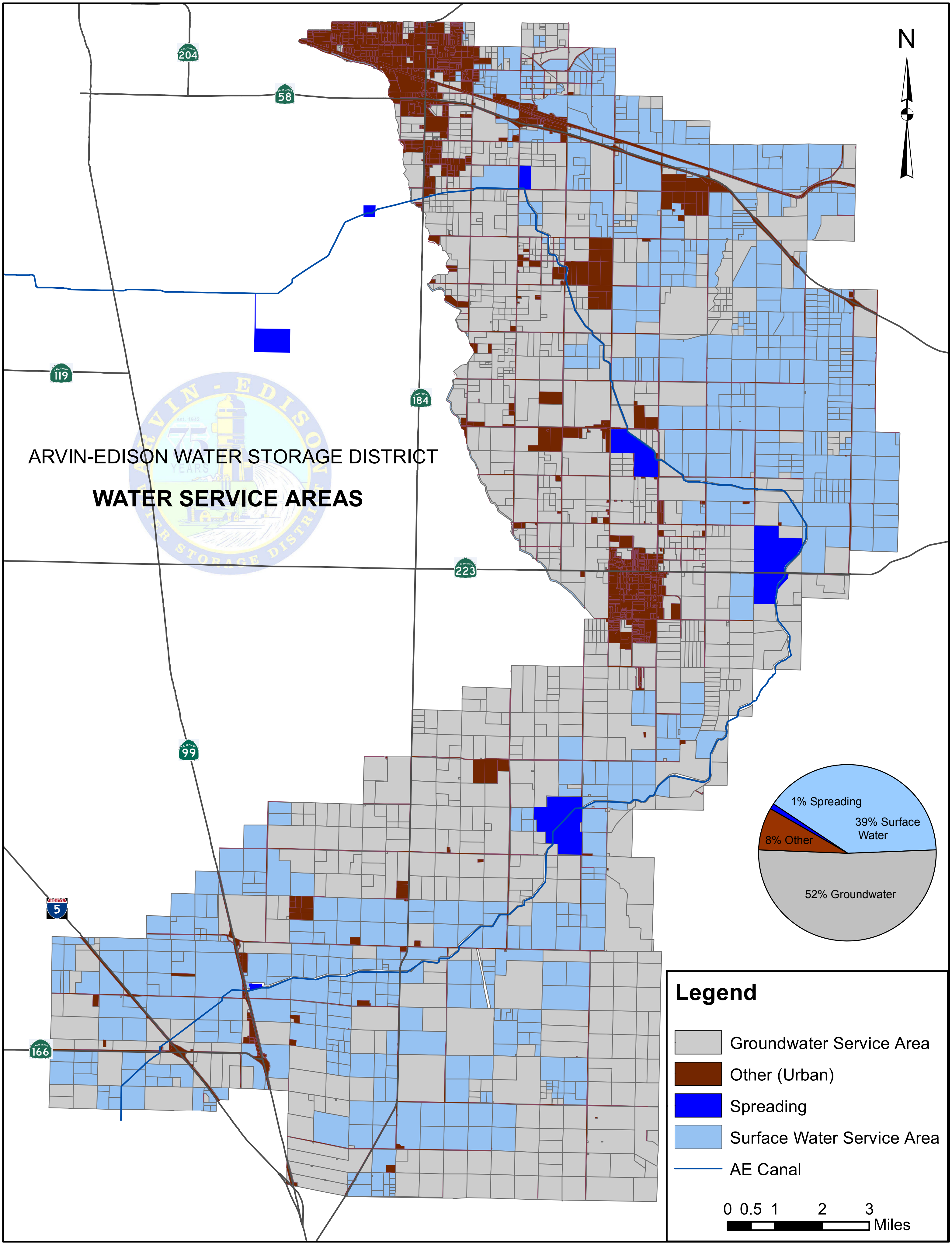
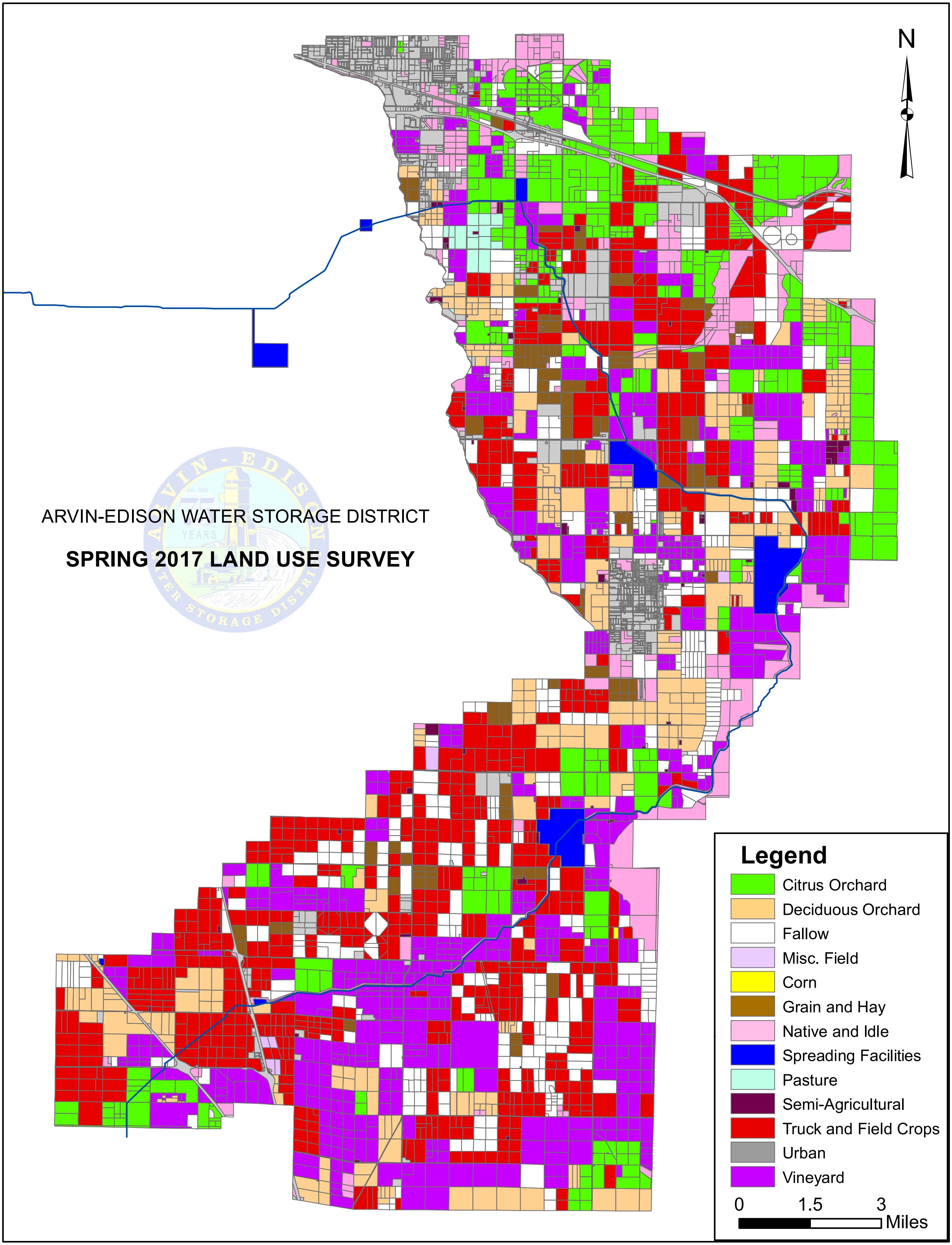
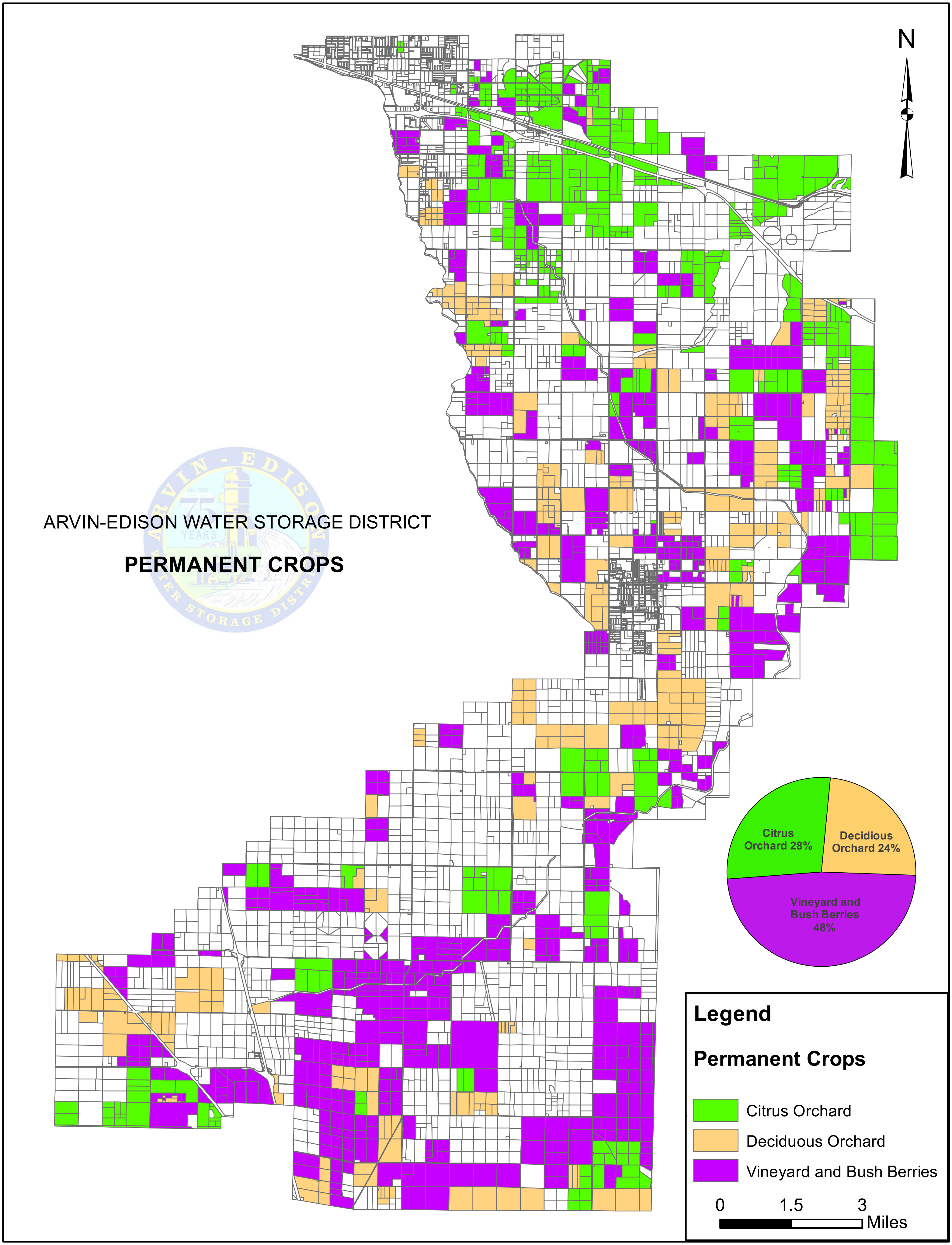

ARVIN-EDISON WATER STORAGE DISTRICT
WATER SERVICE AREAS
N
204
58
119
184
223
99
5
166
1% Spreading
39% Surface Water
8% Other
52% Groundwater
Legend
Groundwater Service Area
Other (Urban)
Spreading
Surface Water Service Area
AE Canal
0 0.5 1 2 3
Miles

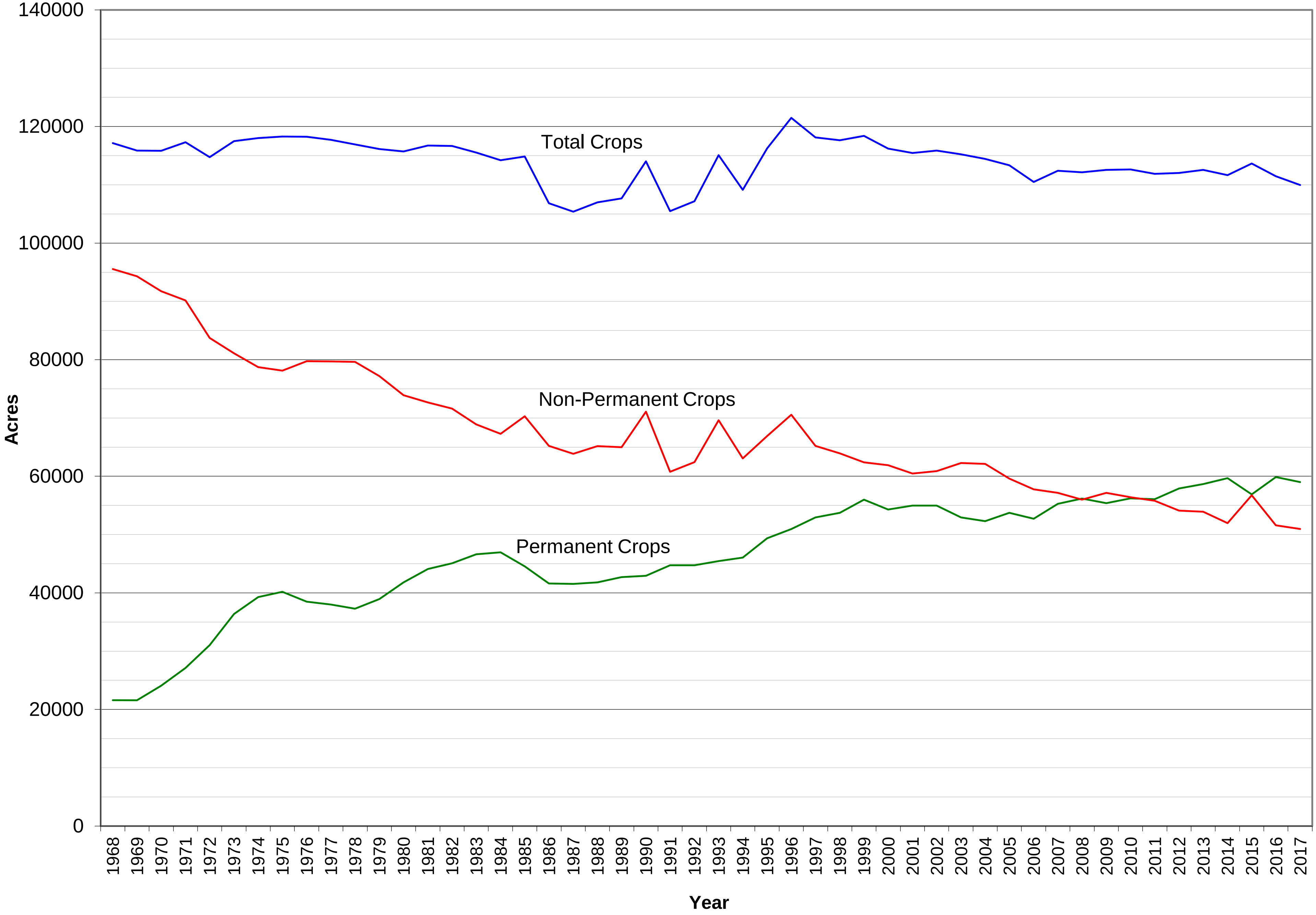

N
ARVIN-EDISON WATER STORAGE DISTRICT
SPRING 2017 LAND USE SURVEY
Legend
Citrus Orchard
Deciduous Orchard
Fallow
Misc. Field
Corn
Grain and Hay
Native and Idle
Spreading Facilities
Pasture
Semi-Agricultural
Truck and Field Crops
Urban
Vineyard
0
1.5
3
Miles



N
ARVIN-EDISON WATER STORAGE DISTRICT
PERMANENT CROPS
Citrus Orchard 28%
Decidious Orchard 24%
Vineyard and Bush Berries 48%
Legend
Permanent Crops
Citrus Orchard
Deciduous Orchard
Vineyard and Bush Berries
0
1.5
3
Miles

ARVIN-EDISON WATER STORAGE DISTRICT

PERMANENT VS. NON-PERMANENT CROPPING PATTERNS



ARVIN-EDISON WATER STORAGE DISTRICT

5 YEAR CROP SURVEY SUMMARY (2013 - 2017)

	2013			2014			2015			2016			2017		
Crop	**Spring**	**Fall**	**Total**	**Spring**	**Fall**	**Total**	**Spring**	**Fall**	**Total**	**Spring**	**Fall**	**Total**	**Spring**	**Fall**	**Total**
Alfalfa/Hay[2]	2,047	966	3,013	1,214	452	1,666	1,897	1,252	3,149	1,435	23	1,457	605	160	765
Almonds	6,992	0	6,992	7,348	0	7,348	9,178	969	10,147	9,044	1,054	10,099	9,146	747	9,893
Apples	23	0	23	23	0	23	23	0	23	23	0	23	23	1	24
Apricots	152	0	152	130	0	130	125	0	125	134	0	134	121	32	153
Beans (Green)	751	0	751	868	53	921	554	0	554	514	0	514	401	0	401
Carrots	3,822	4,059	7,881	3,321	9,485	12,806	3,905	8,496	12,400	3,906	10,518	14,424	3,652	9,871	13,522
Citrus[3]	15,811	41	15,852	16,136	0	16,136	15,489	627	16,115	15,984	1,725	17,709	16,403	733	17,137
Cole Crops	155	50	205	121	123	244	252	221	473	120	0	120	681	729	1,411
Cotton	1,664	0	1,664	409	0	409	0	0	0	0	39	39	40	0	40
Corn (Field)	242	0	242	962	255	1,217	431	0	431	111	0	111	16	0	16
Irrigated Pasture[4]	75	148	223	246	0	246	0	0	0	0	0	0	0	0	0
Lettuce	155	293	448	413	164	577	78	457	535	473	0	473	155	87	242
Melons	1,125	0	1,125	934	0	934	1,080	0	1,080	918	0	918	755	13	768
Misc. Deciduous[5]	3,539	0	3,539	3,456	0	3,456	3,259	98	3,357	3,370	557	3,927	2,479	181	2,659
Misc. Truck Crops[6]	2,193	518	2,711	2,963	3,659	6,622	2,464	1,514	3,977	3,671	3,174	6,845	2,944	1,573	4,518
Misc. Field Crops[7]	39	0	39	0	0	0	0	0	0	0	442	442	191	4	195
Nursery	276	16	292	236	0	236	203	118	320	152	26	178	52	8	60
Onions	4,172	636	4,808	3,917	259	4,176	3,889	287	4,176	3,405	507	3,912	3,923	311	4,235
Peaches/Nectarines	1,050	0	1,050	1,349	0	1,349	769	37	806	964	214	1,178	858	111	969
Pears	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peppers	2,003	0	2,003	2,327	0	2,327	2,137	0	2,137	2,205	43	2,248	1,718	10	1,728
Pistachios	595	0	595	603	0	603	602	745	1,347	1,471	601	2,072	1,438	130	1,568
Plums	230	0	230	30	0	30	12	0	12	0	0	0	0	0	0
Potatoes[8]	9,090	996	10,086	11,632	1,623	13,255	11,486	888	12,374	11,024	1,377	12,400	12,996	1,404	14,400
Safflower	221	0	221	240	0	240	365	0	365	317	0	317	0	0	0
Small Grains[9]	5,991	1,813	7,804	4,065	1,414	5,479	2,610	422	3,032	3,831	208	4,040	3,863	1,388	5,251
Sugarbeets[10]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tomatoes	4,377	0	4,377	4,540	0	4,540	5,569	0	5,569	5,070	0	5,070	3,772	0	3,772
Vineyard	29,753	119	29,872	30,128	387	30,515	27,240	3,210	30,450	28,314	3,582	31,895	27,962	2,583	30,545
Walnuts	136	0	136	136	0	136	136	0	136	0	0	0	0	0	0
Total[1]	96,679	9,655	106,334	97,747	17,874	115,621	93,752	19,340	113,092	96,455	24,090	120,545	94,194	20,079	114,273

Permanent crops include acreage for young crops in total count.

[1]Includes non-irrigated crops. Does not include Native classes.

[2]Includes: Alfalfa, Misc. Grains and Hay, and Mixed Grains and Hay.

[3]Includes: Grapefruit, Jojoba, Lemons, Misc. Citrus, and Oranges.

[4]Includes: Mixed Pasture and Turf Farms.

[5]Includes: Cherries, Misc. Deciduous, and Mixed Deciduous.

[6]Includes: Asparagus, Broccoli, Bush Berries, Cabbage, Cauliflower, Misc. Truck Crops, Mixed Truck Crops, Spinach, Strawberries, and Sweet Potatoes.

[7]Includes: Misc. Field and Sudan.

[8]Does not include Sweet Potatoes.

[9]Includes: Barley, Oats, and Wheat.

[10]Classified as Misc. Truck Crop.

ARVIN-EDISON WATER STORAGE DISTRICT

10 YEAR SUMMARY OF SPRING LAND USE (2008 - 2017)

LAND USE *(1) *(2) *(3)	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Field Crops										
Cotton	2,569	1,372	1,443	1,375	2,088	1,664	409	0	0	40
Milo & Field Corn	125	240	77	37	201	242	962	431	111	16
Other Field Crops	535	284	289	514	307	221	240	365	290	106
Truck Crops										
Potatoes	8,067	10,541	9,654	11,290	11,544	9,090	11,632	11,486	10,981	12,996
Other Truck Crops	16,411	16,660	16,169	17,219	18,479	19,029	19,640	20,009	20,434	18,054
Grain & Hay Crops	9,751	8,974	8,399	9,737	6,615	6,876	4,449	3,706	4362	3,863
Pasture	409	349	129	77	113	1,080	829	622	904	605
Vineyards	27,954	28,051	28,869	29,239	29,975	29,753	30,109	27,224	28,314	27,923
Deciduous Orchard	12,749	12,420	11,725	11,335	11,791	12,717	13,029	14,074	14,978	14,064
Citrus	15,190	14,694	15,242	15,176	15,875	15,811	15,999	15,450	15,961	16,403
Subtotal	93,760	93,585	91,996	95,999	96,988	96,483	97,298	93,367	96,334	94,071
Fallow *(4)	17,690	18,374	19,284	14,417	14,083	15,741	13,909	15,703	15,007	15,754
Total Irrigated Acres	111,450	111,959	111,280	110,416	111,071	112,224	111,207	109,070	111,341	109,824
Semi-Incidental To Agricultural	731	562	479	804	519	411	381	245	326	560
Urban and Vacant	8,791	8,519	8,841	8,821	8,924	8,938	10,313	9,007	10,401	10,515
Non-Irrigated Crops	863	749	973	1,464	954	196	449	385	121	124
Abandoned Orchards/Vineyards	0	0	0	0	0	0	0	0	0	0
Idle Land *(5)	1,115	1,189	1,590	1,226	1,018	1,015	1,112	6,498	1,530	2,211
Native Classes	8,710	8,682	8,497	8,929	9,174	8,876	8,198	6,455	7,941	8,426
Total Non-Irrigated Acres	20,210	19,701	20,380	21,244	20,589	19,436	20,453	22,590	20,319	21,836
Total District Acreage	131,660	131,660	131,660	131,660	131,660	131,660	131,660	131,660	131,660	131,660

*(1) Standard Land Use Legend as prepared by DWR, July 1993; for 2005 the 1999 Legend was used. There were minor changes in 2005 and 2009.
*(2) Land Use is surveyed during the Spring of each year
*(3) Land Use survey completed in August
*(4) Land is tilled at time of survey but current crop not identified
*(5) Land cropped within the past three years but not tilled at time of survey

ARVIN-EDISON WATER STORAGE DISTRICT

2017 LAND USE TABLES WITH CROPS AND ACRES

2017 Spring Land Use with Crops			
LEGEND	SWSA*	GWSA	Total (AC)
Oranges	9,369	3,979	13,348
Vineyard	6,310	19,299	25,609
Fallow	5,182	10,571	15,754
Potatoes	5,088	7,907	12,996
Almonds	2,457	4,804	7,261
Onions	2,272	1,652	3,923
Wheat	2,130	1,128	3,259
Tomatoes	1,784	1,989	3,772
Cherries	1,533	660	2,193
Urban Industrial	1,483	293	1,776
Carrots	1,474	2,178	3,652
Idle	1,280	931	2,211
Vineyard-Young	1,178	1,175	2,352
Urban Vacant-Roads	1,173	2,579	3,752
Pistachios-Young	1,076	237	1,313
Native Grasses	972	3,551	4,522
Almonds-Young	922	963	1,885
Peppers	774	944	1,718
Citrus-Misc.	709	635	1,345
Urban Industrial Solar	681	834	1,514
Oranges-Young	520	720	1,240
Peaches/Nectarines	395	382	778
Melons	328	427	755
Bush Berries	243	354	597
Cherries-Young	177	45	222
Lemons	154	0	155
Broccoli	152	110	262
Grapefruit	151	2	153
Jojoba	150	3	154
Urban Residential	149	2,905	3,054
Sweet Potatoes	143	141	284
Pistachios	125	0	125
Beans	120	281	401
Apricots	118	2	121
Water Surface	113	2,564	2,676
Farmsteads	67	217	284
Mixed Truck Crops	64	852	916
Cabbage	60	34	94
Sudan	52	53	106
Asparagus	37	2	39
Oats	37	568	605
Cauliflower	37	43	79
Deciduous-Misc.	32	12	44
Urban Commercial	30	390	420
Apples	22	0	23
Mixed Decidous	20	0	20
Peaches/Nec.-Young	19	61	80
Nursery Crops	15	37	52
Feedlots	9	267	276
Citrus-Misc.-Young	9	0	9
Cole Crops (mixed)	8	673	681
Truck Crops-Misc.	5	500	505
Strawberries	4	0	4
Native Grass/Shrubs	3	1,223	1,227
Lettuce	1	153	155
Cotton	0	40	40
Misc. Field	0	85	85
Corn	0	16	16
Alfalfa	0	605	605
Spinach	0	163	163
Total	**51,420**	**80,240**	**131,660**

2017 Fall Crops**	
Legend	Total
Carrots	9,871
Potatoes	1,404
Wheat	1,388
Vineyard	1,299
Vineyard-Young	1,284
Truck Crops-Misc.	758
Cole Crops (mixed)	729
Mixed Truck Crops	533
Almonds	532
Oranges-Young	461
Onions	311
Oranges	229
Sweet Potatos	222
Almonds-Young	215
Alfalfa	160
Cherries	111
Lettuce	87
Peaches/Nectarines	80
Pistachios-Young	77
Cherries-Young	70
Pistachios	54
Cabbage	53
Citrus-Misc.	40
Apricots-Young	32
Peaches/Nec.-Young	30
Melons	13
Peppers	10
Cauliflower	9
Nursery Crops	8
Sudan	4
Grapefruit	3
Apples	1
Total	**20,079**

*Crop is sorted by descending SWSA
**Crops grown in the Fall in addition to Spring Crops

SWSA - Surface Water Service Area
GWSA - Groundwater Service Area

SWSA GIS layer is outdated and is currently being updated.

ARVIN-EDISON WATER STORAGE DISTRICT
2017 COMMODITY VALUES

2017 Spring Crops					
Legend	Acres	Production Per Acre	Production (tons)	Unit Value*	Total Value
Vineyard	25,609	11	286,313	$1,389	$397,657,179
Oranges	13,348	14	186,600	$725	$135,285,005
Potatoes	12,996	26	341,395	$298	$101,829,552
Almonds	7,261	1	8,640	$4,920	$42,510,977
Onions	3,923	24	93,182	$200	$18,636,388
Tomatoes	3,772	46	175,036	$73	$12,690,084
Carrots[1]	3,652	24	89,107	$467	$41,604,116
Wheat	3,259	3	8,798	$175	$1,539,712
Cherries	2,193	6	13,003	$3,810	$49,542,136
Peppers	1,718	21	35,524	$970	$34,458,180
Citrus-Misc.	1,345	14	18,802	$725	$13,631,335
Mixed Truck Crops	916	24	22,348	$467	$10,434,297
Peaches/Nectarines[2]	778	15	11,351	$880	$9,986,782
Melons	755	34	25,909	$327	$8,472,193
Cole Crops (Mixed)	682	24	16,642	$467	$7,770,124
Alfalfa	605	7	4,321	$153	$661,067
Oats	605	3	1,935	$127	$245,697
Bush Berries	597	5	3,060	$7,380	$22,585,782
Truck Crops-Misc.	505	24	12,325	$467	$5,754,335
Beans	401	1	522	$80	$41,731
Sweet Potatoes	284	24	6,937	$467	$3,239,071
Broccoli	261	24	6,369	$467	$2,973,611
Spinach	163	24	3,974	$467	$1,855,601
Lettuce	155	20	3,029	$470	$1,423,843
Lemons	155	15	2,277	$1,330	$3,027,774
Jojoba	154	15	2,243	$880	$1,973,213
Grapefruit	153	13	1,997	$853	$1,703,027
Pistachios	125	2	202	$4,320	$873,470
Apricots	121	10	1,180	$1,090	$1,285,970
Sudan	106	8	845	$128	$108,420
Cabbage	94	24	2,303	$467	$1,075,057
Misc. Field	85	8	691	$128	$88,704
Cauliflower	79	24	1,940	$467	$905,641
Nursery Crops	52	29,355	1,525,573	$3	$4,608,155
Deciduous-Misc.	44	15	643	$880	$566,087
Cotton[3]	40	1,710	68,451	$1	$70,163
Asparagus	39	24	954	$467	$445,472
Apples	23	2	42	$900	$37,386
Mixed Deciduous	20	15	297	$880	$260,955
Corn[4]	16	8	131	$128	$16,852
Strawberries	4	15	65	$880	$57,405
Total	**87,093**	**31,684**	**2,984,955**	**$39,772**	**$941,932,548**

Orchards and vineyards only depict mature fruit and nut bearing crop acreage.

2017 Fall Crops**					
Legend	Acres	Production Per Acre	Production (tons)	Unit Value*	Total Value
Carrots[5]	9,871	24	240,858	$467	$112,456,712
Potatoes	1,404	16	22,694	$342	$7,753,527
Wheat	1,388	3	3,747	$175	$655,693
Vineyard	1,299	11	14,524	$1,389	$20,172,452
Truck Crops-Misc.	758	24	18,497	$467	$8,636,345
Cole Crops (Mixed)	729	24	17,797	$467	$8,309,590
Mixed Truck Crops	533	24	12,999	$467	$6,069,014
Almonds	532	1	633	$4,920	$3,114,344
Onions	311	24	7,396	$200	$1,479,198
Oranges	229	14	3,205	$725	$2,323,361
Sweet Potatoes	222	24	5,405	$467	$2,523,809
Alfalfa	160	7	1,145	$153	$175,180
Cherries	111	6	655	$3,810	$2,496,786
Lettuce	87	20	1,700	$470	$799,073
Peaches/Nectarines[6]	80	15	1,173	$880	$1,032,131
Pistachios	54	2	87	$4,320	$377,494
Cabbage	53	24	1,286	$467	$600,419
Citrus-Misc.	40	14	557	$725	$404,102
Melons	13	34	447	$327	$146,258
Peppers	10	21	212	$970	$205,611
Cauliflower	9	24	208	$467	$97,297
Nursery Crops	8	29,355	244,820	$3	$739,355
Sudan	4	8	36	$128	$4,588
Grapefruit	3	13	35	$853	$29,741
Apples	1	2	2	$900	$2,118
Total	**17,909**	**29,735**	**600,119**	**$24,558**	**$180,604,196**

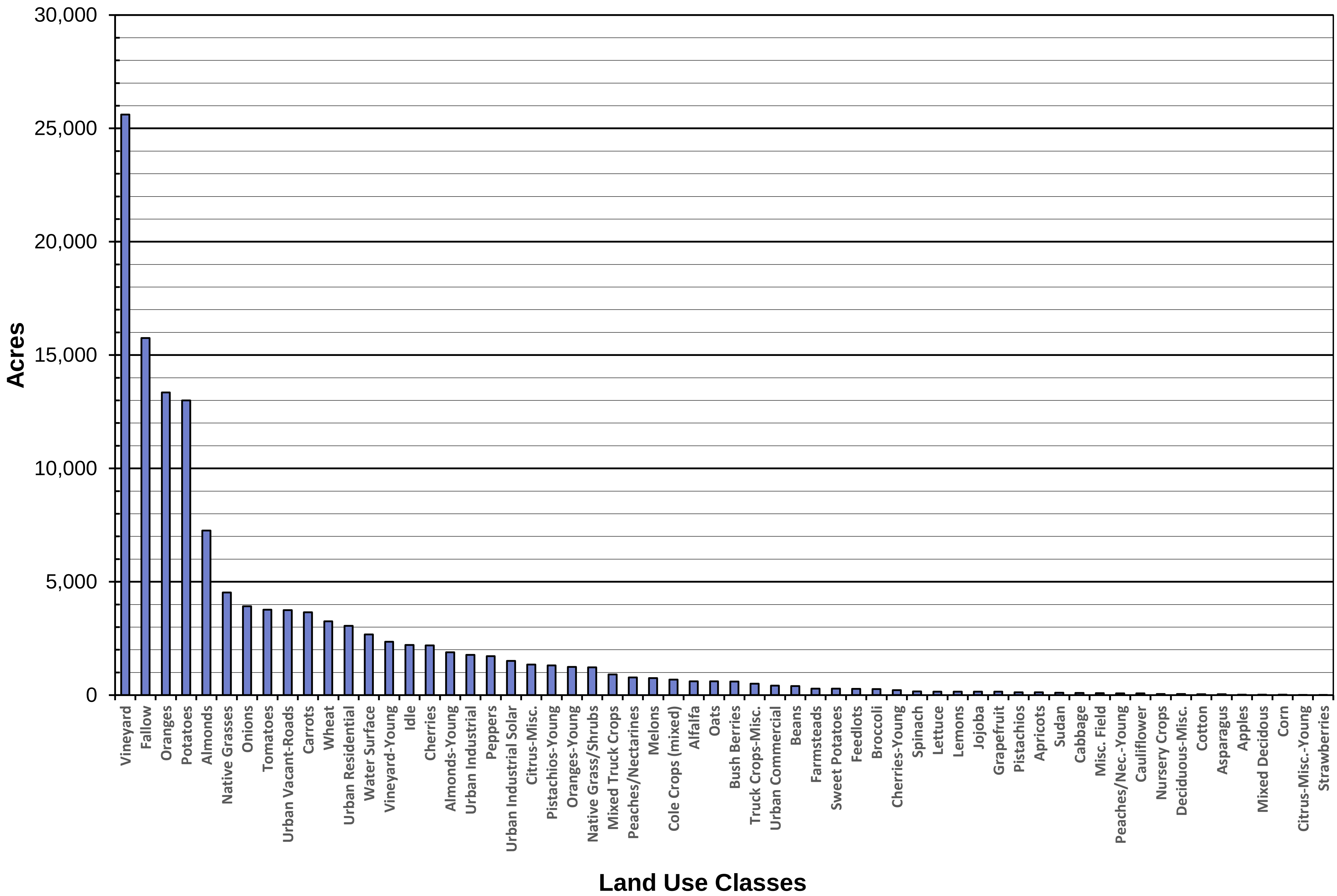
Legend	Acres	Value
Total Spring 2017	87,093	$941,932,548
Total Fall 2017	17,909	$180,604,196
Total Non-Bearing 2017	9,271	$0
Grand Total	**114,273**	**$1,122,536,745**

Legend	Acres	Value
Total AEWSD 2017	114,273	$1,122,536,745
Total Kern County 2016[7]	885,987	$6,132,436,340
AEWSD % of Total Value	**13%**	**18%**

*Based on 2016 unit vales from "2016 Kern County Agricultural Crop Report" dated 9/12/17.
**Crops grown in the Fall in addition to Spring Crops.
[1]The following crops are classified into the same category according to the Kern County Crop Report: Artichoke, Broccoli, Carrots, Celery, Cole Crops, Misc. Truck and Mixed Truck.
[2]The following crops are classified into the same category according to the Kern County Crop Report: Jojoba, Misc. Deciduous, Mixed Deciduous, Nectarines and Peaches, and Strawberries.
[3]Production units are in bales.
[4]The following crops are classified into the same category according to the Kern County Crop Report: Corn and Safflower.
[5]The following crops are classified into the same category according to the Kern County Crop Report: Asparagus, Broccoli, Cabbage, Carrots, Cauliflower, Misc. Truck, Mixed Truck, Spinach, and Sweet Potatoes.
[6]The following crops are classified into the same category according to the Kern County Crop Report: Jojoba, Misc. Deciduous, Nectarines and Peaches.
[7]Total acreage and value of Kern County for all commodities, excluding Industrial and Wood Crops, Livestock and Poultry, Livestock and Poultry Products, Apiary Products, and Rangeland.

ARVIN-EDISON WATER STORAGE DISTRICT

SPRING 2017 LAND USE SURVEY

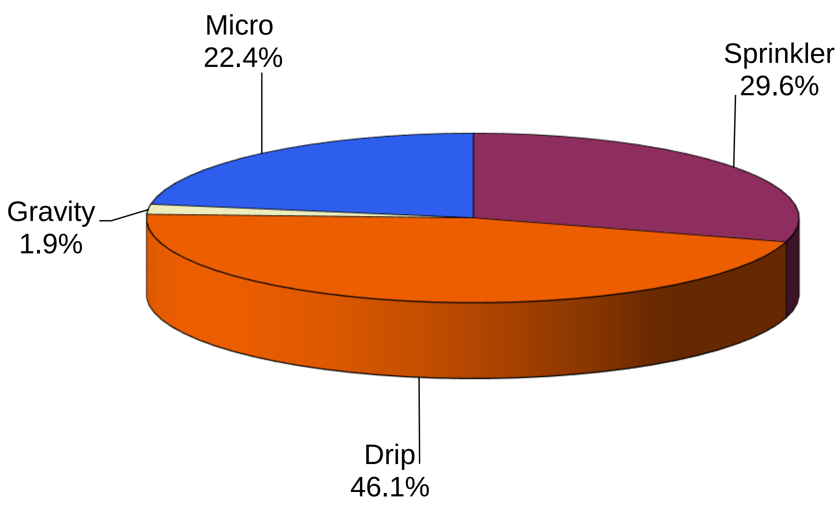


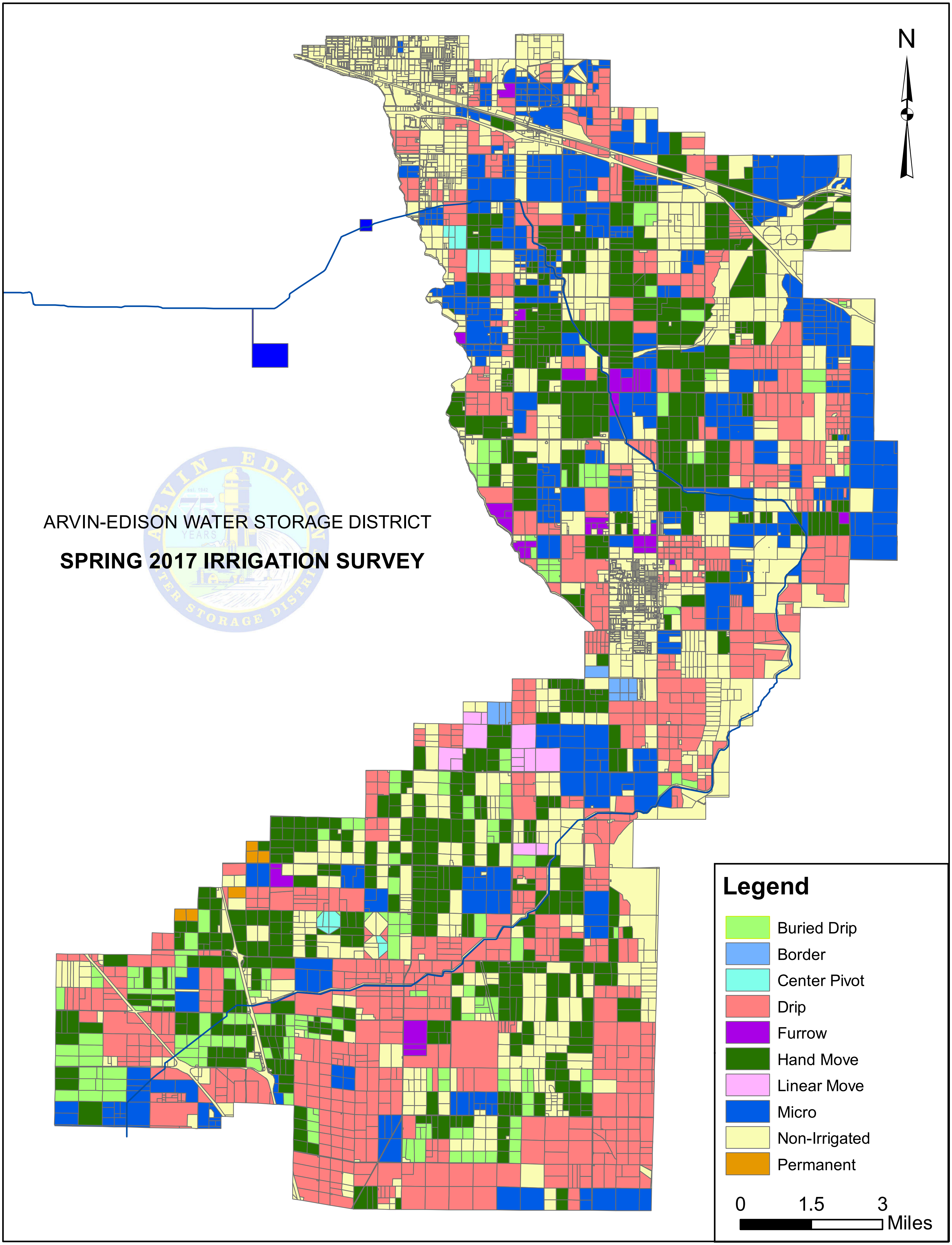
ARVIN-EDISON WATER STORAGE DISTRICT

SPRING 2017 IRRIGATION SUMMARY

Method	Acres	%
Sprinkler	27,830	29.6
Drip	43,352	46.1
Gravity	1,788	1.9
Micro	21,101	22.4
Subtotal	94,071	100.0
Non-Irrigated	37,589	
Total	131,660	

2017 IRRIGATION SYSTEMS PERCENTAGE

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ARVIN-EDISON WATER STORAGE DISTRICT
SPRING 2017 IRRIGATION SURVEY
Legend
Buried Drip
Border
Center Pivot
Drip
Furrow
Hand Move
Linear Move
Micro
Non-Irrigated
Permanent
0
1.5
3
Miles

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

STANDARD LAND USE LEGEND

Land and Water Use Section

Statewide Planning Branch
Division of Planning

February 2009

STANDARD LAND USE LEGEND

Table of Contents

I. GENERAL

The minimum breakdown of land use is according to the class symbol. More detail is obtained by adding the subclass number to the class symbol, or by use of special condition symbols. Any or all of the following information can be delineated.

1. Types of agricultural, urban, or native land use
2. Specific crops
3. Multiple land use
4. Sources of water supply
5. Type of irrigation system

This legend is for land use surveys conducted in 2009 and after.

II. AGRICULTURAL CLASSES

The vast majority of crops grown in California are irrigated. Unless preceded with an "n" if it is non-irrigated, all agricultural classes are considered irrigated. (This statement is for the agricultural classes and does not apply to the other non-agricultural classes of semiagricultural, urban, or native.)

G - GRAIN AND HAY CROPS

1. Barley
2. Wheat
3. Oats
6. Miscellaneous grain and hay
7. Mixed grain and hay

R - RICE

1. Rice
2. Wild rice

F - FIELD CROPS

1. Cotton
2. Safflower
3. Flax
4. Hops
5. Sugar beets
6. Corn (field & sweet)
7. Grain sorghum
8. Sudan
9. Castor beans
10. Beans (dry)
11. Miscellaneous field
12. Sunflowers
13. Hybrid sorghum/sudan
14. Millet
15. Sugar cane

P - PASTURE

1. Alfalfa & alfalfa mixtures
2. Clover
3. Mixed pasture
4. Native Pasture
5. Induced high water table native pasture
6. Miscellaneous grasses
7. Turf farms
8. Bermuda grass
9. Rye grass
10. Klein grass

T - TRUCK, NURSERY AND BERRY CROPS

1. Artichokes
2. Asparagus
3. Beans (green)
4. Cole crops (mixture of 22-25)
6. Carrots
7. Celery
8. Lettuce (all types)
9. Melons, squash, and cucumbers (all types)
10. Onions and garlic
11. Peas
12. Potatoes
13. Sweet Potatoes
14. Spinach
15. Tomatoes (processing)
16. Flowers, nursery & Christmas tree farms
17. Mixed (four or more)
18. Miscellaneous truck
19. Bush berries
20. Strawberries
21. Peppers (chili, bell, etc.)
22. Broccoli
23. Cabbage
24. Cauliflower
25. Brussels sprouts
26. Tomatoes (market)
27. Greenhouse

D - DECIDUOUS FRUITS AND NUTS

1. Apples
2. Apricots
3. Cherries
5. Peaches and nectarines
6. Pears
7. Plums
8. Prunes
9. Figs
10. Miscellaneous deciduous
11. Mixed deciduous
12. Almonds
13. Walnuts
14. Pistachios

C - CITRUS AND SUBTROPICAL

1. Grapefruit
2. Lemons
3. Oranges
4. Dates
5. Avocados
6. Olives
7. Miscellaneous subtropical fruits
8. Kiwis
9. Jojoba
10. Eucalyptus
11. Mixed subtropical fruits

V - VINEYARDS

1. Table grapes
2. Wine grapes
3. Raisin grapes

I - IDLE

(Precede with "n" in non-irrigated area, and <u>must</u> include subclass)

1. Land not cropped the current or previous crop season, but cropped within the past three years.
2. New lands being prepared for crop production.

III. SEMIAGRICULTURAL CLASS

(Do not precede with "n")

S - SEMIAGRICULTURAL & INCIDENTAL TO AGRICULTURE
(Must include subclass)

1. Farmsteads (includes a farm residence)
2. Livestock feed lot operations
3. Dairies
4. Poultry farms
5. Farmsteads (without a farm residence)
6. Miscellaneous semi-ag (small roads, ditches, non-planted areas of cropped fields)

IV. URBAN CLASSES

(Do not precede with "n")

U - URBAN

Residential, commercial, and industrial (may be used alone when further breakdown is not required)

UR - RESIDENTIAL

Single and multiple family units, including trailer courts (may be used alone when further breakdown is not required)

1. Single family dwellings with lot sizes greater than 1 acre up to 5 acres (ranchettes, etc.)
2. Single family dwellings with a density of 1 unit/acre up to 8+ units/acre.
3. Multiple family (apartments, condos, townhouses, barracks, bungalows, duplexes, etc.)
4. Trailer courts

WATER USE FACTOR (% of total area irrigated - will be the second digit of UR Subclass when water factor is used)

1. 0% to 25% area irrigated
2. 26% to 50% area irrigated
3. 51% to 75% area irrigated
4. 76% or greater

Example: UR32 indicates multiple family with water use factor of 26% to 50% of area irrigated.

UC - COMMERCIAL

(May be used alone when further breakdown is not required)

1. Offices, retailers, etc.
2. Hotels
3. Motels
4. Recreation vehicle parking, camp sites
5. Institutions (hospitals, prisons, reformatories, asylums, etc., having a reasonably constant 24-hour resident population)
6. Schools (yards to be mapped separately if large enough)
7. Municipal auditoriums, theaters, churches, buildings and stands associated with race tracks, football stadiums, baseball parks, rodeo arenas, amusement parks, etc.
8. Miscellaneous high water use (to be used to indicate a high water use condition not covered by the above categories.)

UI - INDUSTRIAL

(May be used alone when further breakdown is not required)

1. Manufacturing, assembling, and general processing
2. Extractive industries (oil fields, rock quarries, gravel pits, rock and gravel processing plants, etc.)
3. Storage and distribution (warehouses, substations, railroad marshalling yards, tank farms, etc.)
6. Saw mills
7. Oil refineries
8. Paper mills
9. Meat packing plants
10. Steel and aluminum mills
11. Fruit and vegetable canneries and general food processing
12. Miscellaneous high water use (to be used to indicate a high water use condition not covered by other categories.)
13. Sewage treatment plant including ponds.
14. Waste accumulation sites (public dumps, sewage sludge sites, landfill and hazardous waste sites, etc.)
15. Wind farms, solar collector farms, etc.

UL - URBAN LANDSCAPE

(May be used alone when further breakdown is not required)

1. Lawn area - irrigated
2. Golf course - irrigated
3. Ornamental landscape (excluding lawns) - irrigated
4. Cemeteries - irrigated
5. Cemeteries - not irrigated

UV - VACANT

(May be used alone when further breakdown is not required)

1. <u>Unpaved areas</u> (vacant lots, graveled surfaces, play yards, developable open lands within urban areas, etc.)
3. Railroad right of way.
4. <u>Paved areas</u> (parking lots, paved roads, oiled surfaces, flood control channels, tennis court areas, auto sales lots, etc.)
6. Airport runways
7. Land in urban area that is not developable

V. NATIVE CLASSES

(Do not precede with "n")

NC - NATIVE CLASSES UNSEGREGATED

(May be used alone when further breakdown is not required)

NV - NATIVE VEGETATION

(May be used alone when further breakdown is not required)

1. Grass land
2. Light brush
3. Medium brush
4. Heavy brush
5. Brush and timber
6. Forest
7. Oak woodland

NR - RIPARIAN VEGETATION

(May be used alone when further breakdown is not required)

1. Marsh lands, tules and sedges
2. Natural high water table meadow
3. Trees, shrubs or other larger stream side or watercourse vegetation
4. Seasonal duck marsh, dry or only partially wet during summer
5. Permanent duck marsh, flooded during summer

NW - WATER SURFACE

(May be used alone when further breakdown is not required)

1. River or stream (natural fresh water channels)
2. Water channel (all sizes - ditches and canals - delivering water for irrigation and urban use - ie State Water Project, CVP, water district canals, etc.)
3. Water channel (all sizes - ditches and canals - for removing on-farm drainage water - surface runoff and subsurface drainage - ie Colusa drain, drainage ditches in Imperial)
4. Freshwater lake, reservoir, or pond (all sizes, includes ponds for stock, recreation, groundwater recharge, managed wetlands, on-farm storage, etc.)
5. Brackish and saline water (includes areas in estuaries, inland water bodies, the ocean, etc.)
6. Wastewater pond (dairy, sewage, cannery, winery, etc)
7. Paved water conveyance channels within urban areas (mainly for flood control)

NB - BARREN AND WASTELAND

(May be used alone when further breakdown is not required)

1. Dry stream channels
2. Mine Tailing
3. Barren land
4. Salt flats
5. Sand dunes

VI. UNCLASSIFIED

NS - NOT SURVEYED

Area within the investigation area that was not mapped.

E - ENTRY DENIED

Area within the investigation area that was not mapped because entry into the area was denied.

Z - OUTSIDE

Area outside of the study area.

VI. SPECIAL CONDITIONS, IRRIGATION TYPE, AND WATER SOURCE

When any of the following special conditions, type of irrigation, or source of water is used, a (-) should precede them. When more than one is used they should be used in the order stated above.

1. SPECIAL CONDITIONS
(only one can be used per parcel)

A - ABANDONED ORCHARDS AND VINEYARDS

Trees or vines must be in such a condition that renewal of cultural practices would restore economic production. Indicated by "A" following crop symbol.

Example: D1-A indicates an apple orchard previously irrigated but now abandoned.

B - BURNED OVER AREAS

Indicated by "B". The type and density of natural cover destroyed by fire is obtained by examination of aerial photo.

Example: NV7-B indicates oak grass land recently burned over.

C – GREEN CHOPPED

Grain or field crops harvested early for livestock feed

D - HIGH DENSITY ORCHARDS

Indicates the density of trees is higher than normally expected (used with D and C classes).

E – ECOSYSTEM RESTORATION

Native vegetation or riparian areas that have undergone restoration (used with NV and NR classes).

F - FALLOW LANDS

Land not cropped during the current crop season, but cropped during the previous crop season.

(1) If no crop residue is apparent or identifiable then the "F" symbol will follow the agricultural class symbol for the crop most representative of those grown in the area.
Example: T-F indicates fallow land within a truck crop area (with facilities for irrigation).

(2) If the crop residue is apparent and identifiable but is not from the current crop season covered by the survey then the field is considered fallow and mapped as the class of the crop residue.
Example: Surveyor found an old sugar beet residue not from current season. Land would be mapped F-F.

(3) If the crop residue is identifiable as that of a crop which was grown during the survey period, then map the field as though crop existed.
Example: Surveyor found carrot residue from current growing season. Land would be mapped T6.

G – COVER CROP

Indicates where grain, field, or pasture type crops have been planted for soil stabilization or for cover crops grown between rows of deciduous and subtropical trees and vines.

H – HARVESTED CROP

Indicates the identified crop was harvested at the time of the survey (used with truck, field, and grain crops).

K - FREEWAYS

The area within the freeway right of way.

<u>Examples:</u> UV-K indicates urban vacant, unsegregated, with a freeway special condition (all areas within the freeway right of way).

UV4-K indicates the urban vacant paved areas with a freeway special condition (the paved portion within the freeway right of way.)

UL3-K indicates irrigated urban landscape with a freeway special condition (irrigated landscape portion within the freeway right of way).

R - RECREATIONAL

To be used with urban residential, commercial, and vacant (R.V. parks and camp sites) within primarily a seasonal recreational area.

S - SEED CROP

Indicates any crop grown for seed.

<u>Example:</u> P1-S indicates irrigated alfalfa seed crop.

T - TILLED LANDS

Land prepared for immediate planting, or just newly planted, including the appearance of seed lines or unidentifiable tiny seedlings.

<u>Example:</u> T-T indicates tilled land (either prepared for planting or just planted) in a predominately truck crop area.

U – INTERPRETED LANDUSE

Indicates that the land use was determined using other means than visual field verification.

X - PARTIALLY IRRIGATED CROPS

Crops irrigated for only part of their normal irrigation season.

<u>Example:</u> P3-X indicates partially irrigated mixed pasture.

Y - YOUNG CROPS

Indicates the identified crop is at early stages of growth (used with non-bearing orchards and vineyards, and truck, field, and grain crops).

Example: C3-Y indicates young non-bearing irrigated oranges.

Z - RECLAMATION

Land being leached for the removal of harmful salts. This symbol will be used following either the “Idle” symbol or symbols of crops grown as a step in the reclamation process.

Example: I2-Z indicates new lands being leached in preparation for crop production.

2. TYPE OF IRRIGATION SYSTEM

C - Center Pivot Sprinkler
L - Linear Move Sprinkler
R - Side Roll Sprinkler
H - Hand Move Sprinkler
P - Permanent Sprinkler
T - Solid Set Sprinkler
F - Furrow Irrigation
B - Border Strip Irrigation
N - Basin Irrigation
W - Wild Flooding
S - Subirrigation
D - Surface Drip Irrigation
A - Buried Drip Irrigation
M - Micro Sprinkler
E - LEPA (Low Energy Precision Application)
U - Unknown or not mapped

As part of the map symbols these irrigation type letters required a circle around them so that they are not confused with the special condition letters.

Example: P1- B indicates border strip irrigated alfalfa.

3. SOURCE OF IRRIGATION WATER

Water Source	Code
Surface water	1
Mixed surface & ground water	2
Ground water	3
Unknown source	4
Reclaimed	5
Recycled	6

Example: P3- B1 indicates border strip irrigated pasture with surface water as the water source.

VIII. MULTIPLE LAND USE

INTERCROPPING

Used with orchards or vineyards when intercropped with some other crop class. Indicated by a fractional symbol, with the orchard or vineyard symbol appearing in the numerator.

Example: D12-Y/F10 indicates young almonds intercropped with dry beans.

DOUBLE CROPS

Used when two consecutive crops are grown in the survey season. The first crop is indicated by enclosed parenthesis.

Example: (G)F6 indicates irrigated grain followed by field corn.

TRIPLE CROPS

Used when three consecutive crops are grown in the survey season. The first and second crops are indicated by enclosed parenthesis.

Example: (T8)(T23)T8 indicates irrigated lettuce followed by cabbage followed by lettuce.

MIXED LAND USE

Used when two to three land uses are present in one area but, because of the large degree of intermixing, cannot be delineated separately. Indicated by percentages following land use symbols. No more than three different land uses may be used in describing the area. Percentages are in increments of 10.

Example: D5 - 40% indicates irrigated peaches 40%
NV - 20% indicates native vegetation 20%
UR - 40% indicates urban residential 40%

IX. FURTHER INSTRUCTIONS, CLARIFICATIONS AND EXAMPLES

1) Land use class and subclass should come before the dash which separates the special condition, irrigation type, and source of water.

2) Water source should be the last symbol in the code. If the field has more that one crop, the source should follow the last crop.

3) Irrigation type and source of water must be enclosed in a circle.

LAND USE CODE EXAMPLES

Single Crop:

F1-F 3
Indicates cotton that is furrow irrigated with ground water as the water source.

D12-Y P
Indicates young irrigated almonds that are irrigated with a permanent sprinkler system.

Intercropped:

D13-Y/F10 P1
Indicates young irrigated walnuts intercropped with dry beans, irrigated by a permanent sprinkler system with surface water as the water source.

Double cropped:

(G-H)F6- F 2
Indicates grain irrigated with a hand move sprinkler system followed by furrow irrigated corn, with mixed ground and surface water as the water source.

Triple Cropped:

(T8)(T23)T8-P
Indicates irrigated lettuce followed by irrigated cabbage followed by irrigated lettuce, all three crops irrigated by a permanent sprinkler system (when type of irrigation is not shown next to the first and second crops, the irrigation type for the last crop will be assumed for the first two crops).

(T8-U)(T23-U)T8- H3
Indicates irrigated lettuce with unknown irrigation type, followed by irrigated cabbage with unknown irrigation type, followed by lettuce irrigated with a hand move sprinkler system, with ground water as the water source.

ATTACHMENT N

Water Requirements

ARVIN-EDISON WATER STORAGE DISTRICT

ASSESSMENT OF
REASONABLE WATER REQUIREMENTS

WATER YEARS
2013-14
2014-15
2015-16
2016-17
2017-18

June 2018

ARVIN-EDISON WATER STORAGE DISTRICT

ASSESSMENT OF
REASONABLE WATER REQUIREMENTS

WATER YEARS
2013-14
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2015-16
2016-17
2017-18

Prepared For:

ARVIN-EDISON WATER STORAGE DISTRICT

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June 2018

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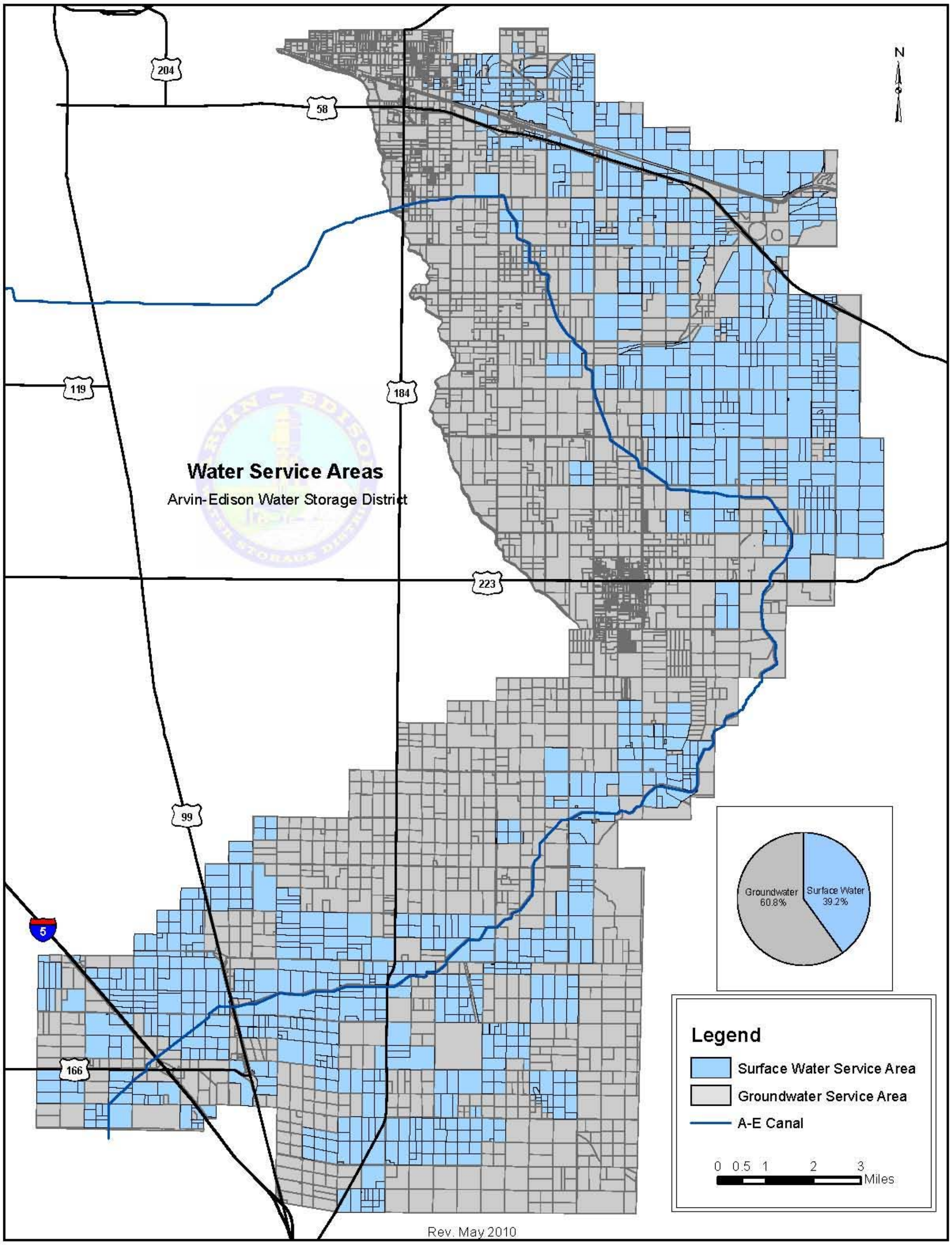

Figure 1. Arvin-Edison Water Storage District Boundary Map

ARVIN-EDISON WATER STORAGE DISTRICT

ASSESSMENT OF REASONABLE WATER REQUIREMENTS

2017 WATER YEAR - IRRIGATION SEASON

I. INTRODUCTION

This Assessment of Reasonable Water Requirements presents an estimate of water use by agricultural growers within the Arvin-Edison Water Storage District (AEWSD or District). Reasonable and beneficial water use is defined here as the minimum amount of water needed by crops for evapotranspiration and leaching in order to maximize yield. The approach of using a calibrated ET model and real time climatic data to determine water use is a widely accepted and commonly applied technique upon which the following water needs assessment is based. The assessment can then be compared to actual water use. The Summary section of this report provides a summary of the assessment and actual water use for this comparison.

Additional reasonable water use may include pre-irrigation, harvest, pest control, frost control, crop uniformity, germination, and dust control. An operational component factor is applied to account for these additional beneficial uses (see the Summary section).

The following data on crop water requirements for the District during the 2017 Water Year[1] was determined based on the calculations, considerations and procedures outlined herein. Note that some of the numbers reported are preliminary and subject to change and in that regard all final values/exhibits reside with the District. Data from previous years are provided as historical reference in Appendix 1.

Since crop water use is not restricted by the District's defined water year (March through February), water use from the Jan-Feb period for the following year will result in changing slightly the calculated results of the current year. For this reason, the results reported in the previous annual report will not match exactly those reported herein. These differences are minor and no attempt has been made to update the previous annual reports.

Starting in 2006, the District improved the way it tracked crops by utilizing new resources and methods. These included updating its Geographical Information System (GIS) database with new Kern County Assessor parcel map data, utilizing new aerial photography and more detailed subdivision of crop fields. The result was improved accuracy of field boundaries and calculation of crop acreages.

[1] Water Year = March through February (2017 Water Year = March 2017 through February 2018)

II. EFFECTIVE PRECIPITATION

Rainfall varies considerably from year to year as well as within a year in the District, and only a portion of the total precipitation contributes to crop evapotranspiration. The effective precipitation reported in this analysis was determined using the same formula applied by the United States Bureau of Reclamation (USBR) for preparation of annual water supply reports for water districts/users within the Central Valley Project (CVP) Friant Division (personal communication with USBR, Fresno, California office). The formula for effective precipitation is:

$$\text{Effective Precipitation} = \frac{0.8 \times (\text{Annual Rainfall} - 4)}{12} - 0.07$$

The annual rainfall amount in the equation is reported as inches and the divisor (12) converts the result into feet. The effective precipitation is then multiplied by actual cropped acres (i.e., actual = spring + winter – double/triple) to determine the total acre-feet of utilizable precipitation for the entire District.

Rainfall amounts are recorded within the District at three separate locations (Sycamore, Tejon, and the District Office weather stations). Using the average rainfall totals between the three stations and the net cropped acreage within the District each year, the utilizable annual precipitation was estimated as shown in Table 1.

The amount of utilizable precipitation (column 4) in each year was subtracted from estimates of the sum of Crop Evapotranspiration and the leaching requirement or ETc + LR (Table 10) to determine the net irrigation requirement of the District.

Table 1. Utilizable Precipitation

(Data Values Represent Fiscal Year, Mar through Feb)

Year	Average Annual (in)	Effective Rainfall (ac-ft/ac)	Total Irrigated (ac)	Utilizable Precipitation (ac-ft)	Effective Rainfall (%)
	(1)	(2)	(3)	(4)	(5)
1994-95	10.9	0.390	103,656	40,449	42.9
1995-96	12.4	0.493	110,244	54,338	47.5
1996-97	8.5	0.227	111,147	25,267	32.2
1997-98	8.8	0.250	112,789	28,147	34.1
1998-99	15.2	0.679	109,278	74,212	53.5
1999-00	5.2	0.010	106,197	1,062	2.3
2000-01	7.4	0.154	105,551	16,208	25.1
2001-02	5.7	0.042	107,687	4,499	8.8
2002-03	7.2	0.144	105,424	15,228	24.0

Table 1. Utilizable Precipitation (cont.)

(Data Values Represent Fiscal Year, Mar through Feb)

Year	Average Annual (in)	Effective Rainfall (ac-ft/ac)	Total Irrigated (ac)	Utilizable Precipitation (ac-ft)	Effective Rainfall (%)
	(1)	(2)	(3)	(4)	(5)
2003-04	9.4	0.291	104,508	30,447	37.1
2004-05	5.9	0.054	102,626	5,496	11.0
2005-06	8.2	0.208	102,951	21,460	30.6
2006-07	7.9	0.189	99,956	18,903	28.8
2007-08	6.1	0.070	100,961	7,067	13.8
2008-09	5.9	0.054	100,727	5,484	11.1
2009-10	7.5	0.164	100,024	16,426	26.2
2010-11	12.3	0.482	100,399	48,370	47.1
2011-12	5.6	0.040	101,627	4,020	8.4
2012-13	7.4	0.159	102,133	16,228	25.7
2013-14	2.9	0.000	99,225	0	0.0
2014-15	6.3	0.083	102,068	8,483	15.8
2015-16	7.6	0.167	100,666	16,845	26.6
2016-17	10.0	0.332	106,908	35,446	39.7
2017-18	2.8	0.000	101,596	0	0.0

1. Averaged from AE Headquarters, Sycamore and Tejon weather stations
2. Calculated effective precipitation
   Note: When average rainfall is less than 4.0 inches, effective precipitation is zero.
3. Total cropped acres includes spring and fall irrigated acres minus double/triple cropped acres
4. Utilizable Precipitation = (2) * (3)
5. Effective Rainfall (%) = {(2)/ [(1)/12]}*100

III. ELECTRO-CONDUCTIVITY OF WATER (ECw)

Water quality measurements are compiled monthly at three locations along the District canal system (Intake Canal, North Canal, and South Canal). For the first time, water quality data from the Intertie Pipeline were also received (for 2010 water inputs). These measurements provide a good indication of the salinity of the water, which is delivered for irrigation use during the crop season. No data was collected at the Intake Canal for the months of November/December of 2008 and January/February of 2009. Table 2 below presents the information for 2013 through 2017. Appendix 1 (Table A1) presents historical water quality data for previous years.

Table 2.[2] Water Quality Measurements

Year	Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
							ECw in micromhos/cm							
2013	**Intake**	390	403	329	292	361	421	389	197	384	321	354	272	343
	North	410	327	347	301	291	424	331	293	298	308	316	440	341
	South	387	340	364	375	357	414	392	403	418	390	377	479	391
	Intertie	364	348	378	425	382	415	467	442	514	400	387	486	417
													micromhos/cm =	373
													dS/m =	0.373
													Adjusted[3] dS/m =	**0.371**
2014	**Intake**	240	294	322	274	277	231	174	364	297	288	321	341	285
	North	384	364	326	410	429	432	420	426	391	432	446	512	414
	South	379	414	396	419	456	450	434	438	431	431	447	467	430
	Intertie	367	423	403	412	440	445	437	445	442	426	440	465	429
													micromhos/cm =	390
													dS/m =	0.390
													Adjusted dS/m =	**0.404**
2015	**Intake**	334	328	336	318	318	272	278	295	327	310	315	250	307
	North	506	432	459	448	448	454	464	474	461	482	546	505	473
	South	487	477	466	451	486	449	491	485	480	482	518	504	481
	Intertie	514	488	479	477	478	433	480	482	489	493	514	507	486
													micromhos/cm =	437
													dS/m =	0.473
													Adjusted dS/m =	**0.437**
2016	**Intake**	252	257	304	65	82	280	209	106	33	108	145	253	175
	North	541	495	79	91	91	426	456	381	357	251	135	286	299
	South	518	480	470	78	96	468	498	437	433	345	140		360
	Intertie	522	488	454	80	97	476	466	405	405	362	167	154	340
													micromhos/cm =	293
													dS/m =	0.293
													Adjusted dS/m =	**0.248**
2017	**Intake**	242	47	61	48	59	35	33	56	30	187	119	127	87
	North	364	48	66	49	59	41	29	64	25	184	157	135	102
	South	265	48	69	50	62	41	26	56	25	186	337	302	122
	Intertie	354	69	63	64	64	51	35	56	210	352	358	281	163
													micromhos/cm =	119
													dS/m =	0.119
													Adjusted dS/m =	**0.141**
2018	**Intake**	43	421											
	North	36	124											
	South	388	528											
	Intertie	428	533											

2. Water Year = March through February, for consistency with past reports this table is for calendar year.
3. For missing data, average values are produced from the same months of previous years.

IV. CROP EVAPOTRANSPIRATION (ETc)

The process of evapotranspiration (ET) depends upon climatic factors as well as the internal condition of the cropped field itself. If the internal conditions in a field are kept at an optimum (i.e., non-stressed growing conditions), then the ET rate is assumed to depend solely upon the meteorological regime. The concept of reference or potential evapotranspiration attempts to characterize the climatic environment in terms of its evaporative power (i.e., the maximum evaporation rate that the atmosphere is capable of extracting from a well-watered field under a given condition). Thus, the reference ET expresses the climatically imposed evaporative demand (Hillel, 1990).

Several climatic models have been developed to define reference ET and its relationship to crop water use. Most of these are reviewed by Doorenbos and Pruitt (1977) and Hatfield (1990). These models utilize either a grass crop (ETo), and alfalfa crop (ETp), or open water (ETpan) as the reference component (ETr). For this report, the ETr is based on a grass crop (ETo). Using a calculated reference ET value based on climatic variables, it is possible to account for the effects of specific crop characteristics and other internal field factors on crop water requirements using an empirical crop coefficient (Kc). The Kc is derived from the following formula:

$$Kc = \frac{ETc}{ETr}$$

Where,

Kc = the crop coefficient for a particular stage of growth
ETc = the evaporative demand of the crop
ETr = the evaporative demand of a reference component (e.g., grass, alfalfa, or open water)

Kc values vary widely among crops as well as between different growth stages for particular crops. Values for Kc's are generally derived under carefully controlled growing conditions and are reported in various literature sources (Doorenbos and Pruitt, 1977; Snyder et al., 1989 a, b). It is important to note that Kc values are dependent upon which reference ET component (i.e., ETo, ETp, or ETpan) is utilized to estimate the climatic evaporative demand.

By rearranging the above equation, the relationship between the ETr and ETc may be described as,

$$ETc = Kc \times ETr$$

Thus, the evapotranspiration demand of a crop (ETc) at any time during the growing season may be estimated through determination of an ETr (e.g., ETo) value and application of an appropriate Kc value.

The daily rate of actual ETc will seldom equal the ETr. Crop canopy characteristics, stand density, stage of growth, the degree of surface cover, and the soil moisture regime all affect the actual ET demand by the crop. In the case of annual crops, the seasonal total ETc will usually not equal the total ETr for the same period. Early in the season, during germination and stand-establishment, the rate of ETc is generally small. Later, the ET demand of the fully developed crop canopy may actually exceed the reference ET and then, as the crop matures, the actual ETc will again fall below ETr.

Crop water requirements are defined in this report as the depth of water required to meet the water loss through ETc (as defined above). It is assumed that the ETc demand is representative of a disease-free crop, growing in a field without restrictive soil conditions, and achieving full-production potential under the given environment. ETr is based on a grass crop and is defined in this analysis as ETo.

Reference ETo values were obtained from the California Irrigation Management Information System (CIMIS) network and are representative of the normal year ETo (inches/year). Table 3 provides the information for 2013 through 2017 Water Years. Appendix 1 (Table A2) provides the information for previous years.

Kc values for individual crops were determined on a monthly basis for identified stages of growth. The basic crop growth stages are schematically presented in Figure 2 and described in Table 4.

Table 3. Summary of Reference Evapotranspiration (ETo) - Inches

Month	2013-14	2014-15	2015-16	2016-17	2017-18
March	4.31	4.84	4.13	4.15	4.07
April	6.25	6.18	5.62	5.62	5.85
May	8.01	8.41	7.63	7.61	7.47
June	8.8	9.39	8.66	8.67	9.05
July	8.74	8.99	9.06	9.09	9.81
August	8.32	8.52	8.15	8.45	8.63
September	5.9	6.27	6.13	6.15	6.13
October	4.36	4.54	4.07	4.08	4.78
November	2.54	2.23	2.07	2.07	2.29
December	1.8	1.39	1.37	1.41	1.98
January	2.63	1.33	1.49	1.35	1.41
February	2.74	2.58	2.34	1.99	2.89
Total	**64.40**	**64.67**	**60.72**	**60.64**	**64.36**

Data from CIMIS Monthly Average Eto Report; (station 125) Arvin, CA

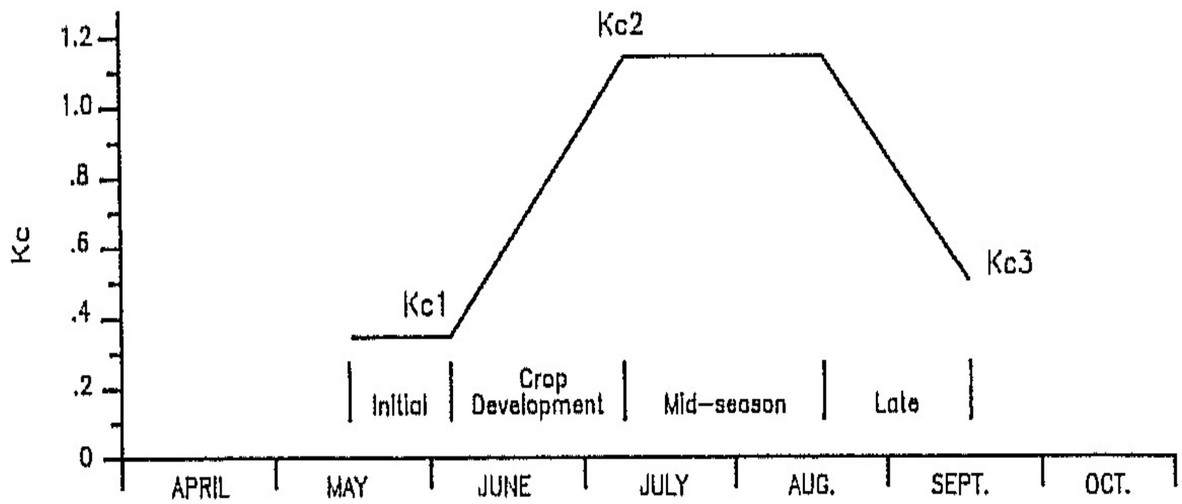

Figure 2. Generalized Crop Coefficients (Kc) and Growth Stages

Table 4. Description of Crop Coefficients (Kc) and Crop Growth Stages

Kc Value	Growth Stage	Description
Kc1	Initial	The average Kc value from planting to 10% cover.
Kc1 to Kc2 (positive slope)	Crop development	From 10% cover to about 75% cover or peak water use (whichever occurs first). In orchards/grapes from leaf out to full cover.
Kc2 (zero slope)	Mid-season	From attainment of full cover to the initiation of maturation or until water use begins to decline due to aging.
Kc2 to Kc3 (negative slope)	Late season	From the beginning of decline until harvest or water use ceases or becomes minimum.
Kc3	Harvest	The average value at harvest or at the end of the water use season.
NOTE: For deciduous tree crops grown with no cover crop, Kc2 corresponds to approximately 60% to 70% ground shading and Kc3 corresponds to leaf drop (mature trees only).		

Once the average Kc values for each month (or partial month) were determined, the KC's were multiplied times the reference ETo value for that month (in that particular year). The resulting monthly crop ETc values were summed to estimate the water requirement of the crop for the entire growing season. This value (i.e., ETc) represents the net amount of water required to satisfy the ET demand of the crop.

Estimates of the ETc (acre-feet/acre) for various crops produced within the District for 2013 through 2017 Water Years are presented in Table 5. Estimates of ETc for previous years are presented in Appendix 1 (Table A3). In addition, irrigated acres of each crop grown and the corresponding net ETc demand (total acre-feet) are presented in Tables 6 and 7, respectively for the 2013 through 2017 Water Years. Appendix 1 (Tables A4 and A5) provide the same data for previous years. Acreage values were obtained from District compiled crop census reports.

Table 5. Calculated Evapotranspiration Demand (ETc) for Various Crops[4,5]

(Data Values Represent Fiscal Year, Mar through Feb)

Crop	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
	Acre Feet / Acre				
Alfalfa	4.00	4.17	3.92	3.88	4.06
Almonds	3.47	3.61	3.38	3.34	3.52
Almonds, Young	3.47	3.61	3.38	3.34	3.52
Apples	4.07	4.22	3.98	4.02	4.18
Apricots	3.47	3.61	3.38	3.34	3.52
Apricots, Young					3.47
Artichokes				4.88	5.19
Asparagus	4.26	4.35	4.10	4.06	4.28
Barley	2.03	1.91	1.88	1.83	1.94
Beans (Green) (Fall)		1.00			
Beans (Green) (Spring)	1.50	1.57	1.44	1.43	1.46
Broccoli (Fall)	0.54	0.50	0.46	0.47	
Broccoli (Spring)	1.03	1.05	0.94	0.82	0.87
Bushberries	3.81	3.97	3.75	3.78	3.92
Bushberries - Young	3.81		3.75	3.78	3.92
Cabbage (Fall)	0.85	0.83		0.80	0.87
Cabbage (Spring)					0.86
Carrots (Fall)	1.33	1.32	1.24	1.27	1.38
Carrots (Spring)	1.73	1.80	1.63	1.57	1.64
Cauliflower (Fall)		0.83			0.87
Cauliflower (Spring)	0.91				0.86
Celery				2.65	2.75

4. Values that are less than 0.005 will appear as 0.00 due to rounding. All true zero values will be represented as a null or blank value.

5. Not all crop growth factors follow the Districts fiscal year boundaries. Therefore, some crops contribute to previous or post fiscal years. If a previous or post fiscal year does not include such a crop, then abnormally low values are seen for that crop. This is not an error, but expected due to the difference in fiscal and crop years.

Table 5. Calculated Evapotranspiration Demand (ETc) for Various Crops (cont.)

Crop	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
	Acre Feet / Acre				
Cherries	4.07	4.22	3.98	4.02	4.18
Cherries, Young	4.07	4.22	3.98	4.02	4.18
Cole Crops (Fall)	0.85	0.83	0.78		0.87
Cole Crops (Spring)	1.03	1.05	0.94	0.82	0.90
Corn (Fall)		1.76			
Corn (Spring)	2.51	2.61	2.50	2.53	2.64
Cotton	2.61	2.71	2.60	2.63	2.73
Flowers & Nursery	2.15	2.16	2.02	1.91	2.13
Grapefruit	2.95	2.96	2.78	2.62	2.93
Grapefruit, Young	2.71	0.18	2.78	2.62	2.77
Grass Misc	1.70				
Jojoba	2.95	2.96	2.78	2.62	2.91
Lemons	3.49	3.50	3.29	3.10	3.43
Lettuce (Fall)	0.97	1.02	0.96		1.03
Lettuce (Spring)	0.87	0.56	0.75	0.70	0.82
Melons, cucumbers, squash (Fall)					1.91
Melons, cucumbers, squash (Spring)	1.57	1.64	1.49	1.47	1.51
Misc. Deciduous	3.35	3.50	3.29	3.30	3.43
Misc. Deciduous, Young	3.35				
Misc. Field	3.12		3.07	3.08	3.20
Misc. Hay & Grain	2.03	1.91	1.88	1.83	1.94
Misc. Subtropical Fruits	2.95	2.96	2.78	2.62	2.86
Misc. Subtropical Fruits, Young	2.95	2.96	2.78	2.62	2.83
Misc. Truck/Berry	3.81	3.97	3.75	3.78	3.92
Mixed Deciduous			3.29	3.30	3.43
Mixed Hay & Grain	2.03	1.91	1.88	1.83	1.92
Mixed Pasture	4.77	0.22	4.82	4.65	4.98
Mixed Truck Crops	3.81	3.97	3.75	3.78	3.92
Oats	2.03	1.91	1.88	1.83	1.94
Onions & Garlic	2.57	2.16	2.29	2.23	2.41
Oranges	3.49	3.50	3.29	3.10	3.46
Oranges, Young	3.49	3.50	3.29	3.10	3.46
Peaches & Nectarines	3.35	3.50	3.29	3.30	3.43
Peaches & Nectarines, Young	3.35	3.50	3.29	3.30	3.43

Table 5. Calculated Evapotranspiration Demand (ETc) for Various Crops (cont.)

Crop	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
	Acre Feet / Acre				
Peppers (Fall)				2.32	2.43
Peppers (Spring)	2.12	2.21	2.07	2.06	2.14
Pistachios	3.58	3.72	3.50	3.54	3.68
Pistachios, Young	3.58	3.72	3.50	3.54	3.68
Plums	3.35	3.50	3.29	3.30	3.43
Potatoes (Fall)	1.38	1.40	1.32	1.35	1.44
Potatoes (Spring)	1.82	1.89	1.70	1.60	1.72
Safflower	2.49	2.60	2.39	2.33	2.45
Spinach			0.07	0.51	0.53
Strawberries					2.21
Sudan Grass				2.12	2.22
Sweet Potatoes (Fall)	1.13	1.16	1.09		1.18
Sweet Potatoes (Spring)	2.01	2.09	2.01	2.01	2.11
Tomatoes (Spring)	2.16	2.26	2.13	2.13	2.22
Turf Farm	4.24	4.31	4.05	3.79	4.17
Urban Landscaped	5.00	5.16	4.82	4.65	4.88
Vineyards	2.18	2.27	2.14	2.15	2.23
Vineyards, Young	2.18	2.27	2.14	2.15	2.23
Walnuts	3.50	3.64	3.44	3.48	3.62
Wheat	2.03	1.91	1.88	1.83	1.94

Table 6. Irrigated Acreage of Various Crops

(Data Values include Spring and Fall Crops)

Crop	2013-14	2014-15	2015-16	2016-17	2017-18
	Acres				
Alfalfa	1,327	583	754	927	765
Almonds	5,996	6,098	8,082	7,883	7,793
Almonds, Young	996	1,250	2,066	2,217	2,100
Apples	23	23	23	23	23
Apricots	152	130	125	134	121
Apricots, Young	0	0	0	0	32
Artichokes	0	0	0	76	0
Asparagus	32	26	0	235	39
Barley	286	240	112	0	0
Beans (Green) (Fall)	0	53	0	0	0
Beans (Green) (Spring)	751	868	554	512	401
Broccoli (Fall)	30	148	78	119	0
Broccoli (Spring)	107	84	216	162	262

Table 6. Irrigated Acreage of Various Crops (cont.)

Crop	2013-14	2014-15	2015-16	2016-17	2017-18
	Acres				
Bushberries	311	353	256	911	597
Bushberries - Young	80	0	0	0	0
Cabbage (Fall)	5	53	0	256	53
Cabbage (Spring)	0	0	0	0	94
Carrots (Fall)	4,059	9,485	8,496	10,518	9,871
Carrots (Spring)	3,822	3,321	3,839	3,906	3,652
Cauliflower (Fall)	0	114	0	0	9
Cauliflower (Spring)	0	0	0	0	79
Celery	0	0	0	39	0
Cherries	3,019	3,194	3,112	3,516	2,304
Cherries, Young	463	202	118	247	292
Cole Crops (Fall)	50	123	221	0	729
Cole Crops (Spring)	155	121	252	120	681
Corn (Fall)	0	255	0	0	0
Corn (Spring)	242	962	431	111	16
Cotton	1,664	409	0	39	79
Farmsteads	0	0	5	0	0
Feed Lots (livestock & poultry)	0	0	0	9	0
Flowers & Nursery	292	236	321	178	60
Grapefruit	134	197	287	195	156
Grapefruit, Young	40	0	0	0	0
Grass Land	0	0	227	0	0
Jojoba	118	235	118	151	154
Lemons	169	163	197	156	155
Lettuce (Fall)	293	164	457		87
Lettuce (Spring)	155	413	78	473	155
Light Brush	0	0	11	0	0
Melons, cucumbers, squash (Fall)	0	0	0	0	13
Melons, cucumbers, squash (Spring)	1,125	934	1,080	918	755
Misc. Deciduous	57	60	119	96	44
Misc. Hay & Grain	664	492	2,269	531	0
Misc. Subtropical Fruits	2,216	2,409	3,306	2,968	1,385
Misc. Subtropical Fruits, Young	958	727	457	391	9
Misc. Truck/Berry	1,061	3,094	1,392	2,469	1,263
Mixed Deciduous	0	0	8	40	20
Mixed Hay & Grain	1,022	591	81	0	0
Mixed Pasture	165	0	0	0	0
Mixed Truck Crops	1,006	2,307	1,860	2,424	1,449

Table 6. Irrigated Acreage of Various Crops (cont.)

Crop	2013-14	2014-15	2015-16	2016-17	2017-18
	Acres				
Oats	593	235	156	139	605
Onions & Garlic	4,808	4,176	4,160	3,912	4,234
Oranges	11,711	12,169	11,080	12,737	13,577
Oranges, Young	506	236	632	1,086	1,701
Peaches & Nectarines	971	1,288	739	1,080	858
Peaches & Nectarines, Young	79	61	37	98	110
Peppers (Fall)	0	0	0	43	10
Peppers (Spring)	2,003	2,327	2,137	2,205	1,718
Pistachios	167	167	590	1,066	179
Pistachios, Young	428	436	757	1,006	1,389
Plums	230	30	12	0	0
Potatoes (Fall)	996	1,623	888	1,377	1,404
Potatoes (Spring)	9,090	11,632	11,486	10,983	12,996
Safflower	221	240	365	290	0
Spinach	0	0	0	154	163
Strawberries	0	0	0	0	4
Sudan Grass	0	0	0	442	110
Sweet Potatoes (Fall)	79	207	59	0	222
Sweet Potatoes (Spring)	0	236	116	0	284
Tomatoes (Spring)	4,377	4,540	5,530	5,070	3,772
Turf Farm	58	246	0	0	0
Vineyards	26,572	27,859	26,768	27,281	26,869
Vineyards, Young	3,300	2,656	3,666	4,613	3,636
Walnuts	136	136	136	0	0
Wheat	6,768	4,757	2,631	3,901	4,647
Total	**106,138**	**115,374**	**112,953**[1]	**120,433**	**114,185**

1. Irrigated fallow land not included in total (470 acres in 2015WY)

Table 7. Total ETc Demand of Various Crops[6,7]

(Data Values include Spring and Fall Crops)

Crop	2013-14	2014-15	2015-16	2016-17	2017-18
	Acre-Feet				
Alfalfa	5385	2463	2955	3655	3106
Almonds	21155	22393	27340	26807	27468
Almonds, Young	3505	4578	6969	7518	7382
Apples	93	97	92	92	96
Apricots	536	477	423	456	426
Apricots, Young					111
Artichokes				371	394
Asparagus	137	114	0	961	167

Table 7. Total ETc Demand of Various Crops (cont.)

Crop	2013-14	2014-15	2015-16	2016-17	2017-18
	Acre-Feet				
Barley	584	462	212	0	0
Beans (Green) (Fall)	0	53			0
Beans (Green) (Spring)	1,124	1,365	797	732	587
Broccoli (Fall)	16	74	36	56	0
Broccoli (Spring)	112	90	185	137	229
Bushberries	1,186	1,402	961	3,447	2,342
Bushberries - Young	305		0	0	0
Cabbage (Fall)	4	44		204	46
Cabbage (Spring)	0	0			81
Carrots (Fall)	5,399	12,490	10,542	13,378	13,624
Carrots (Spring)	6,767	6,109	6,249	6,292	6,000
Cauliflower (Fall)		95			8
Cauliflower (Spring)	0	0	0	0	68
Celery				103	0
Cherries	12,273	13,484	12,385	14,123	9,620
Cherries, Young	1,882	853	470	992	1,219
Cole Crops (Fall)	42	102	172	0	635
Cole Crops (Spring)	166	133	222	104	611
Corn (Fall)		448			
Corn (Spring)	607	2,512	1,079	281	42
Cotton	4,338	1,109	0	103	216
Flowers & Nursery	664	538	649	362	128
Grapefruit	419	618	747	545	456
Grapefruit, Young	109	0	0	0	0
Grass Misc	29	0			
Jojoba	366	732	326	419	447
Lemons	620	600	642	512	532
Lettuce (Fall)	285	167	441		89
Lettuce (Spring)	138	239	60	342	128
Melons, cucumbers, squash (Fall)					25
Melons, cucumbers, squash (Spring)	1,786	1,545	1,612	1,358	1,139
Misc. Deciduous	191	210	391	317	151
Misc. Hay & Grain	1,356	947	4,287	981	0
Misc. Subtropical Fruits	6,774	7,394	8,968	8,101	3,958
Misc. Subtropical Fruits, Young	2,903	2,212	1,227	1,057	25
Misc. Truck/Berry	4,046	12,289	5,225	9,342	4,954
Mixed Deciduous			26	132	69
Mixed Hay & Grain	2,075	1,130	152	0	0
Mixed Pasture	810	0	0	0	0
Mixed Truck Crops	3,836	9,163	6,982	9,172	5,684

Table 7. Total ETc Demand of Various Crops (cont.)

Crop	2013-14	2014-15	2015-16	2016-17	2017-18
	Acre-Feet				
Oats	1,211	452	295	257	1,172
Onions & Garlic	12,477	9,141	9,658	8,833	10,219
Oranges	43,247	45,116	36,410	42,106	46,946
Oranges, Young	1,869	875	2,077	3,590	5,882
Peaches & Nectarines	3,255	4,507	2,429	3,570	2,942
Peaches & Nectarines, Young	265	213	122	324	377
Peppers (Fall)				100	24
Peppers (Spring)	4,242	5,151	4,418	4,540	3,671
Pistachios	598	621	2,068	3,770	658
Pistachios, Young	1,533	1,622	2,653	3,558	5,106
Plums	771	105	39	0	0
Potatoes (Fall)	1,376	2,277	1,174	1,864	2,016
Potatoes (Spring)	17,339	22,955	19,560	18,505	22,301
Safflower	559	632	871	688	0
Spinach				79	86
Strawberries					9
Sudan Grass				939	244
Sweet Potatoes (Fall)	89	241	64		263
Sweet Potatoes (Spring)	0	494	233	0	600
Tomatoes (Spring)	9,469	10,283	11,799	10,822	8,392
Turf Farm	260	1,119	0	0	0
Vineyards	58,024	63,341	57,394	58,790	59,818
Vineyards, Young	7,206	6,039	7,860	9,941	8,095
Walnuts	475	494	468	0	0
Wheat	13,820	9,156	4,970	7,204	9,000
Totals	**270,108**	**293,570**	**267,384**	**291,931**	**280,085**

6. Values that are less than 0.5 will appear as 0 due to rounding. All true zero values will be represented as a null or blank value.

7. Not all crop growth factors follow the Districts fiscal year boundaries. Therefore, some crops contribute to previous or post fiscal years. If a previous or post fiscal year does not include such a crop, then abnormally low values are seen for that crop. This is not an error but expected due to the difference in fiscal and crop years.

V. CROP LEACHING

Drainage of irrigated cropland is essential to remove excess soluble salts from the root zone and to maintain optimum crop productivity. Increases in soil salinity levels primarily occur as a result of salt importation from irrigation water and, to a lesser extent, from other sources such as fertilizers and soil amendments (Hanson et al., 1993). Water imported into the District from the CVP (Friant-Kern Canal) and Kern River has an extremely low salt content relative to other

8. Intertie Pipeline deliveries began in July 2002

imported surface water sources such as State Water Project (Cross Valley Canal and the District's Intertie Pipeline[8]) and groundwater (District and Kern Fan projects). Over time, however, salt accumulation will occur in the crop root zone if an appropriate amount of leaching is not provided. Since effective rainfall is often lacking or inconsistent in the region, leaching of salts out of the crop root zone must be accomplished through the application of additional irrigation water.

The leaching fraction (LF) is defined as the incremental portion of infiltrated water, beyond that required for crop evapotranspiration (ETc) that must pass through the root zone to maintain the soil solution at a salinity level compatible with the particular crop being grown. The LF is dependent upon the salinity of the irrigation water and the salinity tolerance of the crop. It may be calculated as follows:

$$LF = \frac{ECw}{5\,(ECe) - ECw}$$

where,

ECw = the electrical conductivity of the irrigation water

ECe = the maximum electrical conductivity of the saturated soil paste extract at which 100 percent crop yield is maintained. This is also described as the crop salinity threshold.

Accordingly, the leaching requirement (LR) is defined as the incremental portion of water necessary to satisfy the required leaching fraction. It is dependent upon the crop ET demand (ETc) and is expressed as a depth of water in inches, feet, acre-inches, or acre-feet per acre. The LR may be calculated as follows:

$$LR = \frac{ETc * LF}{1 - LF}$$

where,

ETc = the net crop evapotranspiration requirement.
LF = the leaching fraction.

It is important to note that the terms LF and LR are sometimes used interchangeably. Both terms refer to that portion of irrigation water, which should pass through the root zone to maintain salt concentration at a desired level. As indicated in the equations above, however, LR should be considered as a specified volume of water, which is dependent upon the crop ET requirement (ETc), whereas LF is expressed only as a fraction or percentage.

Water sources available to the District include both imported surface and banked groundwater stored supplies. Imported surface water is acquired primarily from the Friant-Kern Canal, through a series of exchange agreements through the Cross-Valley Canal, and the District's Intertie Pipeline. To a lesser extent, imported surface water may also be obtained from the Kern River and other sources. If necessary, the annual surface water allocation is supplemented by banked groundwater storage, which is pumped in various amounts from three separate well fields, to meet in-District irrigation demands. Water from all sources (surface and groundwater) is combined in the District conveyance system prior to delivery to water users. Thus, the quality of water delivered to District users represents a composite of various water sources (blended).

Water quality measurements are compiled monthly at three locations along the District canal. These measurements provide a good indication of the salinity of the water, which is delivered for irrigation use throughout the crop season. To estimate an appropriate LR for each crop, an estimate of the average water salinity was determined for each year as shown in Table 2.

Based upon salinity thresholds for specific crops, as documented in the literature and presented in Table 8, an appropriate LF for each crop grown in the District was determined. The LF values (not shown) together with the total ETc demands (Table 7) were then used to determine the LR for each crop. The results are provided in Table 9 for 2013 through 2017 Water Years. Appendix 1 (Table A6) provides the same information for previous years. Lastly, the total ETc and LR demand for crops grown in the District are presented in Table 10 for the 2013 through 2017 Water Years and Appendix 1 (Table A7) for previous years.

Soil Salinity:

The leaching fraction (LF) considers water salinity but does not consider the soil salinity. As an example, if a soil with an EC of 5 is used to produce a crop with a salinity threshold of 8, it will produce a good crop. If that soil is later planted with a crop with a salinity threshold of 1.7, extra leach water will be needed to reduce the soil EC from 5 to 1.7. The reverse could also be true. It should be noted that this reclamation leaching has not been included herein.

Other Beneficial Irrigation (Non-Crop):

The District records irrigation events that are beneficial but do not fall within the normal crop definition. These include particle/dust suppression (on fallow ground and roads) and miscellaneous irrigations on farmsteads/dairies. Based on data gathered for like events and past experience, an estimate of 1.0 acre-feet/acre is used for estimation of beneficial use. This item (if so noted for the year) is appended to the end of Table A7.

Table 8. Crop Salinity Thresholds for Various Crops

Crop	Salinity Threshold (dS/m)	Crop	Salinity Threshold (dS/m)	Crop	Salinity Threshold (dS/m)
Alfalfa	2	Garlic	1.2	Pecans	1.5
Almonds	1.5	Garlic (Early)	1.2	Peppers	1.5
Almonds, Young	1.5	Grain Hay	6	Peppers (Late)	1.5
Apples	1.5	Grapefruit	1.7	Persimmons	1.5
Apricots	1.6	Grapefruit, Young	1.7	Pistachios	2.5
Apricots, Young	1.6	Grapes	1.5	Pistachios, Young	2.5
Artichokes	1	Irrigated Pasture	4	Pistachios Standard	2.5
Barley	8	Jojoba	1.7	Plums	1.5
Beans (Blackeye)	1.3	Kiwi	1.5	Plums, Young	1.5
Beans (Dry)	1	Lettuce (Fall)	1.3	Potatoes	1.7
Beans (Green)	1	Lettuce (Spring)	1.3	Pumpkins	2.2
Berries	1.5	Melons	2.2	Radishes	1.2
Broccoli (Fall)	2.8	Melons (Early)	2.2	Rice	3
Broccoli (Spring)	1.8	Melons, cucumbers, squash	2.2	Safflower	5.3
Bushberries	1.5	Milo (Sorghum)	6.8	Safflower (Early)	5.3
Bushberries, Young	1.5	Misc. Deciduous	1.7	Safflower (Late)	5.3
Cabbage (Fall)	1.8	Misc. Field	6	Silage (Early)	6.8
Cabbage (Spring)	1.8	Misc. Hay & Grain	6	Silage (Late)	6.8
Cactus	4	Misc. Subtropical Fruits	1.7	Small Grains	6
Cantaloupes	2.2	Misc. Subtropical Fruits, Young	1.7	Sod	4
Carrots (Fall)	1	Misc. Trees	1.7	Spinach	1.2
Carrots (Spring)	1	Misc. Truck/Berry	1.5	Squash	2.5
Cauliflower (Fall)	1.8	Misc. Veg.	1.2	Strawberries	1
Cauliflower (Spring)	1.8	Mixed Hay & Grain	6	Sudan Grass	2.8
Celery	2.2	Native Pasture	6	Sugar Beets	7
Cherries	1.5	Nectarines	1.7	Sunflowers	5.3
Cherries, Young	1.5	Nursery Roses	0	Sweet Corn (Early)	1.7
Christmas	1.5	Oats	6	Sweet Corn (Late)	1.7
Citrus (All)	1.7	Onions & Garlic	1.2	Sweet Potatoes	1.5
Cole Crops (Fall)	2.3	Onions (Early)	1.2	Tomatoes	2.5
Cole Crops (Spring)	2.3	Onions (Late)	1.2	Tomatoes (Late)	2.5
Corn – Fall	1.7	Oranges	1.7	Turf Farm	4
Corn - Spring	1.7	Oranges, Young	1.7	Turnip	1
Cotton	7.7	Parsnips	1	Vineyards	1.5
Eucalyptus	8	Peaches	1.7	Vineyards, Young	1.5
Eggplant	1.1	Peaches & Nectarines	1.7	Walnuts	1.7
Figs	2.7	Peaches & Nectarines, Young	1.7	Watermelon	2.2
Flowers & Nursery	2.5	Pears	1.5	Wheat	6

Table 9. Leaching Requirement (LR) for Various Crops[9,10]

(Data Values are for Fiscal Year (Mar through Feb) and include Spring & Fall Crops)

Crops	2013-14	2014-15	2015-16	2016-17	2017-18
	Acre Feet				
Alfalfa	216	108	141	95	45
Almonds	1,161	1,353	1,801	949	535
Almonds, Young	192	277	459	266	144
Apples	5	6	6	3	2
Apricots	27	27	26	15	8
Apricots, Young				0	2
Artichokes				20	12
Asparagus	3	2	0	12	1
Barley	6	5	2	0	0
Beans (Green) (Fall)		5			
Beans (Green) (Spring)	98	132	84	40	
Broccoli (Fall)	0	2	1	1	18
Broccoli (Spring)	5	4	10	4	4
Bushberries	65	85	63	122	46
Bushberries - Young	17		0	0	
Cabbage (Fall)	0	2		6	1
Cabbage (Spring)					1
Carrots (Fall)	470	1,205	1,115	737	406
Carrots (Spring)	589	589	661	346	179
Cauliflower (Fall)		5			0
Cauliflower (Spring)	0				1
Celery				2	0
Cherries	673	815	816	500	0
Cherries, Young	103	52	31	35	187
Cole Crops (Fall)	1	4	7		24
Cole Crops (Spring)	6	5	9	2	8
Corn (Fall)		5			8
Corn (Spring)	29	132	62	9	1
Cotton	43	12	0	1	1
Flowers & Nursery	21	19	24	7	1
Grapefruit	20	32	33	17	8
Grapefruit, Young	5	0	0	0	0
Grass Misc	0				
Jojoba	18	38	19	13	8

9. Values that are less than 0.005 will appear as 0.00 due to rounding. All true zero values will be represented as a null or blank value.

10. Not all crop growth factors follow the Districts fiscal year boundaries. Therefore, some crops contribute to previous or post fiscal years. If a previous or post fiscal year does not include such a crop, then abnormally low values are seen for that crop. This is not an error but expected due to the difference in fiscal and crop years.

Table 9. Leaching Requirement (LR) for Various Crops (cont.)

Crops	2013-14	2014-15	2015-16	2016-17	2017-18
	Acre Feet				
Lemons	30	32	37	16	9
Lettuce (Fall)	18	12	34		2
Lettuce (Spring)	9	17	5	14	3
Melons, cucumbers, squash (Fall)					0
Melons, cucumbers, squash (Spring)	65	61	69	32	15
Misc. Deciduous	9	11	22	10	3
Misc. Hay & Grain	17	13	64	8	0
Misc. Subtropical Fruits	324	389	513	251	68
Misc. Subtropical Fruits, Young	139	116	70	33	0
Misc. Truck/Berry	222	742	344	331	97
Mixed Deciduous			2	4	1
Mixed Hay & Grain	26	16	2	0	0
Mixed Pasture	16	0	0	0	0
Mixed Truck Crops	210	554	460	325	111
Oats	15	6	4	2	6
Onions & Garlic	880	712	822	398	251
Oranges	2,067	2,371	2,084	1,305	804
Oranges, Young	89	46	119	111	101
Peaches & Nectarines	156	237	139	111	50
Peaches & Nectarines, Young	13	11	7	10	6
Peppers (Fall)				4	0
Peppers (Spring)	233	311	291	161	72
Pistachios	19	21	78	78	8
Pistachios, Young	48	56	100	74	59
Plums	42	6	3	0	0
Potatoes (Fall)	66	120	67	58	35
Potatoes (Spring)	829	1,206	1,120	573	382
Safflower	8	10	15	7	0
Spinach				4	2
Strawberries					0
Sudan Grass				17	3
Sweet Potatoes (Fall)	5	15	4		5
Sweet Potatoes (Spring)	0	30	15	0	12
Tomatoes (Spring)	299	356	443	224	97
Turf Farm	5	24	0	0	0
Vineyards	3,184	3,826	3,781	2,082	1166
Vineyards, Young	395	365	518	352	158
Walnuts	23	26	27	0	0
Wheat	175	127	75	61	43
Total	**13,408**	**16,764**	**16,708**	**9,857**	**5,221**

Table 10. Total of Etc and LR Demand for Crops[11,12a,12b]

(Data Values are for Fiscal Year (Mar through Feb) and include Spring & Fall Crops)

Crops	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
	Total Acre-Feet				
Alfalfa	5,601	2,571	3,096	3,751	3,151
Almonds	22,316	23,746	29,142	27,756	28,004
Almonds, Young	3,697	4,855	7,429	7,784	7,526
Apples	99	103	98	96	98
Apricots	564	504	449	471	434
Apricots, Young				0	113
Artichokes				391	406
Asparagus	140	116	0	973	168
Barley	590	467	214	0	0
Beans (Green) (Fall)		58			
Beans (Green) (Spring)	1,221	1,496	881	772	605
Broccoli (Fall)	17	76	37	57	
Broccoli (Spring)	117	95	195	141	233
Bushberries	1,251	1,487	1,024	3,569	2,387
Bushberries - Young	322		0	0	0
Cabbage (Fall)	4	46		210	47
Cabbage (Spring)					82
Carrots (Fall)	5,869	13,694	11,658	14,115	14,030
Carrots (Spring)	7,357	6,698	6,910	6,638	6,179
Cauliflower (Fall)		100			8
Cauliflower (Spring)	0				69
Celery				106	0
Cherries	12,946	14,299	13,200	14,623	9,808
Cherries, Young	1,985	904	501	1,027	1,243
Cole Crops (Fall)	44	106	179		643
Cole Crops (Spring)	172	138	231	106	618
Corn (Fall)		454			
Corn (Spring)	636	2,644	1,141	290	43
Cotton	4,380	1,121	0	103	217
Flowers & Nursery	685	557	673	370	129
Grapefruit	439	650	780	562	464
Grapefruit, Young	114	0	0	0	0
Grass Misc	29				
Jojoba	384	771	344	432	455
Lemons	649	632	679	527	541
Lettuce (Fall)	303	179	475		91

11. Values that are less than 0.5 will appear as 0 due to rounding. All true zero values will be represented as a null or blank value.

12a. Not all crop growth factors follow the Districts fiscal year boundaries. Therefore, some crops contribute to previous or post fiscal years. If a previous or post fiscal year does not include such a crop, then abnormally low values are seen for that crop. This is not an error but expected due to the difference in fiscal and crop years.

12b. Values for ETc and LR are calculated in decimals but reported in whole numbers, slight discrepancies might occur.

Table 10. Total of Etc and LR Demand for Crops (cont.)[1]

Crops	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
	Total Acre-Feet				
Lettuce (Spring)	147	256	65	356	131
Melons, cucumbers, squash (Fall)					25
Melons, cucumbers, squash (Spring)	1,850	1,606	1,681	1,390	1,154
Misc. Deciduous	200	221	413	327	153
Misc. Hay & Grain	1,373	960	4,351	989	0
Misc. Subtropical Fruits	7,098	7,782	9,482	8,352	4,026
Misc. Subtropical Fruits, Young	3,041	2,328	1,298	1,089	26
Misc. Truck/Berry	4,268	13,031	5,569	9,673	5,051
Mixed Deciduous			28	136	70
Mixed Hay & Grain	2,101	1,146	154	0	0
Mixed Pasture	825	0	0	0	0
Mixed Truck Crops	4,047	9,717	7,441	9,496	5,794
Oats	1,226	459	299	259	1,177
Onions & Garlic	13,357	9,853	10,480	9,231	10,470
Oranges	45,314	47,487	38,494	43,411	47,750
Oranges, Young	1,958	921	2,196	3,701	5,982
Peaches & Nectarines	3,411	4,744	2,568	3,681	2,992
Peaches & Nectarines, Young	278	225	129	334	384
Peppers (Fall)				103	25
Peppers (Spring)	4,475	5,463	4,709	4,701	3,743
Pistachios	617	643	2,146	3,848	666
Pistachios, Young	1,582	1,678	2,753	3,632	5,165
Plums	813	111	42	0	0
Potatoes (Fall)	1,441	2,397	1,241	1,922	2,050
Potatoes (Spring)	18,168	24,161	20,679	19,079	22,683
Safflower	567	642	886	694	0
Spinach				83	88
Strawberries					9
Sudan Grass				956	247
Sweet Potatoes (Fall)	94	255	69		268
Sweet Potatoes (Spring)	0	524	248	0	612
Tomatoes (Spring)	9,767	10,639	12,242	11,046	8,489
Turf Farm	265	1,142	0	0	0
Vineyards	61,208	67,167	61,175	60,872	60,984
Vineyards, Young	7,601	6,404	8,378	10,293	8,252
Walnuts	498	520	495	0	0
Wheat	13,995	9,283	5,045	7,264	9,043
Totals	**283,516**	**310,333**	**284,092**	**301,788**	**285,300**

VI. IRRIGATION EFFICIENCY

Distribution Uniformity:

On-farm irrigation systems exhibit non-uniformities in distribution due to imperfections in design and implementations. The non-uniformity of water applications is characterized using the concept of distribution uniformity. Distribution Uniformity (DU) is defined as the average depth infiltrated in the low one-quarter of the field divided by the average depth infiltrated over the entire field for surface systems. In like manner, the DU is also applied to all types of irrigation systems including drip, micro irrigation and all types of sprinkler systems (Hoffman, G.J., et al., 2007). This non-uniformity of application within a given field is not accounted for in the efficiency definitions (Hoffman, G.J., et al., 2007).

Because irrigation systems are not uniform, the lower quarter of the field will tend to be under stress if applied water is consistent with the evapotranspiration plus leaching quantities. For this reason, a grower will over irrigate to ensure that the applied amount is sufficient for the lowest quarter of the field. This will cause some of the field to be over irrigated. This additional water use is herein considered beneficial as successful farming cannot be efficient without DU considerations. DU is included in the Operational Component (OC) in Table 15.

Summary of Per Acre Use:

Table 11 presents the net irrigation water requirements per crop acre for the 2017-2018 crop season. This table shows the cropped acres from Table 6 and the total ETc + LR in acre-feet from Table 10. The ‘per acre’ value is calculated by dividing the total ETc + LR in acre-feet by the cropped acres, resulting with the ETc + LR in acre-feet/acre (AF/AC). The effective precipitation for the 2017-2018 season has been calculated using Table 1 data and is provided in the next column of the table. Finally, the net irrigation water requirement is the sum of the ETc + LR in acre-feet/acre minus the effective rainfall.

The cropped acres from Table 6 have been augmented with additional acreage to account for crop seasons that do not align with the water season. If a crop season (only selected crops) for the previous year runs past that year’s season (into March of the current year), the water use for that crop will continue into the current year. The acreage is added to allow accounting for the water use in the current year for these selected crops.

The net irrigation value shown in Table 11 does not include the operational component presented in Table 15.

Table 11. Per Acre Net Water Use for 2017-18

Crop	Irrigated Acres	ETc + LR	ETc + LR	Effective Rainfall	Net Irrigation
	(Acres)	(AF)	(AF/AC)	(AF/AC)	(AF/AC)
Alfalfa	765	3,151	4.12	0.0	4.12
Almonds	7,793	28,004	3.59	0.0	3.59
Almonds, Young	2,100	7,526	3.58	0.0	3.58
Apples	23	98	4.26	0.0	4.26
Apricots	121	434	3.59	0.0	3.59
Apricots, Young	32	113	3.54	0.0	3.54
Artichokes	76	406	5.34	0.0	5.34
Asparagus	39	168	4.31	0.0	4.31
Beans (Green) (Spring)	401	605	1.51	0.0	1.51
Broccoli (Spring)	262	233	0.89	0.0	0.89
Bushberries	597	2,387	4.00	0.0	4.00
Cabbage (Fall)	53	47	0.88	0.0	0.88
Cabbage (Spring)	94	82	0.87	0.0	0.87
Carrots (Fall)	9,871	14,030	1.42	0.0	1.42
Carrots (Spring)	3,652	6,179	1.69	0.0	1.69
Cauliflower (Fall)	9	8	0.88	0.0	0.88
Cauliflower (Spring)	79	69	0.87	0.0	0.87
Cherries	2,304	9,808	4.26	0.0	4.26
Cherries, Young	292	1,243	4.26	0.0	4.26
Cole Crops (Fall)	729	643	0.88	0.0	0.88
Cole Crops (Spring)	681	618	0.91	0.0	0.91
Corn (Spring)	16	43	2.68	0.0	2.68
Cotton	79	217	2.74	0.0	2.74
Flowers & Nursery	60	129	2.15	0.0	2.15
Grapefruit	156	464	2.98	0.0	2.98
Jojoba	154	455	2.95	0.0	2.95
Lemons	155	541	3.49	0.0	3.49
Lettuce (Fall)	87	91	1.05	0.0	1.05
Lettuce (Spring)	155	131	0.84	0.0	0.84
Melons, cucumbers, squash (Fall)	13	25	1.94	0.0	1.94
Melons, cucumbers, squash (Spring)	755	1,154	1.53	0.0	1.53
Misc. Deciduous	44	153	3.49	0.0	3.49
Misc. Subtropical Fruits	1,385	4,026	2.91	0.0	2.91
Misc. Subtropical Fruits, Young	9	26	2.88	0.0	2.88
Misc. Truck/Berry	1,263	5,051	4.00	0.0	4.00
Mixed Deciduous	20	70	3.49	0.0	3.49
Mixed Truck Crops	1,449	5,794	4.00	0.0	4.00
Oats	605	1,177	1.95	0.0	1.95
Onions & Garlic	4,234	10,470	2.47	0.0	2.47

Table 11. Per Acre Net Water Use for 2017-18 (cont.)

Crop	Irrigated Acres	ETc + LR	ETc + LR	Effective Rainfall	Net Irrigation
	(Acres)	(AF)	(AF/AC)	(AF/AC)	(AF/AC)
Oranges	13,577	47,750	3.52	0.0	3.52
Oranges, Young	1,701	5,982	3.52	0.0	3.52
Peaches & Nectarines	858	2,992	3.49	0.0	3.49
Peaches & Nectarines, Young	110	384	3.49	0.0	3.49
Peppers (Fall)	10	25	2.48	0.0	2.48
Peppers (Spring)	1,718	3,743	2.18	0.0	2.18
Pistachios	179	666	3.72	0.0	3.72
Pistachios, Young	1,389	5,165	3.72	0.0	3.72
Potatoes (Fall)	1,404	2,050	1.46	0.0	1.46
Potatoes (Spring)	12,996	22,683	1.75	0.0	1.75
Spinach	163	88	0.54	0.0	0.54
Strawberries	4	9	2.28	0.0	2.28
Sudan Grass	110	247	2.24	0.0	2.24
Sweet Potatoes (Fall)	222	268	1.21	0.0	1.21
Sweet Potatoes (Spring)	284	612	2.15	0.0	2.15
Tomatoes (Spring)	3,772	8,489	2.25	0.0	2.25
Vineyards	26,869	60,984	2.27	0.0	2.27
Vineyards, Young	3,636	8,252	2.27	0.0	2.27
Wheat	4,647	9,043	1.95	0.0	1.95
Totals	**114,261**[1]	**285,300**	**2.50**	**0**	**2.50**

1. 76 Acres of Perennial Artichokes from 2016 carried over to 2017.

<u>Summary of Use by Application Method (Irrigation Type):</u>

Using the Net Irrigation in acre-feet/acre (Table 11), Table 12 presents the 2017-2018 water use by application method (irrigation type). The efficiency associated with each application method, assumed from previous experience, is provided below:

Irrigation Type	Efficiency
Drip or Micro	85%
Sprinkler	75%
Gravity	65%

The District has recorded land area by irrigation type for 2017-2018 for each crop type. Using the District data (acres by crop type) times the water use by irrigation application method, the water use for irrigation type is added to the previous net irrigation requirement. The total is provided in Table 12.

Table 12. 2017-2018 Water Use by Irrigation Type

Crop	Net Irrigation (AF/AC)	Net Irrigation Factors by Application Method (AF/AC)			Total Water Including Irrigation by Application Method (AF)				Total Water Including Operational Component Minus Irrigation by Application Method (OC)				**TOTAL**	Gross Irrigation Factors by Application Method (AF/AC)		
		Drip & Micro	Sprinkler	Gravity	Drip & Micro	Sprinkler	Gravity	**Sum**	Drip & Micro	Sprinkler	Gravity	**Sum**	**(AF)**	Drip & Micro	Sprinkler	Gravity
Alfalfa	4.12	4.74	5.15	5.56	0	3,578	389	3,967	0	206	22	229	4,196		5.45	5.88
Almonds	3.59	4.13	4.49	4.85	32,204	0	0	32,204	1,855	0	0	1,855	34,059	4.37		
Almonds, Young	3.58	4.12	4.48	4.84	8,655	0	0	8,655	499	0	0	499	9,154	4.36		
Apples	4.26	4.90	5.32	5.75	113	0	0	113	6	0	0	6	119	5.18		
Apricots	3.59	4.13	4.49	4.85	499	0	0	499	29	0	0	29	528	4.37		
Apricots, Young	3.54	4.07	4.42	4.78	130	0	0	130	8	0	0	8	138	4.30		
Artichokes	5.34	6.15	6.68	7.22	0	508	0	508	0	29	0	29	537		7.07	
Asparagus	4.31	4.96	5.39	5.82	193	0	0	193	11	0	0	11	204	5.24		
Beans (Green) (Spring)	1.51	1.73	1.89	2.04	0	758	0	758	0	44	0	44	802		1.99	
Broccoli (Spring)	0.89	1.02	1.11	1.20	0	291	0	291	0	17	0	17	308		1.17	
Bushberries	4.00	4.60	5.00	5.40	2,741	0	0	2,741	158	0	0	158	2,899	4.86		
Cabbage (Fall)	0.88	1.02	1.11	1.19	0	59	0	59	0	3	0	3	62		1.17	
Cabbage (Spring)	0.87	1.00	1.09	1.18	0	102	0	102	0	6	0	6	108		1.15	
Carrots (Fall)	1.42	1.63	1.78	1.92	0	17,537	0	17,537	0	1,010	0	1,010	18,548		1.88	
Carrots (Spring)	1.69	1.95	2.12	2.28	0	7,724	0	7,724	0	445	0	445	8,169		2.24	
Cauliflower (Fall)	0.88	1.02	1.11	1.19	0	10	0	10	0	1	0	1	11		1.17	
Cauliflower (Spring)	0.87	1.00	1.09	1.18	0	86	0	86	0	5	0	5	91		1.15	
Cherries	4.26	4.90	5.32	5.75	11,274	0	0	11,274	649	0	0	649	11,923	5.18		
Cherries, Young	4.26	4.90	5.32	5.75	1,425	0	0	1,425	82	0	0	82	1,507	5.18		
Cole Crops (Fall)	0.88	1.01	1.10	1.19	0	803	0	803	0	46	0	46	850		1.17	
Cole Crops (Spring)	0.91	1.04	1.13	1.23	0	773	0	773	0	45	0	45	817		1.20	
Corn (Spring)	2.68	3.08	3.35	3.62	49	0	0	49	3	0	0	3	52	3.26		
Cotton	2.74	3.16	3.43	3.70	0	271	0	271	0	16	0	16	287		3.63	
Flowers & Nursery	2.15	2.48	2.69	2.91	40	118	0	158	2	7	0	9	167	2.62	2.85	
Grapefruit	2.98	3.42	3.72	4.02	534	0	0	534	31	0	0	31	565	3.62		
Jojoba	2.95	3.40	3.69	3.99	523	0	0	523	30	0	0	30	553	3.59		
Lemons	3.49	4.01	4.36	4.71	622	0	0	622	36	0	0	36	658	4.24		
Lettuce (Fall)	1.05	1.21	1.31	1.42	0	114	0	114	0	7	0	7	121		1.39	
Lettuce (Spring)	0.84	0.97	1.05	1.14	0	163	0	163	0	9	0	9	173		1.11	
Melons, cucumbers, squash (Fall)	1.94	2.23	2.42	2.62	0	31	0	31	0	2	0	2	33		2.56	
Melons, cucumbers, squash (Spring)	1.53	1.76	1.91	2.06	1,327	0	0	1,327	76	0	0	76	1,404	1.86		

Table 12. 2017-2018 Water Use by Irrigation Type (cont.)

Crop	Net Irrigation (AF/AC)	Net Irrigation Factors by Application Method (AF/AC)			Total Water Including Irrigation by Application Method (AF)				Total Water Including Operational Component Minus Irrigation by Application Method (OC)				TOTAL	Gross Irrigation Factors by Application Method (AF/AC)		
		Drip & Micro	Sprinkler	Gravity	Drip & Micro	Sprinkler	Gravity	**Sum**	Drip & Micro	Sprinkler	Gravity	**Sum**	**(AF)**	Drip & Micro	Sprinkler	Gravity
Misc. Deciduous	3.49	4.01	4.36	4.71	176	0	0	176	10	0	0	10	187	4.24		
Misc. Subtropical Fruits	2.91	3.34	3.63	3.92	4,630	0	0	4,630	267	0	0	267	4,897	3.54		
Misc. Subtropical Fruits, Young	2.88	3.31	3.60	3.89	30	0	0	30	2	0	0	2	32	3.50		
Misc. Truck/Berry	4.00	4.60	5.00	5.40	0	6,313	0	6,313	0	364	0	364	6,677		5.29	
Mixed Deciduous	3.49	4.01	4.36	4.71	80	0	0	80	5	0	0	5	85	4.24		
Mixed Truck Crops	4.00	4.60	5.00	5.40	248	6,973	0	7,221	14	402	0	416	7,637	4.86	5.29	
Oats	1.95	2.24	2.43	2.63	0	1,472	0	1,472	0	85	0	85	1,556		2.57	
Onions & Garlic	2.47	2.84	3.09	3.34	151	12,927	0	13,078	9	745	0	753	13,831	3.01	3.27	
Oranges	3.52	4.04	4.40	4.75	53,614	0	1,519	55,133	3,089	0	88	3,176	58,309	4.28		5.02
Oranges, Young	3.52	4.04	4.40	4.75	6,884	0	0	6,884	397	0	0	397	7,280	4.28		
Peaches & Nectarines	3.49	4.01	4.36	4.71	3,441	0	0	3,441	198	0	0	198	3,639	4.24		
Peaches & Nectarines, Young	3.49	4.01	4.36	4.71	441	0	0	441	25	0	0	25	467	4.24		
Peppers (Fall)	2.48	2.85	3.10	3.35	0	31	0	31	0	2	0	2	33		3.28	
Peppers (Spring)	2.18	2.51	2.72	2.94	4,304	0	0	4,304	248	0	0	248	4,552	2.65		
Pistachios	3.72	4.28	4.65	5.02	765	0	0	765	44	0	0	44	810	4.52		
Pistachios, Young	3.72	4.28	4.65	5.02	5,940	0	0	5,940	342	0	0	342	6,282	4.52		
Potatoes (Fall)	1.46	1.68	1.83	1.97	0	2,563	0	2,563	0	148	0	148	2,710		1.93	
Potatoes (Spring)	1.75	2.01	2.18	2.36	0	28,353	0	28,353	0	1,633	0	1,633	29,987		2.31	
Spinach	0.54	0.62	0.68	0.73	0	111	0	111	0	6	0	6	117		0.72	
Strawberries	2.28	2.62	2.85	3.08	10	0	0	10	1	0	0	1	11	2.77		
Sudan Grass	2.24	2.58	2.80	3.03	10	297	0	307	1	17	0	18	325	2.73	2.96	
Sweet Potatoes (Fall)	1.21	1.39	1.51	1.63	0	335	0	335	0	19	0	19	354		1.59	
Sweet Potatoes (Spring)	2.15	2.48	2.69	2.91	0	765	0	765	0	44	0	44	809		2.85	
Tomatoes (Spring)	2.25	2.59	2.81	3.04	9,762	0	0	9,762	562	0	0	562	10,325	2.74		
Vineyards	2.27	2.61	2.84	3.06	67,396	0	3,217	70,613	3,883	0	185	4,068	74,681	2.76		3.24
Vineyards, Young	2.27	2.61	2.84	3.06	9,490	0	0	9,490	547	0	0	547	10,037	2.76		
Wheat	1.95	2.24	2.43	2.63	913	9,292	1,098	11,303	53	535	63	651	11,954	2.37	2.57	2.78
Totals	**2.50**	**Totals:**			**228,616**	**102,359**	**6,224**	**337,199**	**13,171**	**5,897**	**359**	**19,426**	**356,625**			

VII. SUMMARY ANALYSIS

Water Supplies:

Table 13 presents a summary of the available water supplies within the District for the Water Years 1994-2017. As the table indicates, the District receives water from both surface and groundwater sources. This concept was implemented in order to accommodate a relatively consistent irrigation demand schedule with a variable water supply. Water conveyed to the District from surface sources is delivered directly for irrigation through the distribution system. Water in excess of irrigation demands is applied to spreading basins for percolation into groundwater storage. Thus, during periods of insufficient surface water supply, water previously percolated/banked into groundwater storage may be recovered and used to offset deficiencies.

Water Demands:

Table 14 presents a summary of water demands within AEWSD for the Water Years 1994-2017 and includes banked groundwater storage used to supplement District water demands. As this table indicates, the amount of water diverted to groundwater storage in any given year is highly variable.

The District delivers the available water supply (i.e., a combination of surface and groundwater sources) to about 40 percent of the cropped land within its boundaries. Most growers receiving District water have suspended on-farm groundwater pumping. This reduces groundwater overdraft and provides a stabilized groundwater source for the remaining irrigated lands. Table 14 indicates the total amount of water available to the District, the portion allocated to groundwater recharge, and the net amount of water delivered to users. The difference between supply and demand, not accounted for in the spreading amount, is attributable to District losses due to factors such as evaporation, seepage, or metering inaccuracies.

Summary of Reasonable Water Requirements:

Table 15 presents a summary of reasonable irrigation water requirements for the District from 1994-2017. The sum of ETc, LR, and the operational component represents an estimate of beneficial use of irrigation water within the District. This amount has been adjusted downward for effective rainfall. Reasonable water use is not limited to evapotranspiration and leaching. Additional reasonable water use may include cultural practices including pre-irrigation, harvest, pest control, frost control, crop uniformity, and germination. Column (4) provides an operational component factor that is chosen in part to include these additional beneficial uses. An estimate of the total District irrigation water requirement is indicated in Column (5).

Table 13. Summary of Water Supplies within the Arvin-Edison Water Storage District for Water Delivery Years 1994-95 through 2017-18.

(Data Values Represent Fiscal Year, Mar through Feb)

Water Source	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
	Acre-Feet												
Surface Supplies													
Friant-Kern Canal	37,639	246,253	172,007	178,237	120,006	69,511	106,845	32,786	42,561	91,801	60,845	222,589	145,999
Cross-Valley Canal	50,963	23,696	12,481	11,206	11,643	144,243	148,389	13,602	50,821	64,018	40,714	15,565	49,719
Kern River	1,200	9,802	47,323	68,772	81,548	37,588	1,973	662	2,847	0	341	10,148	14,724
Farm Wells	0	0	0	0	0	0	0	156	0	0	0	0	0
Intertie Pipeline									2,772	15,396	6,604	5,143	9,151
Total Surface Supplies	**89,802**	**279,751**	**231,811**	**258,215**	**213,197**	**251,342**	**257,207**	**47,206**	**99,001**	**171,215**	**108,504**	**253,445**	**219,593**
Groundwater Supplies													
(District owned wells only)													
Four Balancing Res													
Sycamore Well Field	39,752	391	0	0	0	114	1,693	56,355	36,189	7,772	48,291	0	293
Tejon Well Field	26,867	661	0	0	0	900	3,350	42,866	36,514	6,684	38,720	174	292
North Canal Wells	8,660	43	0	0	0	35	384	18,387	7,816	1,194	13,114	0	702
Total Groundwater Supplies	**75,279**	**1,095**	**0**	**0**	**0**	**1,049**	**5,427**	**117,608**	**80,519**	**16,650**	**100,125**	**174**	**1,287**
Total Water Supply to the District	**165,081**	**280,846**	**231,811**	**258,215**	**213,197**	**252,391**	**262,634**	**164,814**	**179,520**	**187,865**	**208,629**	**253,619**	**220,880**

Table 13. Summary of Water Supplies within the Arvin-Edison Water Storage (cont.)
District for Water Delivery Years 1994-95 through 2017-18.

Water Source	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
	Acre-feet										
Surface Supplies											
Friant-Kern Canal	15,462	25,177	111,816	176,249	171,536	3,788	19,925	11,918	3,174	96,429	203,485
Cross-Valley Canal	31,937	23,629	980	73,991	36,264	64,679	15,788	16,439	9,839	14,363	36,654
Kern River	300	14,955	19,756	0	0	0	1,451	17,599	28,366	15,749	23,907
Farm Wells	0	0	0	0	0	0	0	4,464	7,357	385	0
Intertie Pipeline	0	156	1,280	30,154	27,326	31,703	6,592	0	0	1,011	24,308
Total Surface Supplies	**47,699**	**63,917**	**133,832**	**280,394**	**235,126**	**100,170**	**43,756**	**50,420**	48,736	**127,937**	**288,354**
Groundwater Supplies											
District owned wells only											
Four Balancing Res			3,169	0	0	687	5,204	4,110	1,758	0	0
Sycamore Well Field	70,317	62,276	41,302	769	159	28,003	65,457	51,880	43,591	8,006	0
Tejon Well Field	50,232	42,468	40,385	153	5	19,976	52,381	42,891	42,559	10,080	22
North Canal Wells	31,635	35,185	27,022	1,801	0	20,033	38,310	35,836	35,450	14,924	28
Total Groundwater Supplies	**152,184**	**139,930**	**111,878**	**2,723**	**164**	**68,699**	**161,352**	**134,717**	**123,358**	**33,010**	**50**
Total Water Supply to the District	**199,883**	**203,847**	**245,710**	**283,117**	**235,290**	**168,869**	**205,108**	**185,137**	**172,094**	**160,947**	**288,404**

Table 14. Summary of Water Demands within the Arvin-Edison Water Storage District for Water Delivery Years 1994-95 through 2017-18.

(Data Values Represent Fiscal Year, Mar through Feb)

Water Source	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
	Acre-Feet											
Ground water Recharge[13]	12,839	109,226	54,106	70,994	77,457	80,542	97,399	2,558	9,090	43,180	31,669	105,723
Deliveries												
SWSA[14]	137,277	135,481	147,303	149,338	114,123	151,376	143,549	153,828	148,054	132,943	143,662	139,033
Intertie									11,483	897	25,512	
Calculated Losses[15]	14,965	36,139	30,402	37,883	21,617	20,473	21,686	8,428	10,893	10,845	7,786	8,863
Total Demand (SWSA)	**165,081**	**280,846**	**231,811**	**258,215**	**213,197**	**252,391**	**262,634**	**164,814**	**179,520**	**187,865**	**208,629**	**253,619**

13. Groundwater Recharge from the 1994 water year through the 2001 water year uses net spreading numbers. From the 2002 water year to present, Direct Spreading (Gross Spreading minus in Lieu Spreading) is used for Groundwater Recharge. Accounting for in-lieu spreading began in November 2010 during the 2010-2011 water year. In-lieu Spreading is contained within the District SWSA Deliveries value.

14. SWSA = Surface Water Service Area

15. Calculated losses equal Total District Supply minus all Deliveries and Groundwater recharged. Beginning with the 2002 water year, the calculated losses do not include evaporation losses from the spreading facilities.

Water Source	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
	Acre-Feet											
Ground water Recharge[13]	73,565	4,603	3,463	46,945	133,409	79,752	2,094	4,010	3,507	273	31,880	148,016
Deliveries												
SWSA[14]	134,226	149,678	149,181	135,122	128,235	137,585	145,853	161,605	126,153	98,329	107,214	138,411
Intertie		38,698	40,329	55,118	17,701	13,752	16,738	38,549	52,028	69,751	19,489	0
Calculated Losses[15]	13,089	6,904	10,870	8,525	3,772	4,201	4,184	944	3,449	3,741	2,364	1,977
Total Demand (SWSA)	**220,880**	**199,883**	**203,843**	**245,710**	**283,117**	**235,290**	**168,869**	**205,108**	**185,137**	**172,094**	**160,947**	**288,404**

Table 15. Summary of reasonable water requirements for the Arvin-Edison Water Storage District for Water Delivery Years 1994-95 through 2017-18.

Year	ETc+LR	Effective Rainfall	Net Irrigation Requirement	Operational Component		Total District Water Requirement
				Irrigation Efficiency Losses	Other	
	(1)(7)	(2)	(3)	(4)	(5)	(6)
	Acre-Feet					
1994-95	269,959	40,449	229,510		57,378	286,888
1995-96	263,116	54,338	208,778		52,194	260,972
1996-97	320,810	25,267	295,543		73,886	369,429
1997-98	308,726	28,147	280,579		70,145	350,724
1998-99	275,295	74,212	201,083		50,271	251,354
1999-00	275,014	1,062	273,952		68,488	342,440
2000-01	285,076	16,208	268,868		67,217	336,085
2001-02	314,715	4,502	310,213		77,553	387,766
2002-03	302,277	15,228	287,049		71,762	358,811
2003-04	262,603	30,447	232,156		58,039	290,195
2004-05	292,821	5,496	287,325		71,831	359,156
2005-06	273,870	21,460	252,410		63,103	315,513
2006-07	246,623	18,903	227,720		56,930	284,650
2007-08	272,105	7,067	265,038		66,260	331,298
2008-09	282,784	5,484	277,300		69,325	346,625
2009-10	271,947	16,426	255,521		63,880	319,401
2010-11	260,238	48,370	211,868		52,967	264,835
2011-12	265,974	4,020	261,954		65,488	327,442
2012-13	289,476	16,228	273,248	52,426	15,886	341,560
2013-14	276,942	0	276,942	54,384	14,852	346,178
2014-15	310,333	8,483	301,850	58,064	17,398	377,313
2015-16[8]	284,092	16,845	267,247	43,311	23,501	334,059
2016-17	301,788	35,446	266,342	44,171	22,414	332,927
2017-18	285,300	0	285,300	51,899	19,426	356,625
Average	**282,995**	**20,587**	**262,408**	**50,709**	**18,913**	**328,010**

1. From Table 10.

2. Calculated using USBR formula for utilizable precipitation (see Table 1). Annual precipitation amounts were the combined average values compiled from the Sycamore, Tejon, and District office weather stations located within the Arvin-Edison WSD boundaries.

3. Columns: (1) - (2).

4. The Operational Component includes irrigation efficiency (Column #4) and other (Column #5). Assumes 75% overall District water management efficiency. Irrigation efficiency loss rates are calculated for each crop using the following: Net Irrigation Requirement * (1 + (1-Irrigation Efficiency)) * Acreage for each irrigation type. Total irrigation efficiency loss is computed by subtracting column 3 from the sum of "Total Water Including Irrigation by Application Method" from Table 12.

5. Reasonable and unavoidable loss due to irrigation system non-uniformity, soil variation, wind, evaporation, management constraints, economics, etc. Irrigation efficiency separated in 2012 WY. Value computed from: Total Water including by Application Method - (ET+LR - Effective Rainfall)

6. Columns (3) + (4) + (5). Values in Column 6 do not include water for various other practices that are considered beneficial, or water required for Municipal and Industrial uses.

7. Irrigated acreage is calculated by the summation of spring and summer Irrigated acres, which has been the case since the 2006-07 water year. Previously, for low acreage crops, this variable was calculated by taking the larger of the spring or fall irrigated acres.

8. Due to irrigations of non-crops the Total District requirement is adjusted by ETgrass * 713 acres: (768 Acre-feet).

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IX. Appendix 1 – Historical Data

Notes For Tables A3, A5, A6 and A7:

1. For Table A3, values that are less than 0.005 will appear as 0.00 due to rounding. For tables A5, A6 and A7, values that are less than 0.5 will appear as 0 due to rounding. All true zero values will be represented as a null or blank value.
2. Not all crop growth factors follow the Districts fiscal year boundaries. Therefore, some crops contribute to previous or post fiscal years. If a previous or post fiscal year does not include such a crop, then abnormally low values are seen for that crop. This is not an error, but expected due to the difference in fiscal and crop years.
3. Data Values are for fiscal year (Mar through Feb) and include spring and fall crops.

Table A1.[16] Water Quality Measurements – Historical Data

Water Source		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
								ECw in micromhos/cm						
1995	**Intake**	260	80	70	60	40	30	20	40	15	14	30	30	57
	North	300	130	60	60	40	30	20	40	14	13	30	40	64
	South	290	130	70	60	40	30	20	40	16	12	30	40	64
													micromhos/cm =	62
													dS/m =	0.06
1996	**Intake**	30	40	40	50	30	30	170	20	30	30	60	15	45
	North	30	40	40	50	30	30	150	30	60	30	70	20	48
	South	30	40	40	50	30	30	150	20	60	30	60	11	45
													micromhos/cm =	46
													dS/m =	0.05
1997	**Intake**	50	110	50	40	40	60	70	70	50	70	30	30	55
	North	50	110	50	40	40	60	70	70	50	70	30	30	55
	South	50	110	50	40	40	60	70	70	50	70	30	30	55
													micromhos/cm =	55
													dS/m =	0.06
1998	**Intake**	410	60	160	160	100	80	30	50	170	130	120	310	148
	North	410	40	160	160	120	70	30	20	160	140	120	170	133
	South	520	50	160	170	100	70	30	30	150	150	120	200	145
													micromhos/cm =	142
													dS/m =	0.142
													adjusted dS/m[17]=	**0.127**
1999	**Intake**	50	30	140	250	310	310	240	230	270	460	450	220	246
	North	50	40	170	230	290	320	270	240	260	460	460	50	236
	South	50	30	150	260	270	330	280	240	260	470	450	50	236
													micromhos/cm =	240
													dS/m =	0.24
													adjusted dS/m[18]=	**0.34**
2000	**Intake**	780	470	70	260	40	390	260	220	200	290	480	600	338
	North	770	490	370	190	110	370	270	220	210	240	480	590	359
	South	770	480	390	170	190	420	270	230	200	200	470	540	360
													micromhos/cm =	352
													dS/m =	0.35
													adjusted dS/m=	**0.28**
2001	**Intake**	70	300	210	240	110	120	180	160	340	0	0	360	209
	North	70	200	230	240	230	300	270	280	260	250	260	320	242
	South	60	300	270	290	260	290	300	280	270	310	330	280	270
													micromhos/cm =	240
													dS/m =	0.24
													adjusted dS/m=	**0.22**
2002	**Intake**	50	50	290	420	125	513	390	397	472	330	50	259	278
	North	70	250	250	420	295	367	340	276	563	290	45	128	274
	South	80	280	330	440	309	414	350	349	560	361	46	194	309
													micromhos/cm =	287
													dS/m =	0.29
													adjusted dS/m=	**0.31**
2003	**Intake**	353	46		386	47	46	270	330	149	40	45	562	207
	North	404	191	273	293	50	39	34	390	167	69	43	519	206
	South	379	279	375	341	50	40	33	360	156	41	47		191
													micromhos/cm =	201
													dS/m =	0.201
													adjusted dS/m=	**0.166**

Table A1. Water Quality Measurements – Historical Data (Continued)

Water Source		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
							ECw in micromhos/cm							
2004	**Intake**	51	45	53	183	464	320	388	183	464	320	388	278	261
	North	321	44	48	260	280	323	327	260	280	323	327	296	257
	South	304	46	47	291	332	345	349	291	332	345	349	317	279
													micromhos/cm =	266
													dS/m =	0.266
													adjusted dS/m=	**0.251**
2005	**Intake**	45	43	43	49	39	24	28	31	52	31	400	54	70
	North	44	45	48	46	40	24	32	34	50	42	400	75	73
	South	46	43	49	48	41	24	86	39	61	32	410	62	78
													micromhos/cm =	74
													dS/m =	0.074
													adjusted dS/m=	**0.08**
2006	**Intake**	56	36	39	47	43	37	120	150	260	270	270	34	114
	North	160	40	39	50	45	39	160	150	270	260	260	34	126
	South	150	45	44	56	44	38	130	160	270	260	260	45	125
													micromhos/cm =	121
													dS/m =	0.121
													adjusted dS/m=	**0.166**
2007	**Intake**	700	33	138	68	415	378	381	328	305	273	273	273	297
	North	490	52	267	322	341	334	330	329	302	300	318	353	312
	South	500	332	320	343	324	324	352	339	358	378	345	352	356
													micromhos/cm =	321
													dS/m =	0.321
													adjusted dS/m=	**0.323**
2008	**Intake**	273	172	52	64	69	181	100	169	79	280	144		
	North	359	546	59	335	495	369	364	380	363	246	357	546	368
	South	375	451	216	367	364	356	375	391	393	404	382	479	379
													micromhos/cm =	297
													dS/m =	0.297
													adjusted dS/m[19] =	**0.301**
2009	**Intake**			281	442	41	25	101	105	71	72	31	63	123
	North	475	465	490	345	50	28	343	356	282	356	32	499	310
	South	460	424	449	387	47	123	352	337	329	362	32	473	315
													micromhos/cm =	249
													dS/m =	0.249
													adjusted dS/m=	**0.250**
2010	**Intake**	65	49	302	56	48	394	25	298	242	367	136	180	180
	North	558	450	580	57	50	175	27	310	237	376	30		259
	South	516	455	650	62	49	38	23	284	233	574	31	417	278
	Intertie	516	473	528	79	65	38	403	312	364	578	493	416	493
													micromhos/cm =	268
													dS/m =	0.268
													adjusted dS/m=	**0.227**
2011	**Intake**	224	52	359	31	31	272	210	23	148	155	21	32	130
	North	229	55	310	32	32	336	215	92	168	235	22	33	147
	South	228	57	384	30	30	306	178	238	169	172	21	31	154
	Intertie	245	60	389	70	355	224	239	238	313	151	32	146	205
													micromhos/cm =	159
													dS/m =	0.159
													adjusted dS/m=	**0.143**
2012	**Intake**	46	51	291	264	399	293	325	379	386	644	483	336	325
	North	49	53	311	331	365	464	349	384	394	644	458	484	357
	South	51	52	252	266	303	421	376	373	388	249	260	597	299
	Intertie	57	40	306	324	348	426	374	392	395	245	251	520	307
													micromhos/cm =	322
													dS/m =	0.322
													adjusted dS/m=	**0.375**

Table A1. Water Quality Measurements – Historical Data (Continued)

Water Source		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
							ECw in micromhos/cm							
2013	**Intake**	390	403	329	292	361	421	389	197	384	321	354	272	343
	North	410	327	347	301	291	424	331	293	298	308	316	440	341
	South	387	340	364	375	357	414	392	403	418	390	377	479	391
	Intertie	364	348	378	425	382	415	467	442	514	400	387	486	417
												micromhos/cm =		373
													dS/m =	0.373
												adjusted dS/m=		**0.371**
2014	**Intake**	240	294	322	274	277	231	174	364	297	288	321	341	285
	North	384	364	326	410	429	432	420	426	391	432	446	512	414
	South	379	414	396	419	456	450	434	438	431	431	447	467	430
	Intertie	367	423	403	412	440	445	437	445	442	426	440	465	429
												micromhos/cm =		390
													dS/m =	0.39
												adjusted dS/m=		**0.404**
2015	**Intake**	334	328	336	318	318	272	278	295	327	310	315	250	307
	North	506	432	459	448	448	454	464	474	461	482	546	505	473
	South	487	477	466	451	486	449	491	485	480	482	518	504	481
	Intertie	514	488	479	477	478	433	480	482	489	493	514	507	486
												micromhos/cm =		437
													dS/m =	0.437
												adjusted dS/m=		**0.437**
2016	**Intake**	252	257	304	65	82	280	209	106	33	108	145	253	175
	North	541	495	79	91	91	426	456	381	357	251	135	286	299
	South	518	480	470	78	96	468	498	437	433	345	140		360
	Intertie	522	488	454	80	97	476	466	405	405	362	167	154	340
												micromhos/cm =		293
													dS/m =	0.293
												adjusted dS/m=		**0.247**
2017	**Intake**	242	47	61	48	59	35	33	56	30	187	119	127	87
	North	364	48	66	49	59	41	29	64	25	184	157	135	102
	South	265	48	69	50	62	41	26	56	25	186	337	302	122
	Intertie	354	69	63	64	64	51	35	56	210	352	358	281	163
												micromhos/cm =		119
													dS/m =	0.119
												adjusted dS/m=		**0.141**
2018	**Intake**	43	421											
	North	36	124											
	South	388	528											
	Intertie	428	533											

16. Water Year March through February
17. Adjusted Sum based on water year. Adjusted sum procedure not implemented until 1998 and was not used for 1995-1997.
18. Adjusted Sum based on Water Year
19. For missing data, average values are produced from the same months of previous years.

Table A2. Summary of Reference Evapotranspiration (ETo)[20] in the AEWSD for Water Years 1994-95 through 2017-18.

(Data Values Represent Fiscal Year, Mar through Feb)

Year	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	Total (in.)
1994-95[21]	4.28	5.76	6.87	8.75	9.03	7.9	5.22	4.39	1.84	0.64	1.08	1.41	**57.17**
1995-96[22]	3.48	5.12	6.21	8.02	8.57	8.34	5.9	4.36	2.23	1.3	1.03	1.64	**56.20**
1996-97	3.94	5.93	8.03	8.83	9.32	8.88	6.34	4.23	1.61	0.91	1.1	1.85	**60.97**
1997-98	4.71	6.2	8.38	8.32	8.81	8.28	5.95	4.24	1.7	1.3	1.2	1.35	**60.44**
1998-99	3.33	4.87	5.47	7.38	8.95	8.36	5.46	3.76	1.63	1.21	1.2	2.03	**53.65**
1999-00	3.58	5.54	7.73	8.37	8.83	8.45	6.36	4.52	1.77	1.44	1.19	2.19	**59.97**
2000-01	3.55	4.5	7.36	8.76	8.83	8.36	5.76	3.6	1.76	1.24	1.47	1.95	**57.14**
2001-02	3.94	5.21	8.54	9.41	9.08	8.74	6.38	4.21	2.08	1.3	1.29	2.69	**62.87**
2002-03	4.53	5.54	7.97	9.17	9.48	8.78	6.41	4.06	1.97	1.58	1.36	2.24	**63.09**
2003-04	4.15	4.88	7.1	8.51	8.74	7.83	6.27	4.71	1.92	1.55	1.09	2.17	**58.92**
2004-05	4.73	6.57	8.33	9.03	9.53	8.74	6.56	3.76	1.87	1.49	1.16	1.92	**63.69**
2005-06	3.28	5.2	6.99	8.07	9.63	9.15	5.86	3.95	2.37	1.36	1.82	2.71	**60.39**
2006-07	3.17	4.52	7.44	8.3	8.75	8.14	6.12	3.49	1.87	1.73	1.67	2.07	**57.27**
2007-08	4.44	5.51	8.15	8.77	8.73	8.06	5.66	3.75	2.06	1.43	2.01	2.44	**61.01**
2008-09	4.67	6.45	7.65	9.29	9.15	8.81	6.25	4.42	1.9	1.05	1.33	2.23	**63.20**
2009-10	4.26	6.46	7.93	8.06	9.48	8.28	6.41	4.14	2.13	1.27	1.28	1.81	**61.51**
2010-11	3.56	4.61	6.99	8.7	9.47	8.86	6.26	3.7	2.2	1.21	1.21	2.48	**59.25**
2011-12	3.44	5.62	7.26	8.53	9.21	8.6	6.12	3.82	2.01	1.8	2.05	2.9	**61.36**
2012-13	4.34	5.24	8.36	8.88	9.14	8.75	6.37	4.21	2.25	1.15	1.56	2.57	**62.82**
2013-14	4.31	6.25	8.01	8.8	8.74	8.32	5.9	4.36	2.54	1.8	2.63	2.74	**64.40**
2014-15	4.84	6.18	8.41	9.39	8.99	8.52	6.27	4.54	2.23	1.39	1.33	2.58	**64.67**
2015-16	4.13	5.62	7.63	8.66	9.06	8.15	6.13	4.07	2.07	1.37	1.49	2.34	**60.72**
2016-17	4.15	5.62	7.61	8.67	9.09	8.45	6.15	4.08	2.07	1.41	1.35	1.99	**60.64**
2017-18	4.07	5.85	7.47	9.05	9.81	8.63	6.13	4.78	2.29	1.98	1.41	2.89	**64.36**

20. ETo = evapotranspiration of a grass crop

21. Source: ETo values for October 1994 through March 1995 were estimated by regression analysis between CIMIS Station #93 (Lamont) and CIMIS #5 (Shafter).

22. Source: for 1995-96, April through December and all other years, data from CIMIS #125 (Arvin-Edison)

Table A3. Calculated Evapotranspiration Demand (ETc) for Various Crops Grown in the AEWSD for Water Years 2006-07 to 2017-18
(Data Values Represent Fiscal Year, Mar through Feb)

Crop	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
	Acre-Feet / Acre											
Alfalfa	3.69	3.91	4.13	4.02	3.87	3.91	4.05	4.00	4.17	3.92	3.88	4.06
Almonds	3.17	3.37	3.57	3.46	3.32	3.36	3.50	3.47	3.61	3.38	3.34	3.52
Almonds, Young	3.17	3.37	3.57	3.46	3.32	3.36	3.50	3.47	3.61	3.38	3.34	3.52
Apples	3.77	3.93	4.19	4.08	3.95	3.95	4.13	4.07	4.22	3.98	4.02	4.18
Apricots	3.17	3.37	3.57	3.46	3.32	3.36	3.50	3.47	3.61	3.38	3.34	3.52
Apricots, Young	0.06	3.37	3.57	3.46	3.26							3.47
Artichokes											4.88	5.19
Asparagus	3.92	4.07	4.28	4.18	3.99		0.09	4.26	4.35	4.10	4.06	4.28
Barley	0.16	1.95	1.98	1.93	1.69	1.83	1.91	2.03	1.91	1.88	1.83	1.94
Beans (dry)		1.90										
Beans (Green) (Fall)									1.00			
Beans (Green) (Spring)					1.36	1.40	1.49	1.50	1.57	1.44	1.43	1.46
Broccoli (Fall)	0.44	0.45	0.45	0.46	0.44	0.47	0.48	0.54	0.50	0.46	0.47	
Broccoli (Spring)	0.09	0.96	1.03	0.92		0.13	0.91	1.03	1.05	0.94	0.82	0.87
Bushberries	3.58	3.72	3.95	3.84	3.73	3.74	3.89	3.81	3.97	3.75	3.78	3.92
Bushberries - Young								3.81		3.75	3.78	3.92
Cabbage (Fall)	0.73				0.76	0.77		0.85	0.83		0.80	0.87
Cabbage (Spring)	0.66		0.10	1.00	0.70							0.86
Carrots (Fall)	1.20	1.19	1.28	1.26	1.24	1.26	1.30	1.33	1.32	1.24	1.27	1.38
Carrots (Spring)	1.46	1.68	1.72	1.70	1.47	1.57	1.66	1.73	1.80	1.63	1.57	1.64
Cauliflower (Fall)									0.83			0.87
Cauliflower (Spring)						0.13	0.91	0.91				0.86
Celery				2.65	2.68						2.65	2.75
Cherries	3.77	3.93	4.19	4.08	3.95	3.95	4.13	4.07	4.22	3.98	4.02	4.18
Cherries, Young	3.77	3.93	4.19	4.08	3.95	3.95	4.13	4.07	4.22	3.98	4.02	4.18
Cole Crops (Fall)	0.73		0.80	0.80	0.76	0.77	0.82	0.85	0.83	0.78		0.87
Cole Crops (Spring)	0.09	0.96	1.03	1.00	0.81	0.91	0.91	1.03	1.05	0.94	0.82	0.90
Corn (Fall)					1.76		1.79		1.76			
Corn (Spring)	2.43	2.48	2.62	2.53	2.57	2.53	2.60	2.51	2.61	2.5	2.53	2.64
Cotton	2.53	2.57	2.73	2.64	2.68	2.63	2.71	2.61	2.71	2.6	2.63	2.73
Flowers & Nursery	1.91	2.03	2.11	2.05	1.98	2.05	2.09	2.15	2.16	2.02	1.91	2.13
Grapefruit	2.62	2.80	2.90	2.82	2.72	2.81	2.88	2.95	2.96	2.78	2.62	2.93
Grapefruit, Young						0.23	2.88	2.71	0.18	2.78	2.62	2.77
Grass Misc.	0.16	1.63	1.49				0.18	1.70				
Jojoba	2.62	2.80	2.90	2.82	2.72	2.81	2.88	2.95	2.96	2.78	2.62	2.91
Lemons	3.10	3.30	3.42	3.33	3.21	3.32	3.40	3.49	3.50	3.29	3.10	3.43
Lemons, Young	3.10	3.06										
Lettuce (Fall)	0.92	0.90	1.03	0.99	0.96	0.96	1.02	0.97	1.02	0.96		1.03
Lettuce (Spring)	0.64	0.81	0.77	0.72	0.68	0.77	0.77	0.87	0.56	0.75	0.70	0.82
Melons, cucumbers, squash (Fall)	1.75		1.89			1.81						1.91
Melons, cucumbers, squash (Spring)	1.38	1.54	1.57	1.54	1.37	1.45	1.54	1.57	1.64	1.49	1.47	1.51
Misc. Deciduous	3.10	3.27	3.47	3.37	3.23	3.25	3.40	3.35	3.50	3.29	3.30	3.43
Misc. Deciduous, Young		0.00	3.47	3.37	3.23	3.25	3.40	3.35				
Misc. Field			3.21				3.18	3.12		3.07	3.08	3.20
Misc. Hay & Grain	1.67	1.95	1.98	1.93	1.69	1.83	1.91	2.03	1.91	1.88	1.83	1.94
Misc. Subtropical Fruits	2.62	2.80	2.90	2.82	2.72	2.81	2.88	2.95	2.96	2.78	2.62	2.86
Misc. Subtropical Fruits, Young	0.17	2.80	2.90	2.82	2.72	2.81	2.88	2.95	2.96	2.78	2.62	2.83
Misc. Truck/Berry	3.58	3.72	3.95	3.84	3.73	3.74	3.89	3.81	3.97	3.75	3.78	3.92
Mixed Deciduous										3.29	3.30	3.43
Mixed Hay & Grain								2.03	1.91	1.88	1.83	1.92
Mixed Pasture	4.49	4.80	5.06	4.91	4.74	4.79	5.00	4.77	0.22	4.82	4.65	4.98
Mixed Truck Crops	3.58	3.72	3.95	3.84	3.73	3.74	3.89	3.81	3.97	3.75	3.78	3.92
Oats	1.67	1.95	1.98	1.93	1.69	1.83	1.91	2.03	1.91	1.88	1.83	1.94
Onions & Garlic	2.08	2.42	2.38	2.31	2.08	2.32	2.34	2.57	2.16	2.29	2.23	2.41
Oranges	3.10	3.30	3.42	3.33	3.21	3.32	3.40	3.49	3.50	3.29	3.10	3.46
Oranges, Young	3.10	3.30	3.42	3.33	3.21	3.32	3.40	3.49	3.50	3.29	3.10	3.46
Peaches & Nectarines	3.10	3.27	3.47	3.37	3.23	3.25	3.40	3.35	3.50	3.29	3.30	3.43
Peaches & Nectarines, Young	3.10	3.27	3.47	3.37	3.23	3.25	3.40	3.35	3.50	3.29	3.30	3.43
Pears												
Peppers (Fall)						2.32					2.32	2.43
Peppers (Spring)	1.96	2.10	2.15	2.09	2.00	2.03	2.13	2.12	2.21	2.07	2.06	2.14
Pistachios	3.32	3.46	3.70	3.59	3.47	3.48	3.64	3.58	3.72	3.5	3.54	3.68
Pistachios, Young							3.64	3.58	3.72	3.5	3.54	3.68
Plums	3.10	3.27	3.47	3.37	3.23	3.25	3.40	3.35	3.50	3.29	3.30	3.43
Plums, Young	3.10	3.27	3.47									
Potatoes (Fall)	1.25	1.25	1.39	1.36	1.33	1.31	1.40	1.38	1.40	1.32	1.35	1.44
Potatoes (Spring)	1.51	1.76	1.81	1.79	1.52	1.65	1.74	1.82	1.89	1.7	1.60	1.72
Safflower	2.20	2.44	2.52	2.44	2.25	2.33	2.44	2.49	2.60	2.39	2.33	2.45
Spinach										0.07	0.51	0.53
Strawberries												2.21
Sudan Grass	2.04	2.09									2.12	2.22
Sweet Potatoes (Fall)		1.03	1.16	1.12	1.09	1.08	1.16	1.13	1.16	1.09		1.18
Sweet Potatoes (Spring)	1.94		2.08	2.01	2.04	2.01	2.07	2.01	2.09	2.01	2.01	2.11
Tomatoes (Spring)	2.03	2.15	2.23	2.15	2.11	2.11	2.20	2.16	2.26	2.13	2.13	2.22
Turf Farm	3.79	4.07	4.25	4.11	3.95	4.07	4.19	4.24	4.31	4.05	3.79	4.17
Urban Landscaped	4.49	4.59	0.19	4.91	4.53	0.24	5.00	5.00	5.16	4.82	4.65	4.88
Vineyards	2.04	2.15	2.25	2.20	2.12	2.13	2.22	2.18	2.27	2.14	2.15	2.23
Vineyards, Young	2.04	2.15	2.25	2.20	2.12	2.13	2.22	2.18	2.27	2.14	2.15	2.23
Walnuts	3.30	3.39	3.62	3.51	3.45	3.44	3.59	3.50	3.64	3.44	3.48	3.62
Walnuts, Young				3.51	3.45							
Wheat	1.67	1.95	1.98	1.93	1.69	1.83	1.91	2.03	1.91	1.88	1.83	1.94

Table A4. Irrigated acreage of various crops grown in the AEWSD for Water Delivery Years 2006-07 through 2017-18

(Data Values Represent Fiscal Year, Mar through Feb)

Crop	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Alfalfa	1,365	1,220	1,426	1,350	1,091	843	1,197	1,327	583	754	927	765
Almonds	2,471	3,771	4,233	4,577	5,422	5,615	5,895	5,996	6,098	8,082	7,883	7,793
Almonds, Young	1,548	1,681	1,764	1,394	524	455	321	996	1,250	2,066	2,217	2,100
Apples	3	24	21	21	11	23	23	23	23	23	23	23
Apricots	103	95	53	177	93	62	152	152	130	125	134	121
Apricots, Young		82	134	80	105							32
Artichokes											76	0
Asparagus	252	156	129	97	138			32	26	0	235	39
Barley	45	553	672	301	485	76	174	286	240	112	0	0
Beans (dry)		199										
Beans (Green) (Fall)									53			
Beans (Green) (Spring)					530	246	157	751	868	554	512	401
Broccoli (Fall)	28	79	160	128	106	18	246	30	148	78	119	
Broccoli (Spring)		104	36	99			301	107	84	216	162	262
Bushberries	200	223	284	268	324	310	268	311	353	256	911	597
Bushberries - Young								80		0	0	0
Cabbage (Fall)	38				40	40		5	53		256	53
Cabbage (Spring)	128			40	40							94
Carrots (Fall)	8,534	8,843	9,510	9,307	9,781	9,643	8,460	4,059	9,485	8,496	10,518	9,871
Carrots (Spring)	3,576	3,146	3,579	2,806	2,540	1,826	2,974	3,822	3,321	3,839	3,906	3,652
Cauliflower (Fall)									114			9
Cauliflower (Spring)							21	0				79
Celery				46	23						39	0
Cherries	2,158	2,430	1,881	2,759	2,677	3,037	2,899	3,019	3,194	3,112	3,516	2,304
Cherries, Young	436	348	1,002	144	189	211	462	463	202	118	247	292
Cole Crops (Fall)	40		74	88	39	242	85	50	123	221		729
Cole Crops (Spring)		168	167	39	36	64	40	155	121	252	120	681
Corn (Fall)					492		316		255			
Corn (Spring)	95	82	125	240	77	37	201	242	962	431	111	16
Cotton	4,046	2,813	2,569	1,372	1,443	1,375	2,088	1,664	409	0	39	79
Farmsteads										5		0
Flowers & Nursery	393	194	402	416	246	334	276	292	236	321	178	60
Grapefruit	203	296	228	167	167	152	141	134	197	287	195	156
Grapefruit, Young							40	40		0	0	0
Grass Land							0	0	0	227	0	0
Grass Misc.	18	154	17				17	0				
Jojoba	119	118	118	118	118	118	118	118	235	118	151	154
Lemons	108	120	168	168	153	140	169	169	163	197	156	155
Lemons, Young	101	20										
Lettuce (Fall)	329	374	447	192	157	267	280	293	164	457		87
Lettuce (Spring)	73	202	227	189	3	108	78	155	413	78	473	155
Light Brush										11		0
Melons, cucumbers, squash (Fall)	93		39			56						13
Melons, cucumbers, squash (Spring)	2,197	2,054	1,732	1,807	1,889	1,739	1,103	1,125	934	1,080	918	755
Misc. Deciduous	30	64	81	47	63	75	76	57	60	119	96	44
Misc. Deciduous, Young			16	16	23	21	11	0				
Misc. Field			292				37	0		0	0	0
Misc. Hay & Grain	475	673	1,692	2,486	1,895	1,878	2,388	664	492	2,269	531	0
Misc. Subtropical Fruits	918	1,542	1,626	1,711	1,867	2,098	1,810	2,216	2,409	3,306	2,968	1,385
Misc. Subtropical Fruits, Young		447	1,008	849	331	243	599	958	727	457	391	9
Misc. Truck/Berry	1,695	3,159	2,454	1,789	3,168	3,460	3,006	1,061	3,094	1,392	2,469	1,263
Mixed Deciduous										8	40	20
Mixed Hay & Grain								1,022	591	81	0	0
Mixed Pasture	9	98	48	9	33	17	19	165		0	0	0
Mixed Truck Crops	1,563	1,089	1,614	1,865	1,747	998	1,665	1,006	2,307	1,860	2,424	1,449
Oats	1,598	559	704	981	235	707	679	593	235	156	139	605
Onions & Garlic	3,034	2,354	2,505	2,612	3,164	3,795	4,683	4,808	4,176	4,160	3,912	4,234
Oranges	12,682	12,373	11,475	11,357	11,815	11,422	11,864	11,711	12,169	11,080	12,737	13,577
Oranges, Young	779	142	567	324	946	1,336	1,134	506	236	632	1,086	1,701
Peaches & Nectarines	2,675	2,453	2,190	1,728	1,813	1,143	914	971	1,288	739	1,080	858
Peaches & Nectarines, Young	130	278	417	459	214	37	37	79	61	37	98	110
Pears												
Peppers (Fall)						40					43	10
Peppers (Spring)	1,693	2,364	2,126	1,539	1,696	1,661	2,049	2,003	2,327	2,137	2,205	1,718
Pistachios	172	167	167	167	167	167	167	167	167	590	1,066	179
Pistachios, Young							436	428	436	757	1,006	1,389
Plums	171	202	291	353	312	353	262	230	30	12	0	0
Plums, Young	13	50	50									
Potatoes (Fall)	2,533	2,664	2,050	2,237	2,509	1,993	1,484	996	1,623	888	1,377	1,404
Potatoes (Spring)	12,434	10,769	8,067	10,541	9,654	11,290	11,544	9,090	11,632	11,486	10,983	12,996
Safflower	427	280	535	284	289	514	307	221	240	365	290	0
Spinach											154	163
Strawberries												4
Sudan Grass	646	1,193									442	110
Sweet Potatoes (Fall)		157	132	201	201	557	419	79	207	59		222
Sweet Potatoes (Spring)	126		172	105	410	632	254	0	236	116	0	284
Tomatoes (Spring)	2,083	2,640	3,373	4,931	3,519	4,682	4,119	4,377	4,540	5,530	5,070	3,772
Turf Farm	201	150	190	184	149	60	77	58	246	0	0	0
Urban Landscaped	29	171		156	198		207	0	0	0	0	26,869
Vineyards	25,128	25,993	24,239	24,395	24,730	26,177	25,603	26,572	27,859	26,768	27,281	0
Vineyards, Young	2,511	2,474	3,715	3,729	4,314	3,062	4,411	3,300	2,656	3,666	4,613	3,636
Walnuts	517	449	449	449	136	136	136	136	136	136	0	0
Walnuts, Young				49	49							
Wheat	8,160	6,006	6,180	5,009	5,675	7,026	3,501	6,768	4,757	2,631	3,901	4,647
Totals	**111,132**	**110,509**	**109,622**	**108,952**	**110,261**	**112,617**	**112,400**	**106,138**	**115,374**	**112,953**	**120,424**[1]	**114,153**

1. Irrigated Feedlot (9 acres) not included

Table A5. Total ETc Demand of Various Crops Grown in the AEWSD for Water Delivery Years 2006-07 through 2017-18
(Data Values Represent Fiscal Year, Mar through Feb)

Crop	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Alfalfa	5,043	4,767	5,893	5,421	4,222	3,293	4,848	5,385	2,463	2,955	3,655	3,106
Almonds	7,845	12,713	15,098	15,829	18,010	18,853	20,629	21,155	22,393	27,340	26,807	27,468
Almonds, Young	4,915	5,667	6,292	4,821	1,741	1,528	1,123	3,505	4,578	6,969	7,518	7,382
Apples	11	94	88	86	43	91	95	93	97	92	92	96
Apricots	327	320	189	612	309	208	532	536	477	423	456	426
Apricots, Young	0	276	478	277	342							111
Artichokes											371	394
Asparagus	987	636	552	405	550		3	137	114	0	961	167
Barley	7	1,081	1,332	581	821	139	333	584	462	212	0	0
Beans (dry)		378										
Beans (Green) (Fall)									53			
Beans (Green) (Spring)					723	344	234	1,124	1,365	797	732	587
Broccoli (Fall)	12	35	72	59	47	8	117	16	74	36	56	
Broccoli (Spring)	9	100	37	91		38	275	112	90	185	137	229
Bushberries	716	830	1,122	1,029	1,210	1,160	1,043	1,186	1,402	961	3,447	2,342
Bushberries - Young								305		0	0	0
Cabbage (Fall)	28				31	31		4	44		204	46
Cabbage (Spring)	85		4	40	28							81
Carrots (Fall)	10,224	10,501	12,171	11,773	12,129	12,140	11,031	5,399	12,490	10,542	13,378	13,624
Carrots (Spring)	5,231	5,298	6,168	4,770	3,729	2,871	4,945	6,767	6,109	6,249	6,292	6,000
Cauliflower (Fall)									95			8
Cauliflower (Spring)						3	19	0				68
Celery				122	62						103	0
Cherries	8,141	9,546	7,891	11,252	10,561	12,007	11,983	12,273	13,484	12,385	14,123	9,620
Cherries, Young	1,645	1,367	4,203	587	746	834	1,910	1,882	853	470	992	1,219
Cole Crops (Fall)	29		59	70	30	187	70	42	102	172		635
Cole Crops (Spring)	15	161	172	39	29	58	37	166	133	222	104	611
Corn (Fall)					867		564		448			
Corn (Spring)	231	203	328	607	198	94	523	607	2,512	1,079	281	42
Cotton	10,251	7,225	7,007	3,620	3,866	3,623	5,651	4,338	1,109	0	103	216
Flowers & Nursery	750	395	846	853	486	683	578	664	538	649	362	128
Grapefruit	533	828	660	471	454	427	406	419	618	747	545	456
Grapefruit, Young						0	115	109	0	0	0	0
Grass Misc.	3	250	25				3	29				
Jojoba	312	330	342	333	320	332	340	366	732	326	419	447
Lemons	335	397	575	560	491	465	575	620	600	642	512	532
Lemons, Young	313	61										
Lettuce (Fall)	303	338	458	191	152	255	285	285	167	441		89
Lettuce (Spring)	47	163	175	136	2	83	60	138	239	60	342	128
Melons, cucumbers, squash (Fall)	163		74			102						25
Melons, cucumbers, squash (Spring)	3,040	3,172	2,711	2,776	2,595	2,518	1,698	1,786	1,545	1,612	1,358	1,139
Misc. Deciduous	93	209	281	159	204	244	258	191	210	391	317	151
Misc. Deciduous, Young		0	55	54	74	68	37	0				
Misc. Field			938				118	0		0	0	0
Misc. Hay & Grain	792	1,315	3,353	4,796	3,206	3,443	4,566	1,356	947	4,287	981	0
Misc. Subtropical Fruits	2,410	4,312	4,707	4,824	5,070	5,900	5,208	6,774	7,394	8,968	8,101	3,958
Misc. Subtropical Fruits, Young	0	1,250	2,918	2,394	899	683	1,724	2,903	2,212	1,227	1,057	25
Misc. Truck/Berry	6,071	11,755	9,691	6,867	11,831	12,946	11,702	4,046	12,289	5,225	9,342	4,954
Mixed Deciduous										26	132	69
Mixed Hay & Grain								2,075	1,130	152	0	0
Mixed Pasture	40	470	243	44	156	81	95	810	0	0	0	0
Mixed Truck Crops	5,598	4,052	6,374	7,159	6,524	3,734	6,481	3,836	9,163	6,982	9,172	5,684
Oats	2,663	1,092	1,395	1,893	398	1,296	1,298	1,211	452	295	257	1,172
Onions & Garlic	6,317	5,692	5,965	6,047	6,584	8,788	10,981	12,477	9,141	9,658	8,833	10,219
Oranges	39,341	40,889	39,262	37,839	37,919	37,963	40,346	43,247	45,116	36,410	42,106	46,946
Oranges, Young	2,417	469	1,940	1,080	3,036	4,440	3,856	1,869	875	2,077	3,590	5,882
Peaches & Nectarines	8,279	8,009	7,596	5,831	5,858	3,718	3,105	3,255	4,507	2,429	3,570	2,942
Peaches & Nectarines, Young	402	908	1,446	1,549	691	120	126	265	213	122	324	377
Pears												
Peppers (Fall)						93					100	24
Peppers (Spring)	3,324	4,961	4,579	3,215	3,398	3,378	4,359	4,242	5,151	4,418	4,540	3,671
Pistachios	571	578	617	600	579	581	608	598	621	2,068	3,770	658
Pistachios, Young							1,587	1,533	1,622	2,653	3,558	5,106
Plums	529	660	1,009	1,191	1,008	1,148	890	771	105	39	0	0
Plums, Young	40	163	173									
Potatoes (Fall)	3,171	3,341	2,851	3,036	3,337	2,619	2,083	1,376	2,277	1,174	1,864	2,016
Potatoes (Spring)	18,749	18,978	14,592	18,824	14,718	18,612	20,044	17,339	22,955	19,560	18,505	22,301
Safflower	940	683	1,346	693	649	1,199	749	559	632	871	688	0
Spinach											79	86
Sudan Grass	1,319	2,495									939	9
Strawberries												244
Sweet Potatoes (Fall)		161	153	226	219	599	486	89	241	64		263
Sweet Potatoes (Spring)	245		358	211	837	1,269	525	0	494	233	0	600
Tomatoes (Spring)	4,224	5,675	7,519	10,599	7,442	9,885	9,046	9,469	10,283	11,799	10,822	8,392
Turf Farm	763	610	807	756	588	244	323	260	1,119	0	0	0
Urban Landscaped	130	786	0	766	897	50	1,036	0	0	0	0	0
Vineyards	51,258	55,798	54,594	53,572	52,459	55,872	56,723	58,024	63,341	57,394	58,790	59,818
Vineyards, Young	5,122	5,311	8,367	8,189	9,151	6,536	9,773	7,206	6,039	7,860	9,941	8,095
Walnuts	1,707	1,521	1,624	1,575	469	467	488	475	494	468	0	0
Walnuts, Young				172	169							
Wheat	13,598	11,736	12,248	9,664	9,603	12,882	6,695	13,820	9,156	4,970	7,204	9,000
Total	**241,664**	**261,013**	**272,026**	**261,231**	**252,768**	**261,239**	**275,341**	**270,108**	**293,570**	**267,384**	**291,931**	**280,085**

Table A6. Leaching Requirement (LR) for Various Crops Grown in the AEWSD for Water Delivery Years 2006-07 through 2017-18

(Data Values Represent Fiscal Year, Mar through Feb)

Crops	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
						Acre-Feet						
Alfalfa	87	165	184	180	100	49	197	216	108	141	95	45
Almonds	182	600	640	716	579	374	1,147	1,161	1,353	1,801	949	535
Almonds, Young	114	267	267	218	56	30	62	192	277	459	266	144
Apples	0	4	4	4	1	2	5	5	6	6	3	2
Apricots	7	14	7	26	9	4	28	27	27	26	15	8
Apricots, Young	0	12	19	12	10							2
Artichokes											20	12
Asparagus	8	10	8	6	6		0	3	2	0	12	1
Barley	0	9	10	5	5	1	3	6	5	2	0	0
Beans (dry)		28										
Beans (Green) (Fall)									5			
Beans (Green) (Spring)					36	10	21	98	132	84	40	18
Broccoli (Fall)	0	1	2	1	1	0	3	0	2	1	1	
Broccoli (Spring)	0	4	1	3		1	13	5	4	10	4	4
Bushberries	17	39	48	47	39	23	58	65	85	63	122	46
Bushberries - Young								17		0	0	0
Cabbage (Fall)	1				1	1		0	2		6	1
Cabbage (Spring)	2		0	1	1							1
Carrots (Fall)	365	780	809	836	604	369	975	470	1,205	1,115	737	406
Carrots (Spring)	187	394	410	339	186	87	437	589	589	661	346	179
Cauliflower (Fall)									5			0
Cauliflower (Spring)						0	1	0				1
Celery				4	1						2	0
Cherries	189	450	335	509	339	238	667	673	815	816	500	187
Cherries, Young	38	64	178	27	24	17	106	103	52	31	35	24
Cole Crops (Fall)	0		2	2	1	2	2	1	4	7		8
Cole Crops (Spring)	0	5	5	1	1	1	1	6	5	9	2	8
Corn (Fall)					6		6		5			
Corn (Spring)	5	8	12	24	6	2	25	29	132	62	9	1
Cotton	45	62	54	30	23	14	56	43	12	0	1	1
Flowers & Nursery	10	11	21	22	9	8	18	21	19	24	7	1
Grapefruit	11	34	24	19	13	7	20	20	32	33	17	8
Grapefruit, Young						0	6	5	0	0	0	0
Grass Misc.	0	3	0				0	0				
Jojoba	6	14	13	13	9	6	16	18	38	19	13	8
Lemons	7	16	21	22	14	8	28	30	32	37	16	9
Lemons, Young	6	3										
Lettuce (Fall)	8	19	23	10	6	6	19	18	12	34		2
Lettuce (Spring)	1	9	9	7	0	2	4	9	17	5	14	3
Melons, cucumbers, squash (Fall)	3		2			1						0
Melons, cucumbers, squash (Spring)	47	99	76	83	56	34	62	65	61	69	32	15
Misc. Deciduous	2	9	10	6	6	4	13	9	11	22	10	3
Misc. Deciduous, Young		0	2	2	2	1	2	0				
Misc. Field			9				2	0		0	0	0
Misc. Hay & Grain	4	14	33	51	25	17	59	17	13	64	8	0
Misc. Subtropical Fruits	49	178	174	190	143	103	252	324	389	513	251	68
Misc. Subtropical Fruits, Young	0	51	108	95	25	12	83	139	116	70	33	0
Misc. Truck/Berry	141	555	411	311	380	257	651	222	742	344	331	97
Mixed Deciduous										2	4	1
Mixed Hay & Grain								26	16	2	0	0
Mixed Pasture	0	8	4	1	2	1	2	16	0	0	0	0
Mixed Truck Crops	130	191	270	324	210	74	361	210	554	460	325	111
Oats	15	12	14	20	3	6	17	15	6	4	2	6
Onions & Garlic	185	344	323	350	269	220	785	880	712	822	398	251
Oranges	802	1,683	1,455	1,494	1,067	662	1,955	2,067	2,371	2,084	1,305	804
Oranges, Young	49	19	72	43	85	77	187	89	46	119	111	101
Peaches & Nectarines	169	330	281	230	165	65	150	156	237	139	111	50
Peaches & Nectarines, Young	8	37	54	61	19	2	6	13	11	7	10	6
Pears												
Peppers (Fall)						2					4	0
Peppers (Spring)	77	234	194	145	109	67	242	233	311	291	161	72
Pistachios	8	16	15	16	11	7	19	19	21	78	78	8
Pistachios, Young							51	48	56	100	74	59
Plums	12	31	43	54	32	23	50	42	6	3	0	0
Plums, Young	1	8	7									
Potatoes (Fall)	65	138	106	120	94	46	101	66	120	67	58	35
Potatoes (Spring)	382	781	541	743	414	324	971	829	1,206	1,120	573	382
Safflower	6	9	15	8	6	7	11	8	10	15	7	0
Spinach											4	2
Sudan Grass												0
Strawberries	16	60									17	3
Sweet Potatoes (Fall)		8	6	10	7	12	27	5	15	4		5
Sweet Potatoes (Spring)	6		15	10	27	25	29	0	30	15	0	12
Tomatoes (Spring)	58	155	185	278	140	116	289	299	356	443	224	97
Turf Farm	6	10	12	12	7	2	6	5	24		0	0
Urban Landscaped	1	13	0	12	10	0	20	0	0		0	0
Vineyards	1,190	2,632	2,315	2,423	1,686	1,109	3,155	3,184	3,826	3,781	2,082	1,166
Vineyards, Young	119	251	355	370	294	130	544	395	365	518	352	158
Walnuts	35	63	60	62	13	8	24	23	26	27	0	0
Walnuts, Young				7	5							
Wheat	76	129	122	102	74	62	86	175	127	75	61	43
Total	**4,959**	**11,092**	**10,397**	**10,716**	**7,470**	**4,735**	**14,135**	**13,408**	**16,764**	**16,708**	**9,857**	**5,221**

Table A7. Total of ETc and LR demand for crops grown in the AEWSD for Water Delivery Years 2006-07 through 2017-18

(Data Values Represent Fiscal Year, Mar through Feb)

Crops	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
					Acre-Feet							
Alfalfa	5,130	4,932	6,077	5,601	4,323	3,342	5,045	5,601	2,571	3,096	3,751	3,151
Almonds	8,027	13,313	15,739	16,545	18,588	19,227	21,777	22,316	23,746	29,142	27,756	28,004
Almonds, Young	5,029	5,935	6,559	5,039	1,796	1,558	1,186	3,697	4,855	7,429	7,784	7,526
Apples	12	99	92	90	45	93	100	99	103	98	96	98
Apricots	334	334	197	638	318	212	559	564	504	449	471	434
Apricots, Young	0	289	497	288	352							113
Artichokes											391	406
Asparagus	995	646	560	412	557		3	140	116	0	973	168
Barley	7	1,089	1,342	585	825	140	336	590	467	214	0	0
Beans (dry)		406										
Beans (Green) (Fall)									58			
Beans (Green) (Spring)					759	355	255	1,221	1,496	881	772	605
Broccoli (Fall)	12	36	74	61	48	9	120	17	76	37	57	
Broccoli (Spring)	10	103	38	95		39	287	117	95	195	141	233
Bushberries	733	869	1,169	1,075	1,249	1,183	1,101	1,251	1,487	1,024	3,569	2,387
Bushberries - Young								322		0	0	0
Cabbage (Fall)	28				31	31		4	46		210	47
Cabbage (Spring)	87		4	42	29							82
Carrots (Fall)	10,588	11,281	12,980	12,610	12,733	12,508	12,006	5,869	13,694	11,658	14,115	14,030
Carrots (Spring)	5,417	5,692	6,578	5,109	3,915	2,958	5,382	7,357	6,698	6,910	6,638	6,179
Cauliflower (Fall)									100			8
Cauliflower (Spring)						3	20	0				69
Celery				125	63						106	0
Cherries	8,330	9,997	8,225	11,761	10,901	12,245	12,649	12,946	14,299	13,200	14,623	9,808
Cherries, Young	1,683	1,432	4,382	614	770	851	2,016	1,985	904	501	1,027	1,243
Cole Crops (Fall)	30		60	72	30	189	72	44	106	179		643
Cole Crops (Spring)	15	166	177	40	30	59	38	172	138	231	106	618
Corn (Fall)					873		571		454			
Corn (Spring)	236	212	340	631	204	95	548	636	2,644	1,141	290	43
Cotton	10,296	7,287	7,061	3,650	3,889	3,636	5,707	4,380	1,121	0	103	217
Flowers & Nursery	760	405	867	875	495	691	596	685	557	673	370	129
Grapefruit	544	862	685	489	466	435	425	439	650	780	562	464
Grapefruit, Young						0	121	114	0	0	0	0
Grass Misc.	3	253	26				3	29				
Jojoba	319	344	354	346	329	338	356	384	771	344	432	455
Lemons	342	413	596	582	505	473	603	649	632	679	527	541
Lemons, Young	320	64										
Lettuce (Fall)	311	356	481	201	157	261	304	303	179	475		91
Lettuce (Spring)	48	172	184	143	2	85	64	147	256	65	356	131
Melons, cucumbers, squash (Fall)	165		76			103						25
Melons, cucumbers, squash (Spring)	3,087	3,271	2,787	2,859	2,651	2,552	1,760	1,850	1,606	1,681	1,390	1,154
Misc. Deciduous	95	218	291	165	209	248	271	200	221	413	327	153
Misc. Deciduous, Young		0	58	56	76	70	39	0				
Misc. Field			948				119	0		0	0	0
Misc. Hay & Grain	796	1,330	3,387	4,847	3,231	3,460	4,625	1,373	960	4,351	989	0
Misc. Subtropical Fruits	2,459	4,489	4,882	5,014	5,213	6,003	5,461	7,098	7,782	9,482	8,352	4,026
Misc. Subtropical Fruits, Young	0	1,301	3,026	2,488	924	695	1,807	3,041	2,328	1,298	1,089	26
Misc. Truck/Berry	6,212	12,310	10,102	7,177	12,212	13,203	12,352	4,268	13,031	5,569	9,673	5,051
Mixed Deciduous										28	136	70
Mixed Hay & Grain								2,101	1,146	154	0	0
Mixed Pasture	41	478	247	45	158	82	97	825	0	0	0	0
Mixed Truck Crops	5,728	4,243	6,644	7,482	6,734	3,808	6,842	4,047	9,717	7,441	9,496	5,794
Oats	2,678	1,104	1,409	1,913	401	1,302	1,315	1,226	459	299	259	1,177
Onions & Garlic	6,502	6,036	6,289	6,396	6,853	9,008	11,767	13,357	9,853	10,480	9,231	10,470
Oranges	40,143	42,573	40,716	39,333	38,986	38,625	42,301	45,314	47,487	38,494	43,411	47,750
Oranges, Young	2,466	489	2,012	1,122	3,122	4,518	4,043	1,958	921	2,196	3,701	5,982
Peaches & Nectarines	8,448	8,339	7,877	6,061	6,022	3,783	3,256	3,411	4,744	2,568	3,681	2,992
Peaches & Nectarines, Young	411	945	1,500	1,610	711	122	132	278	225	129	334	384
Pears												
Peppers (Fall)						94					103	25
Peppers (Spring)	3,401	5,195	4,773	3,360	3,507	3,445	4,601	4,475	5,463	4,709	4,701	3,743
Pistachios	578	594	632	616	590	588	627	617	643	2,146	3,848	666
Pistachios, Young							1,637	1,582	1,678	2,753	3,632	5,165
Plums	542	691	1,052	1,245	1,040	1,171	940	813	111	42	0	0
Plums, Young	41	171	181									
Potatoes (Fall)	3,235	3,478	2,957	3,156	3,431	2,665	2,184	1,441	2,397	1,241	1,922	2,050
Potatoes (Spring)	19,131	19,760	15,133	19,567	15,132	18,937	21,015	18,168	24,161	20,679	19,079	22,683
Safflower	946	691	1,362	701	655	1,205	760	567	642	886	694	0
Spinach											83	88
Strawberries												9
Sudan Grass	1,336	2,555									956	247
Sweet Potatoes (Fall)		169	159	236	226	611	513	94	255	69		268
Sweet Potatoes (Spring)	250		373	221	864	1,294	554	0	524	248	0	612
Tomatoes (Spring)	4,282	5,830	7,704	10,876	7,582	10,001	9,335	9,767	10,639	12,242	11,046	8,489
Turf Farm	769	620	819	768	595	246	329	265	1,142	0	0	0
Urban Landscaped	131	799	0	779	907	50	1,056	0	0	0	0	0
Vineyards	52,448	58,430	56,909	55,994	54,145	56,981	59,878	61,208	67,167	61,175	60,872	60,984
Vineyards, Young	5,241	5,561	8,722	8,559	9,445	6,665	10,316	7,601	6,404	8,378	10,293	8,252
Walnuts	1,742	1,584	1,684	1,638	483	475	512	498	520	495	0	0
Walnuts, Young				179	174							
Wheat	13,674	11,865	12,370	9,766	9,676	12,944	6,781	13,995	9,283	5,045	7,264	9,043
Other Beneficial Use			130							713		
Total	**246,623**	**272,105**	**282,552**	**271,947**	**260,238**	**265,974**	**289,476**	**283,516**	**310,333**	**284,804**[1]	**301,788**	**285,300**

1. This includes beneficial use water which is not included in Table 10.

ATTACHMENT O

Additional Documentation

ATTACHMENT 1

LEGAL CERTIFICATION AND APPORTIONMENT REQUIRED FOR WATER MEASUREMENT

Arvin-Edison Water Storage District (AEWSD or District) has the legal access necessary to install, measure, maintain, operate and monitor a measurement device at each and every farm-gate/turnout.

The District's Rules and Regulations provide the necessary legal right of access (Division II (1) (d)). In addition, the District's distribution system has legal right of way and encroachment documents for all facilities', including each turnout.

Therefore, no additional information is required of AEWSD for this section.

ATTACHMENT 2

ENGINEER CERTIFICATION AND APPORTIONMENT REQUIRED FOR WATER MEASUREMENT

Arvin-Edison Water Storage District (AEWSD or District) measures water volume (in acre-feet) at each and every farm-gate/turnout.

Therefore, no additional information is required of AEWSD for this section.

ATTACHMENT 3

DESCRIPTION OF WATER MEASUREMENT BEST PROFESSIONAL PRACTICES

Arvin-Edison Water Storage District (AEWSD or District) measures water volume (in acre-feet) at each and every farm-gate/turnout.

COLLECTION:

District staff manually reads each and every farm-gate/turnout which has a volumetric totalizer. Upon taking the reading, the value is transcribed to its daily paperwork, which is then transferred to meter cards which are housed at Headquarters' in the Watermaster's office. At the end of the month, the meter cards are used for billing/invoice purposes.

FREQUENCY:

For each farm-gate/turnout that request a change in flow, a meter read is taken manually by AEWSD staff.

At the end of each month, each and every farm-gate/turnout meter read is taken manually by AEWSD staff.

Upon a discrepancy or "missing/incorrect digit" or general informational purposes the meter may be read on a case-by-case or instance basis.

METHOD OF DETERMINING IRRIGATED ACRES:

The District's Engineering Department collects both Spring data, from April through July, and Fall data, in October and November, through field observations covering the entire 131,600 acre boundary. The data is collected and entered in an ArcGIS geodatabase, with aerial photography, by cropped field, in order to produce maps and summarize data.

Land Use Classes were categorized according to the State of California's Department of Water Resources (DWR) "Standard Land Use Legend" updated in September 2005. The DWR Standard Land Use Legend categorizes land use into four major classes: Agricultural, Semi-Agricultural, Urban, and Native. These classes are subdivided by crop type, land use and irrigation method.

QUALITY CONTROL AND QUALITY ASSURANCE PROCEDURES:

For meter reads, each meter reading is verified by Watermaster orders and also cross referenced with typical or historical water usage.

ATTACHMENT 4

DOCUMENTATION OF WATER MEASUREMENT CONVERSION TO VOLUME

Arvin-Edison Water Storage District (AEWSD or District) measures water volume (in acre-feet) at each and every farm-gate/turnout.

Therefore, no additional information is required of AEWSD for this section.

ATTACHMENT 5

DEVICE CORRECTIVE ACTION PLAN REQUIRED FOR WATER MEASUREMENT

All existing Arvin-Edison Water Storage District (AEWSD or District) measurement devices at each and every farm-gate/turnout are of plus or minus 2% accuracy based on manufacturer specifications.

In addition, given AEWSD's historical practices of reading/inspecting daily during use and at a minimum monthly regardless of use, replacement of nearly 5% of devices on an annual basis and as well as other miscellaneous quality control steps (water use review, water user input, cross references to other meters, etc.) a corrective action plan is not necessary.

Therefore, no additional information is required of AEWSD for this section.

ATTACHMENT P

Conservation Coordinator

ARVIN-EDISON WATER STORAGE DISTRICT

JOB TITLE: **ENGINEERING TECHNICIAN**

PRIMARY RESPONSIBILITIES:

Under the supervision of the Assistant Manager/Staff Engineer, this individual plans, schedules, supervises, monitors, completes, and reports on engineering related activities.

Duties may involve various aspects of water distribution system operations, groundwater monitoring, corrosion control, crop surveys, power management preparation or specifications, composition of reports, the interaction with the district and various districts, agencies, and organizations, perform, prepare, and implement groundwater management plans, annual and 5-year update water conservation/management plans (including knowledge of best management practices, and perform all other duties as required, including covering for the Watermaster/Basin Console Operator position.

TYPICAL TASKS:

Performs biannual crop surveys and tabulates a computerized summary. Conducts depth-to• water measurements on wells within the District. Develops charts, graphs, and reports for presentations and studies. Collects operational field data and composes summaries. Generates various reports, plans, and summaries on computer software for review by the Assistant Manager/Staff Engineer. Maintains a monthly summary report of water and power use and reviews billings.

Responsible for maintenance and repair of District cathodic protection program. Performs pump and motor testing as well as water quality sampling.

Makes field inspections of construction projects for compliance with plans and specifications. Researches and interprets pertinent information from drawings, sketches, maps, field books and catalogues. Assists in land surveying activities.

Performs plan checking for a variety of tract maps, parcel maps and encroachment permits. Writes specifications and administers contracts for various District projects. Performs highly skilled engineering drafting (CAD) and Geographical Information Systems (GIS) tasks. Gathers and analyzes field data for design, construction, and modification of District facilities. Performs and analyzes engineering calculations.

DESIRABLE EDUCATION AND EXPERIENCE QUALIFICATIONS:

EDUCATION: Completion of two years of college (60 units). Preferable course work should include advanced mathematics, geology, physics, chemistry; computer aided drafting, electricity, hydraulics, surveying or other engineering related subjects.

EXPERIENCE: Two years of experience in an Engineering related position requiring mathematical calculations and extensive use of written and verbal skills. Must have a working knowledge of computer hardware and software.

Additional pertinent work experience may be accepted instead of college credit.

ADDITIONAL ABILITIES:

1. Work cooperatively with others.
2. Deal tactfully with the public.
3. Exercise good judgment.
4. Exercise initiative.
5. Be accurate, thorough, and neat.
6. Make advanced arithmetic calculations.
7. Maintain files and records.
8. Maintain a clean driving record.
9. Work in all kinds of weather.

PHYSICAL DEMANDS

The physical demands described here are representative of those that must be met by an employee to successfully perform the essential functions of this job.

While performing the duties of this job, the employee is regularly required to sit and talk and hear for extended periods of time, and utilize multiple computer keyboards and mice. The employee frequently is required to stand and walk, and occasionally must drive a District vehicle and walk on uneven or wet or slippery ground including ground, which may contain a few easily avoidable obstacles. The employee is required to use the hands to finger, handle, or feel; reach with hands and arms; climb or balance; and stoop, kneel, and occasionally crouch or crawl. The employee must regularly lift and/or move up to 20 pounds, frequently lift and/or move up to 50 pounds, and occasionally lift and/or move up to 100 pounds. Specific vision abilities required by this job include close vision, distance vision, peripheral vision, and depth perception.

WORKING CONDITIONS:

WAGES - Please refer to current wage schedule.

HOURS - 0800 to 1630, Monday through Friday with one half hour lunch break 1200 to 1230. In addition, the Engineering Technician is required to work one or more Saturdays per month for which he/she is paid at overtime rates.

Fair Labor Standard Act Status - Non-exempt

ATTACHMENT Q

Changes or Additions to Facilities and Operations

ARVIN-EDISON WATER STORAGE DISTRICT

MAJOR PROJECTS COMPLETED SINCE 1997

#	Year	Cost		Project	Description
38	2018	$2.99	M	Sycamore Check Structure	replace check structure and raise canal concrete liner
37	2017	$0.20	M	Lateral S417	Tejon well 100 discharge to canal
36	2017	$0.67	M	Well Drilling	one well (20) at north canal spreading works
35	2017	$1.70	M	North In-Lieu Pipelines Project	5 temp water turnouts and 4 pump-ins
34	2016	$0.75	M	North Canal Pump Back Project	reverse flow North Canal / 60 in turnout
33	2015	$3.78	M	Emergency Well Drilling	Tej. 98, 99, 100, Syc 38, and NC 19
32	2014	$5.93	M	FFPP Electrical Improvement Project (Phase 2)	upgrade motor controls, starters, breakers
31	2014	$0.50	M	S73-P3 Pilot Pump Station	replace 4 pumps and motors, discharge piping and valves
30	2013	$1.20	M	FFPP Electrical Improvement Project (Phase 1)	upgrade 115 kV substation and main breaker
29	2012	$0.72	M	FFPP Motor Refurbishment	refurbish four 5,500 hp motors
28	2010	$1.33	M	North Canal Check Structure	new check structure within canal prism
27	2009	$2.53	M	Intake Canal Intertie Structures (2 checks/turnouts)	interconnection facilities with Kern Delta WD
26	2008	$0.40	M	Balancing Reservoir Electrical Expansion	power distribution to 4 new wells
25	2007	$20.11	M	South Canal Improvement Project	reverse flow South Canal / Spillway Basin expansion
24	2006	$15.78	M	CVC Expansion Project	500 cfs canal expansion with AE share at 100 cfs
23	2006	$1.61	M	Cross Valley Canal / Friant Kern Canal Intertie	500 cfs connection of facitlities
22	2005	$0.45	M	Wasteway Re-leveling	regrade emergency basin and low flow channel
21	2005	$1.73	M	Sycamore Spreading Works Expansion II	additional 90 acres of spreading basins
20	2005	$1.00	M	FFPP Pump Refurbishment	refurbish units 1 and 2
19	2005	$3.45	M	Balancing Reservoir Expansion	develop remaining 40 acres and drill 4 new wells
18	2004	$0.30	M	Wasteway Obermeyer Gate	replace damaged inflatable dam
17	2002	$3.99	M	Canal Liner Repairs	extensive replacement of damaged panels
16	2002	$0.25	M	Intertie PP Welded Steel Tank	additional facility due to pipeline repairs
15	2001	$0.23	M	FFPP Pump Refurbishment	refurbish unit 4
14	2001	$16.46	M	Intertie Pipeline Lining (fix)	repair faulty 84" RCP with 78" steel pipe
13	2001	$0.17	M	North Canal Levee Reconstruction	repair damages from initial filling of NCSW
12	2000		M	Tejon Wellfield Distribution Pipeline	pipelines for new wells (May-98)
11	1999	$5.08	M	Intertie Pipeline Phase II	84" pipeline / pump station / Spillway Basin expansion
10	1999		M	Radio Communication	HQ tower and SCADA improvements
9	1999	$5.62	M	North Canal Spreading Works	300 acres and 9 wells of water banking facilities
8	1998	$0.31	M	Reinforced Concrete Weir Structures	flow measurement at Sycamore & Tejon gravity ponds
7	1998	$2.07	M	Sycamore & Tejon Wellfield Expansion	3 wells at Sycamore and 5 wells at Tejon
6	1998	$2.33	M	Balancing Reservoir (Section 9)	developed 40 acres of 80 acre parcel
5	1998	$1.80	M	Sycamore Creek Restoration	flood control improvements
4	1998	$0.85	M	Aqueduct Turnout Construction	connection to California Aqueduct
3	1998	$5.07	M	Intertie Pipeline Phase I	purchase 84" RCP pipeline
2	1998	$1.90	M	Tejon Creek Channel Restoration	flood control improvements
1	1997	$2.26	M	Sycamore Spreading Works Expansion	200 acres of spreading basins
	Total	$115.52	M		

SUMMARY BY GROUP		
$0.75	M	Wasteway Refurbishment
$3.70	M	Creek Restoration
$5.78	M	Balancing Reservoir
$11.34	M	Miscellaneous distribution facilities
$9.08	M	Forest Frick Pumping Plant refurbishment
$17.39	M	Cross Valley Canal Expasion
$67.48	M	Water Bank Facilities
$115.52	M	Total

ATTACHMENT R

Combined Turnout Agreement and Consent to Easement

FOR THE BENEFIT OF THE DISTRICT
RECORDING REQUESTED BY:

ARVIN-EDISON WATER STORAGE DISTRICT,
a California water storage district,
as official business

WHEN RECORDED MAIL TO:

ARVIN-EDISON WATER STORAGE DISTRICT
P. O. Box 175
Arvin, California 93203-0175

COMBINED TURNOUT NUMBER ______

COMBINED TURNOUT AGREEMENT AND CONSENT TO EASEMENT

WHEREAS, each of the undersigned parties hereto, as a landowner within the District, has entered into a long-term water service contract with the Arvin-Edison Water Storage District covering the lands in which they own an interest and which lands are a portion of the lands shown on Exhibit "A" attached hereto; and

WHEREAS, by reason of the foregoing, each of said parties is known as a water user as defined in said long-term water service contract; and

WHEREAS, the parties hereto desire to obtain water service for their properties through a single turnout,

NOW, THEREFORE, IT IS MUTUALLY AGREED AS FOLLOWS:

1. The parties to this agreement will accept delivery of water to be made available to their lands by the District pursuant to their respective water service contracts through a combined turnout designated Turnout Number ______the Arvin-Edison Water Storage District System, which combined turnout will serve all the lands described in Exhibit "A" hereto.

2. Each of the parties to this agreement hereby grants to the other parties an easement appurtenant to the lands of the other and within the area to be served by said turnout for reasonable ingress and egress for the purpose of construction, operating, maintaining and repairing any facilities required for the transportation of water from said turnouts to reasonably serve such lands. Said facilities shall be so located as to cause the least inconvenience to the lands subject to said easement and the owner or owners of lands benefited by said easements shall reimburse the owner or owners of the land burdened by said easement for any damage to crops directly arising from the exercise of the rights herein granted. The methods by which repair,

operation and maintenance of any facilities, other than District facilities, jointly used by the water users herein will be accomplished and the means of financing the same is the subject of a separate agreement between said parties and as to which the District is not to be concerned.

3. It is understood that the turnout mentioned herein is for the use and benefit of all of the lands shown on Exhibit “A” hereto. Each of the parities will cooperate with the other with respect to taking of water therefrom and will conduct his operations so as to provide the minimum of interferences with the other parties.

4. Each of the parties to this agreement does hereby appoint ____________________ ______________________________________ whose address is ____________________________ ____ and whose telephone number is __________________________________ as their sole Agent to represent all the water users herein mentioned in matters relating to said combined turnout. Said agent shall advise the District each month, in writing, what portion of the lands within Exhibit “A” hereto received water delivered through said combined turnout and the amount of water so applied and the District shall use said monthly report in computing the charges each water user is to pay by reason of their respective water service contracts with the District.

Agent shall have full power and authority to appoint such subagent, as he deems necessary to carry out the terms hereof. Such appointments shall be in writing in such form as District may approve, and be executed in proper form as District may approve. Any subagent’s appointment shall terminate by its terms at the end of each water year. Any such appointment may be terminated by the Agent by giving written notice thereof to the District executed in the same manner as the appointment.

Should said Agent for any reason refuse or be unable to perform the matters herein mentioned and upon sale of his interest in the lands mentioned in Exhibit “A” hereto, the water users within said area agree to appoint a successor Agent and shall notify the District, in writing, of such appointment. It is agreed that the District may rely upon any such appointment signed by the numerical majority of the landowners within said service area together with the signature of the individual so appointed as Agent and filed with the District. The written form of appointment shall be upon approval of the District.

Each water user agrees with the other and represents to the District that neither the death or subsequent incapacity to contract of a water user shall terminate this agency.

5. The provisions hereof shall be binding upon and shall inure to the benefit of water users, their respective heirs, executors, administrators, successors and assigns, and each and everyone of them, or any person or entity claiming any interest in the lands set forth in Exhibit “A” hereto, through or under any undersigned water user and to the District, its successors and assigns.

6. The rights hereby established are intended to form a part of the appurtenances to the land as described in Exhibit “A” hereto and the duties hereby established, including, but not limited to, the obligations to pay a share of the crop damage shall run with and bind said lands; PROVIDED, HOWEVER, any water user may also enforce said rights as against the owner of other lands set forth in Exhibit “A” hereto by a personal action without resort to foreclosure of a lien

or pursuing any action against the land. Should an action be brought to enforce any of the rights hereby created, the prevailing party shall recover such attorneys' fees and costs as the Court may establish.

7. This agreement shall remain in effect until the last expiration date of the water service contracts between the undersigned water users and the Arvin-Edison Water Storage District.

APPROVED AND FILED THIS ___________ day of ________________________, 200__.

ARVIN-EDISON WATER STORAGE DISTRICT

By :_________________________________

(District Seal)

OWNER(S) OF PARCEL 1

____

By: _________________________________

By: _________________________________

OWNER(S) OF PARCEL 2

____

By: ________________________________

By: ________________________________

STATE OF CALIFORNIA)
) ss.
COUNTY OF KERN)

On this ______ day of __________, 20__, before me, ________________________, Notary Public, personally appeared ____ proved to me on the basis of satisfactory evidence, to be the person(s) whose name(s) are/is subscribed to the within Instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I Declare, UNDER PENALTY OF PERJURY that the foregoing is true and correct.

WITNESS my hand and official seal.

____
Notary Public in and for said State

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document

DESCRIPTION OF DOCUMENT

Title or Type of Document: ____

Document Date: ______________________ ***Number of Pages:*** ______________

Signers Other Than Above: ____

CAPACITY(IES) CLAIMED BY SIGNER

Signer's Name: ____
□ *Individual*
□ *Corporate Officer – Title:* ______________________________
□ *Partner* □ *Limited* □ *General*
□ *Attorney-in-Fact*
□ *Trustee*
□ *Guardian/Conservator*
□ *Other*:____________________________

Signer is Representing: ____

E X H I B I T "A"

(COMBINED TURNOUT SERVICE AREA, TURNOUT NO. _____)

Parcel No. 1

<u>**OWNER**</u>	<u>**APN**</u>	<u>**DESCRIPTION:**</u>
[NAME]	_________________	

Parcel No. 2

<u>**OWNER:**</u>	<u>**APN**</u>	<u>**DESCRIPTION:**</u>
[NAME]	__________________	

ATTACHMENT S

Drought Management Plan

DROUGHT MANAGEMENT PLAN

California Governor Edmund G. Brown, Jr. issued on April 1, 2015 Executive Order B-29-15, Provision 12 stated: "*Agricultural water suppliers that supply water to more than 25,000 acres shall include in their required 2015 Agricultural Water Management Plans a detailed drought management plan that describes the actions and measures the supplier will take to manage water demand during drought*".

In addition, the California Department of Water Resources (DWR) required those plans to include quantification of water supplies and demands for 2013, 2014, and 2015 (to the extent data is available), which information in included in Exhibit A. Section 3.2.4 of DWR's Final Agricultural Water Management Plan Guidebook provided guidance as assistance, which was followed in preparation of this Drought Management Plan.

This Arvin-Edison Water Storage District (AEWSD or District) Drought Management Plan details how the District prepares for droughts, manages water supplies and administers allocations during drought conditions. Some components or actions may require detailed review of conditions, policy changes, and long term capital improvements. Additionally, as conditions change and new technology and knowledge becomes available, opportunities and constraints will change.

A description of the water shortage allocation plan is further described below and as attached herein. In addition, the following components assist AEWSD in planning opportunities including, but not limited to, drought periods:

WATER BANKING AND WATER REGULATION

The District's Project, construction of which was initiated in 1964 and completed in 1968, reflects the implementation of a plan for the integrated management of a supplemental imported surface water supply with banked groundwater reserves providing **a true conjunctive use program** for firm deliveries to contract holders in Surface Water Service Areas (SWSA) as well as stabilized groundwater levels in the area.

As part of the conjunctive use and regulation needs, due to an erratic surface water supply, two key District owned, operated and maintained facility components are the spreading basins (about 1,500 acres), and the associated well fields (79 wells) through which water is stored and banked in the underground and later recovered when required. At its peak, the District had nearly 700,000 acre-feet of water stored in the underground set aside for drought years. A graphic displaying the accumulation of underground storage amounts of annual water banked and water extracted over the history of the District is included in Exhibit B.

In addition to the traditional groundwater banking activities that assist the District to regulate wet period supplies into dry periods, the District makes maximum use of its water supply during wet periods by use of transfers and exchange agreements involving other districts whereby the partnering agency will receive water in wet periods and return water supplies to the District in dry periods. The District has long term agreements with a group of agencies called "Cross Valley Canal Exchangors", Metropolitan Water District of Southern California, and Rosedale Rio Bravo Water Storage District for such water management actions to regulate these wet period supplies into dry periods. In addition, the District typically has annual, as-needed, agreements with other local agencies including, but not limited to, it's neighboring Kern Delta Water District, who shares the same underground aquifer.

A graphic displaying the annual water management programs and water invested or water returned, from both groundwater banking activities and transfers/exchanges in any given year, is included in Exhibit B.

MONITORING HYDRAULIC LEVELS OR CONDITIONS

Statewide snow-water content (snowpack) conditions and reservoir levels plus forecasts of surface water supply declarations are monitored extensively, at times daily, by both District staff and as provided by other agencies through various sources including, but not limited to, internet based information (e.g. California Data Exchange Center, http://cdec.water.ca.gov/ and United States Bureau of Reclamation Central Valley Operations Office, http://www.usbr.gov/mp/cvo/).

Beginning in September of each year, the District reviews the data and subsequent year forecasts, and compares the information against historical declarations to roughly determine the potential drought affect on the District and its overall operation for the upcoming Water Year (which runs from March 1 to the end of February in the next calendar year). In addition to the research performed by its own staff, the District attends frequent United States Bureau of Reclamation water supply meetings. This process is repeated as updated information becomes available.

The District also monitors water levels in the District owned and operated groundwater wells on a monthly basis when in operation (these wells are also known as "District extraction facilities”. In addition, the District performs bi-annual surveys of standing groundwater levels, during both spring and fall, in landowner wells within the District. The bi-annual surveys are used for various purposes including: groundwater depth, groundwater elevation, and annual change contour maps, as well as providing information for the District’s water rate setting process (whereby the District’s average surface water rates for the following year equate to average groundwater pumping cost estimates, so as to efficiently manage the basin and promote conjunctive use of both groundwater and surface water resources). The District actively examines its banked water account during wet or dry periods. It also monitors and manages its surface water “carryover” in reservoirs outside of the district. And, it monitors and manages water transfer and exchange accounts to regulate surface water supplies with water management partners outside of the district. Both of these reduce drought impacts.

PROCESS FOR DECLARING A WATER SHORTAGE AND IMPLEMENTATION

After review and presentation of all readily available surface and groundwater information by District staff, and following meetings with landowners/water users, the AEWSD Board of Directors officially inform and notify Surface Water Service Area (SWSA) water users by letters, which are both mailed and transmitted electronically (e-mail) to those registered with the District. Example letters to the water users from the District during the 2014 and 2015 water shortage periods are included in Exhibit C.

The District’s Water Management Plan Attachment E (Water Shortage Statement from Rules and Regulations Page 15) describes the apportionment within the District during a water shortage period as follows:

> *Pursuant to powers granted by Section 43004 of the California Water Code and Article 2(l) of the Water Service Contracts, water will be apportioned within the District, in the event of a shortage, to each Water User upon the basis of the ratio of each Water User's acreage as listed in Exhibit "A" of each contract to the total acreage subject to the District's contracts for agricultural water service*.

OPERATIONAL ADJUSTMENTS INCLUDING CANAL, RESERVOIR, and GROUNDWATER MANAGEMENT

The District is able to meet the full water demands from the October through March time period solely by the use of groundwater banking facilities (which recover previously recharged/banked water supplies), so no limitations or prorates are placed on water users during that time. However, during the April through September period, during severe drought, the irrigation demand exceeds groundwater bank supplies and surface water supplies must be regulated and imported in the reservoirs and canals that serve the District to meet peak irrigation demands. A general graphical description of the manner in which surface and groundwater supplies are managed within the District to demands is included in Exhibit D. The April through September six month period is then the focus of the prorate allocation, which consist of both available surface water and groundwater extracted by the District and subsequently deliveries are limited/prorated based on all available supplies.

During the prorated period, the District administers turnback/reallocation pools among water users in the District so as to move water allocations to other users at predetermined prices (for both sell and purchase) in order to protect customers from price-gauging. Water users are also allowed to form “Farming Units” in order to collectively manage water supplies amongst those willing to do that.

In addition to the previously banked groundwater that is extracted from District wells for its SWSA water users, the District transports/conveys landowner/water users’ own private wells in the District canal or pipeline distribution system to their desired turnouts. Water transfers from one field to another are allowed, as well as transfers from one water user to another.

During the 2014 drought conditions, the District revised its minimum 24 hour delivery rule to allow for more flexibility in water ordering. For example, instead of the typical 24 hour duration, water users were allowed to modify their irrigation request for *less than* 24 hour periods (e.g. 4, 8, or 12-hour sets). Water could be turned on or turned off as it best suited the water users need so long as proper communication protocols were followed. The letter notifying water users for the shift in the 24 hour delivery rule is included in Exhibit E. The rule was extended past the initial six month shortage period (in 2014) and continued to be instituted for the remainder of the year (even outside of the prorate period) and into the 2015 water year.

During drought times and when the District’s water supply is from groundwater bank wells (extraction of previously banked supplies), the District staff and its contractors are on-call for immediate well repairs so as to limit downtime and associated loss of water production. The District has also reached agreements with other agencies that allow the District to continue pumping its wells during off-peak or low demand periods and subsequently exchange the well supplies for surface supplies at a later time (regulate the fall supply into a summer peak).

In addition, the District severely limits the use of its unlined reservoirs to eliminate water losses (that actually recharge to underground aquifer). The District has recently upgraded many of its facilities to replace its antiquated radial (undershot) gates with overshot gates that have increased in-canal (lined) storage capabilities, and plans to do more. The District also incorporated reverse flow capabilities (raised canal liner, reverse flow pumps, and check structures) to increase operational flexibility. The recent investments made to increasing storage capability assist in regulating groundwater bank supplies, which are generated at a constant rate and must be regulated to available demand centers.

DEMAND MANAGEMENT (POLICIES, INCENTIVES, ALLOCATION PLAN TO LOWER FARM WATER USE)

In addition to the turnback/reallocation pools, that typically move water from non-permanent lands/water users to those with permanent plantings, punitive surcharges are used to discourage water use in excess of a District allocation. An example of such practice was instituted in 2015 during the second consecutive water shortage period and is included in Exhibit F. The AEWSD Board of Director's also have the option to institute tiered prices, if necessary.

ALTERNATIVE WATER SUPPLIES

The District has increased its awareness of, and is actively investigating use of, recycled water opportunities from various sources (tertiary treated wastewater from adjoining cities, oilfield wastewater, and food processing wastewater).

STAGES OF ACTION

The initial stage is review of water supplies against historical demand patterns followed by an allocation of supplies, if necessary. If hydrologic conditions continue to worsen, allocations may be reduced. Upon a reduced allocation, District implements the various programs as described above (turnback/reallocation pools, landowner pump-ins, and delivery flexibility). The District continues to inform landowners/water users' with letters of any changed condition and/or water supply updates on an as-needed basis.

COORDINATION AND COLLABORATION

The District participates in multiple transfers and exchanges with agencies that involves many forums including but not limited to, agencies involved in the operation of Friant-Kern Canal, California Aqueduct, and the Cross Valley Canal. As previously mentioned the District also has multiple long term agreements and annual agreements that deal with specific water management actions.

The District is signatory to many joint power authority (JPA) organizations that hold frequent meetings. AEWSD's JPA affiliations include Friant Water Authority, Power and Water Resources Pooling Authority, Kern Groundwater Authority, and Kern River Watershed Coalition Authority. Other organizations the District is involved in include the Kern Integrated Regional Water Management Plan, Water Association of Kern County, and Association of California Water Agencies.

AFFECT ON REVENUES AND EXPENDITURES

The water shortage periods significantly *increase* the District expenditures based on extensive power requirements (groundwater bank extractions) and associated wellfield repairs. District revenues are *reduced* provided the decrease in water distribution (sold by volume). Therefore, during extended droughts, the District experiences both increases in expenditures and decrease in revenue. However, the District budget incorporates current water and power rates based on 30-year hydrology so as to stabilize long term rates, eliminate peaks/valley from year to year, and limit use of cash reserves. Furthermore, reserves are established and maintained to withstand multiple years of drought.

The District successfully passed a 218 election in 2015 to increase acreage assessments as a result of rising cost of water/power resources, capital improvement projects and new projects that expect to increase water supplies to the District, among other things.

The District is active in pursuing grant funds or low interest loans to the extent feasible for its projects/programs.

ARVIN-EDISON WATER STORAGE DISTRICT

DROUGHT MANAGEMENT PLAN

EXHIBIT A

2013, 2014 and 2015 Supply and Demand Table

ARVIN-EDISON WATER STORAGE DISTRICT

DROUGHT MANAGEMENT PLAN

		2013	2014	2015
Supply	Surface Import	43,756	45,956	48,219
	AE Wells	161,352	134,717	114,975
	Farm Wells	0	6,303	11,326
	Total	205,108	186,976	174,520

Demand	Water Users	161,605	127,991	112,163
	Gross Spreading	4,010	3,507	279
	MWD Return	38,549	52,028	56,950
	Losses	944	3,449	5,128
	Total	205,108	186,975	174,520

Notes:

Based on Water Year (Mar 1 through Feb)

Losses include minor seepage, metering inaccuracies

2013 had no prorate restrictions

2014 had 6-month, Apr through Sep, restriction of 1.9 af/ac

2015 had 6-month, Apr through Sep, restriction of 1.3 af/ac

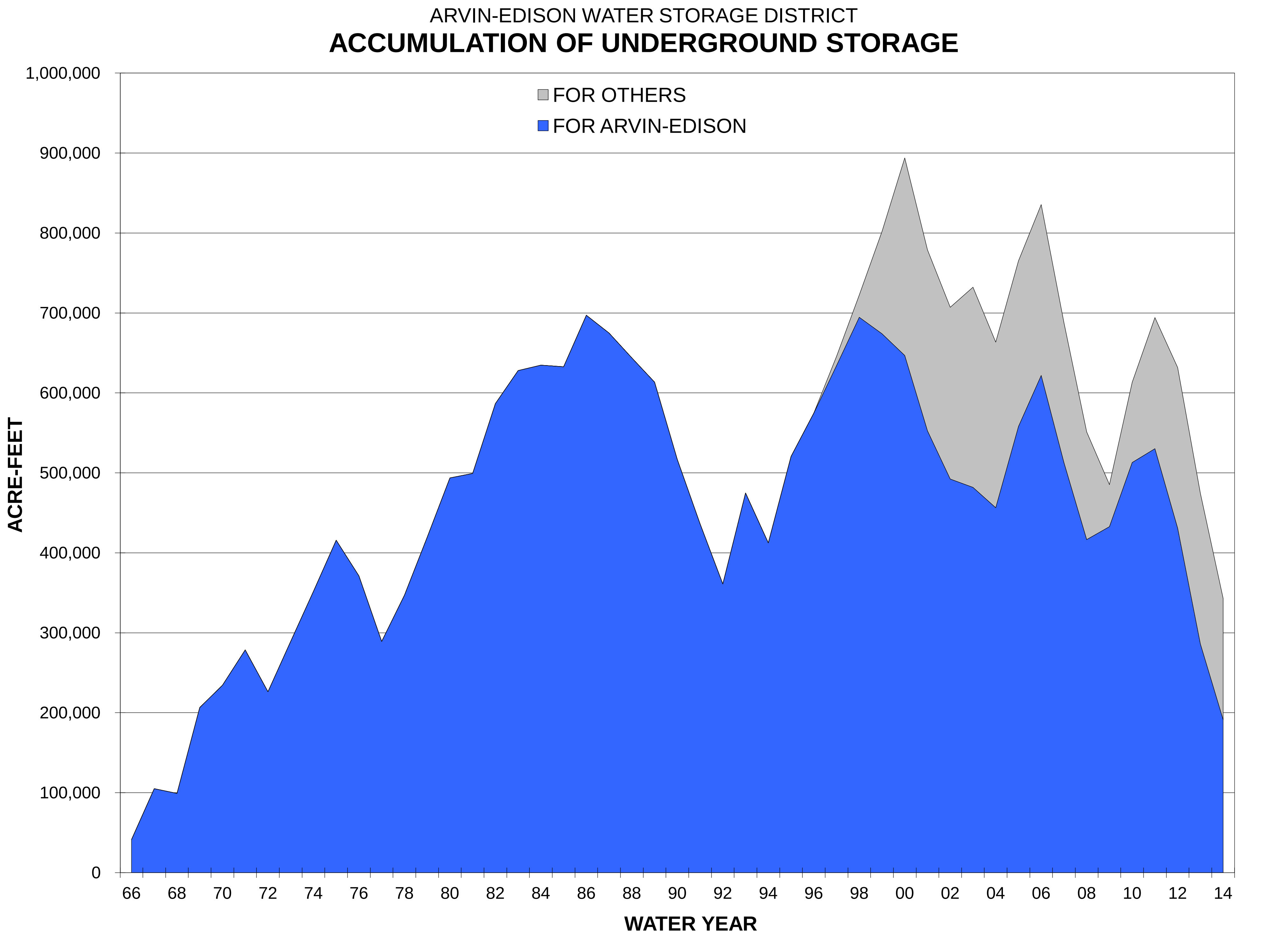
2015 is estimated

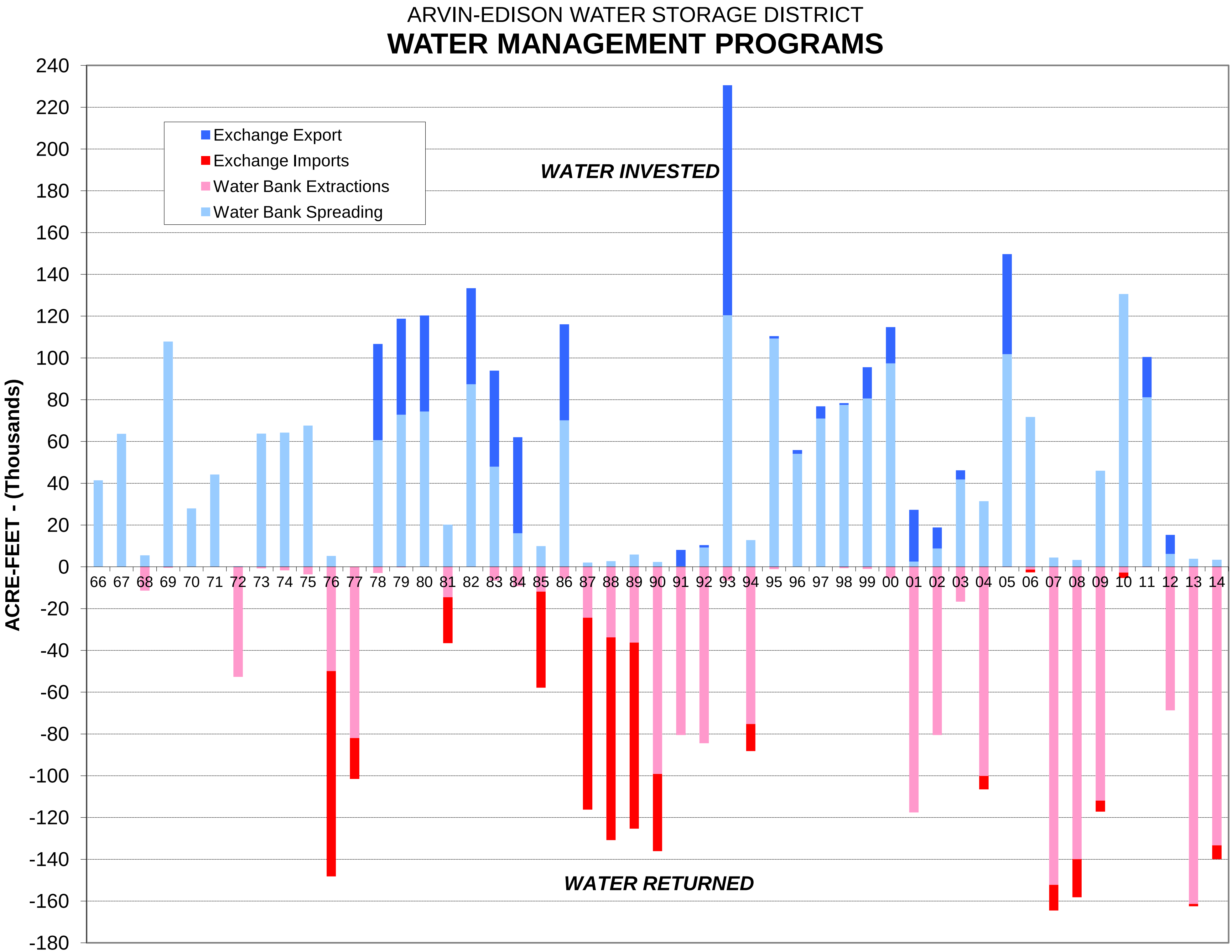
ARVIN-EDISON WATER STORAGE DISTRICT

DROUGHT MANAGEMENT PLAN

EXHIBIT B

Water Banking and Water Regulation


ARVIN-EDISON WATER STORAGE DISTRICT
ACCUMULATION OF UNDERGROUND STORAGE
FOR OTHERS
FOR ARVIN-EDISON
ACRE-FEET
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
66
68
70
72
74
76
78
80
82
84
86
88
90
92
94
96
98
00
02
04
06
08
10
12
14
WATER YEAR


ARVIN-EDISON WATER STORAGE DISTRICT
WATER MANAGEMENT PROGRAMS
Exchange Export
Exchange Imports
Water Bank Extractions
Water Bank Spreading
WATER INVESTED
WATER RETURNED
ACRE-FEET - (Thousands)
240
220
200
180
160
140
120
100
80
60
40
20
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14

ARVIN-EDISON WATER STORAGE DISTRICT

DROUGHT MANAGEMENT PLAN

EXHIBIT C

2014 and 2015 Letters to Landowners/Water Users

ARVIN-EDISON WATER STORAGE DISTRICT

January 22, 2014

Subject: Water Supply Update

Dear Landowner/Water User:

2013 Water Year Wrap Up

The Arvin-Edison Water Storage District (District) has nearly completed deliveries for the 2013 Water Year (ends February 28, 2014). Our success in weathering yet another dry year came from, in large part, extensive use of our water bank supplies (which has taken its toll on wellfield equipment and pumping levels), water management programs with others, as well as attributed to efficient operations by District personnel. During the 2013 Water Year, the District expects a net reduction of 137,000 acre-feet (af) to its banking reserves as a result of meeting an irrigation demand of approximately 155,000 af, including losses.

As you are aware, and have seen in the media, there were dramatic water shortages in 2013 throughout California affecting primarily west-side water agencies in both the Central Valley Project (CVP) (20% allocation) and State Water Project (SWP) (35% allocation) that contract for northern California water supplies that must be conveyed through the Delta and California Aqueduct. The dry hydrology was also compounded by judicial and legislative restrictions that dictate water going to the ocean rather than to farms and cities.

While the District's Friant CVP supply derives from a watershed source different than the west-side CVP and SWP contracts (San Joaquin River and Millerton Lake), the entire State will none-the-less face another challenging year in 2014, as reflected by the Governor's drought emergency declaration last week, if the current dry conditions continue.

2014 Water Year Preliminary Estimate

While any meaningful water supply forecast for the 2014 Friant supply will not be available until mid-February (the District's water year begins March 1), the District has modeled potential 2014 operations assuming the driest-year scenario experienced in the last 47 years (1977 conditions), since the District began operations, and thoroughly reviewed the District's water delivery capabilities under that scenario. The model for this driest-year scenario considered our water bank reserves, projected well field performance, return of water from programs with other agencies, and the amount of carryover water that can be utilized next year.

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Other considerations include the challenge to schedule all these supplies during the peak irrigation season (typically April to September) when District demand exceeds instantaneous District wellfield capacity, as well as the impact to financial reserves to cover the nearly $6 million in incremental power costs incurred when District wellfields are maximized during dry years. (Note: The District has already purchased its power supplies for next year).

Operating under a "driest-year scenario," and barring unforeseen circumstances beyond the District's control, **there remains the potential for the District to make full deliveries to water users in 2014**. However, we are now half-way through the snow accumulation season, and if current weather conditions persist, 2014 could prove to be drier than the driest-year scenario previously experienced. In the case of a zero water supply declaration on the Friant-Kern system, District farmers would be relegated to those District supplies consisting of carryover supplies, return water from partners, and groundwater banking supplies. **If that is the case, District supplies would equate to approximately 2.75 af/acre for the entire year, with a secondary prorate within the year of approximately 2.00 af/ac for the six month period of April through September.**

Regardless of the final water supplies, success will be contingent on the cooperation of water users and strict adherence to District policies.

It is clear at this point that water supplies will be scarce in 2014, and water users may wish to reconsider their farming practices for 2014 in light of the risk of prorated supplies. The District will update the landowners/water users in about a month and if dry conditions persist, the District will more specifically outline a portfolio of drought year programs that may be implemented such as prorates, turn back pool, well pump-in programs, etc., to augment supplies.

Enforcement of Policies

The District's success in 2014 to deliver supplies will also be affected by on-farm irrigation practices. As the District's "Rules and Regulations" specify, it is imperative that water users' water orders correspond to their *actual* daily demands, and they maintain their water demand for the full 24-hour period for which they have ordered. Any deviation from these conditions introduces error into daily District operations; and subsequently, causes "over-prescribing" of what small amount of surface water supply that may be available to the District as well as causing us to "shut off" valuable well supplies so as to balance the District's system, of which such groundwater supplies are then lost for the year. **The District will diligently enforce these rules so as to mitigate this impact.**

In addition, the Board has requested staff to more diligently police irrigation deliveries to ensure water is going only to lands with long-term water service contracts. This will include additional staff efforts to ensure that District water is delivered solely to lands under long-term contract (not temporary water contracts), and through the turnouts specifically cited in those long-term contracts. Any deviance to this requirement manifests itself in high acre-feet per acre (af/ac) water use rates, which is shown on your monthly billing statements. By going through this process, we hope to eliminate illegal water use including potential deliveries to non-contract lands, if any exists. Therefore, please be advised that water users with high af/ac totals on their monthly bills can expect to be contacted by the District for contract clarification and possible enforcement measures. **Please also note that illegal use may be charged at market rates, in order to replace those supplies, plus other normal and customary District charges.**

If you have any doubt as to which lands are under contract please contact the District immediately. It is also imperative that each water user use prudent irrigation practices to conserve water to the extent possible.

Topics for Landowner Meetings in 2014

In order to prepare for 2015 and beyond, during 2014 the District will hold a series of landowner/water user meetings and workshops to discuss and receive input on many water supply topics such as those listed below:

Dwindling Surface Water Supplies: If water supply deficiencies continue, the District may have to frequently prorate supplies and the District Board is contemplating how best to equitably manage water supplies into the future. It is anticipated that, with the growing population in California, and amid ever expanding environmental demands for water, surface water supplies will grow scarcer over time. For future planning, it is also necessary to consider recently enacted legislation, settling 18 years of litigation with environmental groups that mandates water to be diverted below Friant Dam to restore a 60-year old dry San Joaquin River channel for a salmon run rather than continue the historic deliveries to farmers. This San Joaquin River Restoration legislation directly impacts the District by creating a potential surface water deficit averaging 30,000 af per year.

Water Bank Supplies: Even with 2014 presumed a dry year, the District will still have approximately 200,000 af in its water bank inventory beginning in 2015 (from in-District groundwater recharge programs), but groundwater well performance will be greatly reduced due to declining pumping levels and certain water quality constituents could become an issue. Consequently, the Board is discussing how best to manage a dwindling reserve of water bank supplies until hydrology allows us to recharge our groundwater basin, and so as to meet future extended drought conditions. It should be noted that aquifer recharge takes many above normal water years to replace the amount we have withdrawn in the just the last few years.

Maximum Water Use Cap: The question of whether a cap or threshold should be put on water use is also a topic for discussion. The District-wide average use today is approximately 2.9 af/yr annually, but water use varies dramatically farm-to-farm due to cropping patterns as well as irrigation methods and an equitable method of capping water use must be established that allows water users and landowners the maximum flexibility to farm. Furthermore, if water use limits need to be set for surface water users, we may also want to discuss and consider how best to cooperate with groundwater users so as to conjunctively manage and operate the District in a sustainable and equitable manner for both.

Tiered Pricing: Another topic being explored involves tiered pricing, so that incremental water use beyond specific thresholds will incur incrementally higher costs. The purpose for tiered pricing would be to provide both an incentive to reduce water use, and to collect rates more reflective of high dry-year water costs that are directly associated with these higher water use rates while at the same time recognizing that different crops have different needs in this regard.

Annual Prorates: As surface water supplies dwindle and competition to purchase supplemental water increases, eventually the District could be faced with the need to prorate farmers to the available supply for the year. A district-wide prorate could take many forms from annual prorates in acre-feet per year to a daily prorate of gallons per minute per acre so as to match well-field production. One practice in the past was to prorate deliveries only during the six-month peak irrigation season of April through September. As mentioned above, District-wide prorates would need to be discussed with both surface water and groundwater users if an equitable and sustainable practice were to be developed.

Pump-in Programs: As a part of dry year operations, the Board may allow landowners to pump into the District's canal for either a sale to the District to firm up its supply or so as to convey the supplies on behalf of the landowner. A pump-in program has several cost, communication/supply management and water quality issues that would need to be resolved in advance. Landowners may also want to activate idle wells to assist with dealing with the dwindling surface water supplies.

Discussions continue on these complex topics and it is anticipated a series of landowner meetings would be held to gather input from the water users, both in the groundwater service area and the surface water service area. We anticipate these meetings will take place in 2014, and we hope that you will participate in the process and share your ideas. Until that time, feel free to contact the District with any questions or comments you may have.

In closing, the District is asking all landowners/water users to continue planning and implementing on-farm conservation measures in order to use water wisely/efficiently in the coming year and beyond.

Sincerely,

Steve Collup

Steve Collup
Engineer-Manager

cc: Board of Directors
Ernest Conant, Esq.
All District Employees

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ARVIN-EDISON WATER STORAGE DISTRICT

February 14, 2014

Subject: 2014 Water Supply Update

Dear Landowner/Water User:

As a follow up to our January 22, 2014 letter regarding the 2014 Water Supply Update, the Arvin-Edison Water Storage District (District) Board of Directors, pursuant to the District's Rules and Regulations, Article 9b (Proration of Water Delivery: Water Shortage), approved a draft Drought Allocation Program for water users for 2014 (attached).

In summary, the water shortage period is for the 6-month peak irrigation period of April through September (Prorate Period) when surface supplies are necessary to supplement District supplied groundwater to provide full deliveries. For the remaining months of our water year (months of March, and October through February 2015), the irrigation demand can typically be met within the District's instantaneous well production from water bank facilities, and therefore, no prorate is required during the off peak months at this time.

The prorate amount currently being considered for the Prorate Period is 1.90 acre-feet per acre (AF/AC). Note that the historical usage for the Prorate Period is 2.13 AF/AC. Landowners/water users will be allowed to combine their turnouts, contracts, and Prorate Period allocation into farming units. The total Prorate Period allocation can be moved around within those farming units. Initial schedules for the use of Prorate Period water will be required and a return pool will be administered by the District to reallocate water from those that don't need their full Prorate Period supplies to those water users that request more. If a schedule is not submitted the District will assume you do not plan to irrigate this year and your allocated amount will be made available to others through administration of the return pool.

The Board is also considering, among other things, a pump-in program to convey landowner well water to those contract lands still suffering from a water supply deficit.

More specific details of the 2014 Drought Allocation Program are attached.

The District has also reserved the District's Boardroom (20401 Bear Mountain Blvd.) for water user/landowner meetings to discuss the draft Drought Allocation Program on February 19th, 20th, 21st, 25th, and 28th. The District will offer both a 9:00 a.m. and 1:00 p.m. meeting each day, if needed. Meetings are expected to last 90 minutes or less. Limited seating is available so please call and reserve a spot for your attendance. We will cancel any meetings to which we do not receive sufficient reservations. When you call to RSVP, please leave a phone number and email address so that we can notify you of any change in meeting dates and times.

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Although the Prorate Period affects District water users in the surface water service area, the Board strongly suggests that groundwater users also attend as the District's sustainability into the future will be discussed, and is strongly contingent upon cooperation among both District water users and groundwater lands. The District has had a successful history to-date largely in part due to the equitable nature of water supply and costs between District surface water users and groundwater lands.

The District looks forward to receiving your input, and we are confident, we can successfully navigate this year by working together.

Sincerely

Steve Collup

Steve Collup
Engineer-Manager

Enclosure

cc: Board of Directors
All Employees

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DRAFT

ARVIN-EDISON WATER STORAGE DISTRICT

2014 DROUGHT ALLOCATION PROGRAM

(1) **Water Shortage/Prorate Allocation.** District Landowners/Water Users (Water Users) will be subject to water shortage/prorate for only the 6-month peak irrigation period of April through September inclusive (Prorate Period). Unless conditions change significantly, there is no need to prorate deliveries during the other six months of the water year. By March 1, 2014, Water Users will be notified of their preliminary Prorate Period water allocation, in units of acre-feet per contract acre (AF/AC). **The preliminary prorate estimate at this time is about 1.9 AF/AC**. Such allocation may be used by Water Users through any turnout serving District contract lands, under their ownership or control (Farming Unit), at any time during the Prorate Period, consistent with District Rules and Regulations for Delivery of Water. However, certain deliveries may be subject to additional proration due to the same pumping and pipeline capacity limitations which occur from time to time during normal operations.

(2) **Schedules.** After receiving the preliminary Prorate Period water allocation, each water user shall submit a schedule for the Prorate Period, using only their prorated amount, for each of their contract turnouts, on a form supplied by the District. These schedules will also be the basis of a prorate pool to possibly reallocate water to others during the Prorate Period. Such schedule shall indicate usage by month, amount of water to be returned, if any, and a request for additional water (beyond the prorated amount if additional water is desired). The District must receive the schedule by March 14, 2014. If a schedule is not submitted, it will be assumed you are not irrigating and your contract/turnout allocation will be made available to others in the pool. Water Users may schedule any portion of the water allocation within the Prorate Period but no prorate entitlement may be carried over beyond September 2014. There is no prorate declared after that time so that carryover is moot.

All Prorate Period water allocation returned into the pool will receive a credit/payment of $200/AF from the District and all additional water allocated from the pool will have an additional charge of $200/AF above all normal and customary water and energy lift charges.

No individual transfers of Prorate Period water allocation will be allowed. Any and all requests and reallocation of water must go through the District.

(3) **Initial reallocation.** Water Users requesting additional Prorate Period water allocation, if it becomes available, will receive notification of the reallocation of water by April 1, 2014. Allocation of returned water will also be prorated on a contract acreage basis among those Water Users requesting additional water. All water requested and received by reallocation shall become a part of the Water User's Prorate Period

water allocation and the additional water shall be charged for at a rate of an additional $200/AF above all normal and customary charges.

(4) **Subsequent reallocations.** If the total of the March 14, 2014 pool requests for additional water are not satisfied by a sufficient quantity of returned water made available in the initial pool reallocation, the District will continue to receive contributions of return water throughout the Prorate Period until the March 14, 2014 requests are met. It is possible, however, that the requested amounts may never be met.

(5) In the event that the March 14, 2014 return water requests exceed additional water requests, the District will post, at the District office, the quantity of remaining Prorate Period water and it shall become available for transfer on a first come, first serve basis for the balance of the Prorate Period.

(6) Additional contributions and requests for water received after March 14, 2014 will be posted at the District office and also be administered on first-in first-out basis. Water credits and charges will remain at $200/AF.

(7) **No water to leave District.** The District's long-standing policy of not allowing the transfer of surface water or groundwater to outside of District boundaries will continue to be enforced.

"PUMP-IN" PROGRAM

(1) Individuals with wells may "bank" their groundwater in the District's canal for later delivery by introducing metered groundwater into the District's canal for conveyance and delivery to contract lands within the District. Such water will be conveyed by the District to that landowner's contract lands or contract lands belonging to a landowner they may designate and under conditions outlined herein. If appropriate, the District will require the execution of transfer forms supplied by the District and signed by both parties.

(2) All delivery of conveyed groundwater will carry the customary Energy Lift Charges, if any, but will not otherwise be charged a conveyance fee. Conveyed groundwater will have a 10% loss factor applied.

(3) Water may be "banked" and/or withdrawn from the District only during periods when the District is importing surface water (typically same as Prorate Period) and all banked water must be used within the Prorate Period or will be forfeited to the District.

All of the above procedures are subject to amendment as the District Board of Directors determines to be appropriate. These procedures supersede the District's Rules and Regulations for the Distribution of Water for the Prorate Period, and only to the extent these procedures vary from the Rules and Regulations.

2014 DROUGHT ALLOCATION PROGRAM
LANDOWNER MEETING AGENDA

1 **Background**
(8 min)
- District Facilities
- Friant-Kern Allocation
- Water Management Programs
- Typical Banking Facilities
- Underground Storage
- Crops
- Overdraft Mitigation

2 **Drought Supplies**
(10 min)
- Irrigation Demand vs Wellfield Capacity
- 2012 -2014 Groundwater Extractions
- Groundwater Pumping Levels
- 2014 Water Supplies

3 **Prorate**
(10 min)
- Confined to Apr - Sep (6 months)
- no prorate Mar, Oct-Feb
- prorated on a per acre basis
- prorate based on volume (af/ac), not flow (gpm/ac)
- Historical is 2.14 af/ac, 2013 was 2.28 af/ac
- 2014 prorate set at 1.9 af/ac
- still may have lateral prorates
- no water to leave District
- considering a 7 month, 2.0 af/ac prorate (Mar - Sep)

4 **Farming units**
(5 min)
- May combine contracts into a farming unit
- Need not be contiguous
- Need not be same owners
- May move allocation around the farming unit
- May move allocation among prorate period

5 **Schedules**
(5 min)
- need schedule for prorate period
- determine if have water to turn back into a pool
- determine if would like more water from pool
- schedules/request due by March 14, 2014
- no schedule = no irrigation need

6 **Turn Back Pool**
(13 min)
- No transfers among individuals allowed
- AE buys turn back water ($200/af?)
- AE sells turn back water ($200/af?)
- pool reallocation on a per acre basis (farming unit)
- additional sales/requests on a first come basis

7 **Pump-Ins (details to come)**
(5 min)
- groundwater wells may be pumped into canal
- pump-ins and delivery need not be simultaneous
- water may be wheeled to contract lands only
- no cost for wheeling but 10% loss factor applied
- standard costs for delivery/pumping to turnouts

8 **Calendar**
(3 min)
- draft water allocation program mailed 2/14
- landowner meetings 2/19, 2/20, 2/21, 2/25, 2/28
- final program mailed 3/1
- schedules/requests for pool due 3/14
- Notice of final allocations by 4/1

9 **Questions**
(13 min)

10 **Future Topics**
(8 min)

Sustainability	Tiered Pricing
Groundwater metering	In-Lieu Service Area
Banking Reserves	< 24 hr runs
water use cap	annual prorates

(80 min) total

ARVIN-EDISON WATER STORAGE DISTRICT

February 28, 2014

Subject: 2014 Water Supply Update

Dear Landowner/Water User:

As a follow up to our February 14, 2014 letter regarding the 2014 Water Supply Update, the Arvin-Edison Water Storage District (District) Board of Directors, pursuant to the District's Rules and Regulations, Article 9b (Proration of Water Delivery: Water Shortage), has approved a Final Drought Allocation Program for water users for 2014 (attached). The final program is very similar to that described in the letter sent out February 14, 2014 with a few refinements following several meetings with Landowners/Water Users in February. The Drought Allocation program components are:

1. A 6-Month Prorate Period
2. A voluntary turnback/reallocation pool
3. A Landowner well pump-in program

In summary, the water shortage period is still for the 6-month peak irrigation period of April through September (6-Month Prorate Period) when surface supplies are necessary to supplement District supplied groundwater to provide requested deliveries. For the remaining months of our water year (months of March, and October through February 2015), the irrigation demand can typically be met with the District's instantaneous well production from water bank facilities; and therefore, no prorate is required during the off peak months at this time.

The prorate amount allocated for the 6-Month Prorate Period is 1.90 acre-feet per acre (AF/AC). Note that the historical usage for the 6-Month Prorate Period is 2.14 AF/AC. Landowners/Water Users will be allowed to combine their turnouts, contracts, and 6-Month Prorate Period allocation into farming units. The total 6-Month Prorate Period allocation can be moved around within those farming units. Initial schedules for the use of 6-Month Prorate Period water will be <u>required</u> and a turnback/reallocation pool will be administered by the District to reallocate water from those that don't need their full 6-Month Prorate Period supplies to those Water Users that request more.

The Board has also approved a pump-in program to convey landowner well water to those contract lands still suffering from a water supply deficit, or, alternatively, to sell directly to the District.

More specific details of the Final 2014 Drought Allocation Program components are attached.

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Please note that your schedules are due by close of business on March 14, 2014. Schedules may be submitted by email, fax, or mail but email is requested so as to expedite. If a schedule is not submitted, the District will assume you do not plan to irrigate this year and your 6-Month Prorate Period allocated amount will be forfeited and made available to others.

Please also note that your attached preliminary scheduling form has already been started by the District, but feel free to add or subtract turnouts so as to represent the farming unit for which you are scheduling. An electronic copy of this schedule for your use can be made available upon request.

Please feel free to call the District for further assistance.

Sincerely

Steve Collup
Engineer-Manager

Enclosures

cc: Board of Directors
All Employees

SCC:sj\AEWSD\landownersCorresp\2014\Landowner.Water.User.wtr.supply.program.letter.02.27.14.doc

FINAL

ARVIN-EDISON WATER STORAGE DISTRICT

2014 DROUGHT ALLOCATION PROGRAM

6-MONTH PRORATE PERIOD

(1) **Water Shortage/Prorate Allocation.** District Landowners/Water Users (Water Users) will be subject to water shortage/prorate for only the 6-month peak irrigation period of April through September inclusive (Prorate Period). Unless conditions change significantly, there is no need to prorate deliveries during the other six months of the water year. **Water Users have been notified of their 1.9 acre-feet per contract acre (AF/AC) Prorate Period water allocation.** Such allocation may be used by Water Users through any turnout serving District contract lands, under their ownership or control (Farming Unit), at any time during the Prorate Period, consistent with District Rules and Regulations for Delivery of Water. However, certain deliveries may be subject to additional proration due to the same pumping and pipeline capacity limitations which occur from time to time during normal operations. Water Users will be shutoff at the allocated amount and those who overuse their 6-Month Prorate Period Allocations will be subject to severe penalties including but not limited to the market cost of replacement supplies, which is currently $1,300/AF.

TURNBACK/REALLOCATION POOL

(2) **Schedules.** Please submit a schedule for the 6-Month Prorate Period on a form supplied by the District. These schedules will also be the basis of a turnback pool to reallocate water to others that requested such during the Prorate Period, if any exist. Such schedule shall indicate usage by month, amount of water to be returned, if any, and a request for additional water (beyond the prorated amount if additional water is desired). <u>The District must receive the schedule by March 14, 2014</u>. If a schedule is not submitted, the Prorate Period allocation will be forfeited and will be made available to others. Water Users may schedule any portion of the water allocation within the Prorate Period but no prorate allocation may be carried over beyond September 2014. There is no prorate declared after that time so that carryover is moot.

All Prorate Period water allocation returned into the pool will receive a credit/payment of $200/AF from the District and all additional water allocated from the pool will have an additional charge of $200/AF above all normal and customary water and energy lift charges.

No individual transfers of Prorate Period water allocation will be allowed. Any and all requests and reallocation of water must go through the District.

(3) **Initial reallocation.** Water Users requesting additional Prorate Period water allocation, if it becomes available, will receive notification of the reallocation of water by April 1, 2014. Allocation of returned water will also be prorated on a contract acreage basis among those Water Users requesting additional water. All water requested and received by reallocation shall become a part of the Water User's Prorate Period water allocation and the additional water shall be charged for at a rate of an additional $200/AF above all normal and

customary charges. Payment for the additional water shall be due within 14 days of notice. Payments for normal water/lift charges will follow typical protocol.

(4) **Subsequent reallocations.** If the total of the March 14, 2014 pool requests for additional water are not satisfied by a sufficient quantity of returned water made available in the initial pool reallocation, the District will continue to receive contributions of return water throughout the Prorate Period. It is possible, however, that the requested amounts may never be met.

(5) In the event that the March 14, 2014 return water requests exceed additional water requests, the District will post, at the District office, the quantity of remaining Prorate Period water and it shall become available for transfer on a first come, first serve basis for the balance of the Prorate Period.

(6) Additional contributions and requests for water received after March 14, 2014 will be posted at the District office and also be administered on first-in first-out basis. Additional water credits and charges will remain at $200/AF.

(7) **No water to leave District.** The District's long-standing policy of not allowing the transfer of surface water or groundwater to outside of District boundaries will continue to be enforced.

PUMP-IN PROGRAM

(8) Landowners with wells may "bank" their groundwater in the District's canal for later delivery by introducing metered groundwater into the District's canal for conveyance and delivery to contract lands within the District. Such water will be conveyed by the District to that landowner's contract lands or contract lands belonging to a landowner they may designate and under conditions outlined herein. If appropriate, the District will require the execution of transfer forms supplied by the District and signed by both parties.

(9) All delivery of conveyed groundwater will carry the customary Energy Lift Charges, if any, but will not otherwise be charged a conveyance fee. Conveyed groundwater will have a 10% loss factor applied.

(10) Water may be "banked" and/or withdrawn from the District only during periods when the District is importing surface water (typically same as Prorate Period) and all banked water must be used within the Prorate Period or will be forfeited to the District.

(11) Landowners may also pump-in groundwater for direct sale to the District for $200/AF. Payment will be made on the basis of 100% of metered deliveries.

All of the above procedures are subject to amendment at any time as the District Board of Directors determines to be appropriate. These procedures supersede the District's Rules and Regulations for the Distribution of Water for the Prorate Period, and only to the extent these procedures vary from the Rules and Regulations.

ARVIN-EDISON WATER STORAGE DISTRICT

March 31, 2014

Subject: 2014 Water Supply Update

Dear Landowner/Water User:

This notice is provided as a follow up to our February 28, 2014 letter regarding the 2014 Drought Allocation Program. Recall that the Program consists of three components:

1. A 6-Month Prorate Period Allocation
2. A Voluntary Turnback/Reallocation Pool
3. A Landowner Well Pump-in Program

Items one and two have been initiated. The District has received six-month schedules from all water users with requests to turn-back water (approximately 1,400 af) as well as requests for additional water (approximately 6,400 af). Subsequently, those requesting additional water have had their prorate amounts increased from 1.90 af/ac to 1.98 af/ac. If your prorate amount has been changed either by turn-back or additional allocation, your new schedule is enclosed. Schedules for landowners with no changes are the same as previously submitted. Those receiving additional water can expect invoices under separate cover at $200/af additional costs. Those who turned in water should expect payment in about 30 days. If you have any questions about the final schedules please contact David Nixon at (661) 854-5573.

The Board has also approved a pump-in program to convey landowner well water to those contract lands still suffering from a water supply deficit, or, alternatively, to sell directly to the District. To-date, only three landowner's wells are pumping into the District's canal. Please contact Jeevan Muhar at (661) 854-5573, if you would like to participate in the program to convey landowner well water and/or sell it to the District at $200/af.

The District will continue to check in with water users throughout this prorate period, but in the meantime, please feel free to call the District for further assistance.

Sincerely

Steve Collup
Engineer-Manager

Enclosures

cc: Board of Directors

SCC:sj\AEWSD\landownersCorresp\2014\Landowner.Water.User.wtr.supply.program.letter.update.03.31.14.doc

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ARVIN-EDISON WATER STORAGE DISTRICT

July 15, 2014

Subject: 2014 Drought Year Update

Dear Landowner/Water User:

The District has now completed three (3) months (which is half way) of the 2014 6-Month Drought Allocation Program. As you will recall, the Program consisted of several components one of which was a voluntary turnback / reallocation pool whereby Farming Units were given the opportunity to turn back water into a pool or to purchase additional water beyond the prorate allocation. The District did receive requests from farming units to turn-back water (approximately 1,000 af) as well as requests for additional water (approximately 6,400 af) and subsequently those farming units requesting additional water had their prorate amounts increased from 1.90 af/ac to 1.98 af/ac as a result of the original turn back pool.

Since administration of the original pool, District staff has continued to receive inquiries from those with surplus water as well as those requesting more supplies, all for the six-month April through September period. Subsequently, the District Board, at their July 8, 2014 Board of Directors' meeting, approved administration of a second round of the turn back/reallocation pool process.

This second pool will operate similar to the original pool in that request for additional water will be prorated on a per acre basis and the incremental cost of the water will remain at $200/af. For those farming units interested in either selling water from their current allocation (i.e. 1.90 af/ac or 1.98 af/ac allocation), or those interested in purchasing additional water, please respond by Monday, July 28, 2014.

To assist in your planning process a summary of your six-month supply is attached, including those supplies allocated initially and those modified per the first pool process. The spreadsheet also has actual usage by turnout and farming unit for April, May, and June. Recall that unused six-month prorate supplies will be extinguished (October 1, 2014) as the prorate period ends at that time; however, landowners will continue to be responsible for all costs associated with those supplies, used or not.

If you have any questions please call Dave Nixon at (661) 854-5573

Sincerely

David A. Nixon for

Steve Collup
Engineer-Manager

Enclosure

cc: Board of Directors

SCC:sj\AEWSD\landownersCorresp\2014\Landowner.Water.User.wtr.supply.program.letter.update.07.09.14.doc

ARVIN-EDISON WATER STORAGE DISTRICT

August 25, 2014

Subject: 2014 Drought Year Update: Third Turnback Reallocation Pool

Dear Landowner/Water User:

The District has now completed approximately five (5) months of the 2014 6-Month Drought Allocation Program. As you will recall, the District has administered two turnback/reallocation pools, whereby Farming Units were given the opportunity to turnback water into a pool or purchase additional water. These two pools have reallocated 2,778 acre-feet to those farming units desiring more than their original 1.9 af/ac (6 month prorate amount).

District staff continues to receive inquires from those with surplus water as well as those requesting additional water, for the remaining six-month prorate (April through September) period. Subsequently, the District will administer a third and final turnback/reallocation pool process.

The third pool will operate similar to previous pools in that request for additional water will be prorated on a per acre basis and the incremental cost of the water will remain at $200/af. In the event that returns exceed requests, those will also be prorated on a per acre basis. For those farming units interested in either selling or purchasing additional water, please respond by **Tuesday, September 2, 2014** (form attached). As this is a balanced pool, there is no guarantee those with surplus water will be able to sell all their water into the pool or those requesting additional supplies will receive all that they request.

To assist in your planning process, a summary of your six-month allocation supply is attached, including those supplies allocated initially, and those changes per the first and second pools. The spreadsheet also has actual usage by turnout and farming unit for April, May, June, July and the first 14 days of August. Recall that unused six-month prorate supplies will be extinguished (October 1, 2014) as the prorate period ends; however, landowners will continue to be responsible for all costs associated with the purchase of the additional pool supplies, used or not. Those farming units who purchase additional water in this third pool must make payment to the District within 15 days from the date of the invoice.

If you have any questions, please call David Nixon at (661) 854-5573.

Sincerely

David A. Nixon for

Steve Collup
Engineer-Manager

Enclosures

cc: Board of Directors

SCC:sj\AEWSD\landownersCorresp\2014\Landowner.Water.User.wtr.supply.program.letter.update.08.25.14.doc

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ARVIN-EDISON WATER STORAGE DISTRICT

September 17, 2014

Subject: 2015 Water Supply Update

Dear Landowner/Water User:

Although we are only half way through Water Year (WY) 2014, the Arvin-Edison Water Storage District (District) Board of Directors has initiated the WY 2015 budget process, which necessitates projecting WY 2015 water year supplies and deliveries. Subsequently, in the event WY 2015 is as dry as WY 2014, the following emergency water management programs will be put into place similar as to those in WY 2014:

- A 6-month, April through September prorate of 1.4 af/ac, ***reduced 25%*** from the 1.9 af/ac prorate in WY 2014. A prorate may not be required for the remainder of WY 2015.
- These deliveries will reduce District groundwater bank reserves by approximately 85,000 leaving minimal reserves to supplement future years.
- Turnback/Reallocation pools similar to the three (3) pools the District administered in WY 2014, which met ALL requests for additional water with 3,000 af surplus water remaining.
- A Conveyance Program for landowner groundwater wells (4,500 af in WY 2014).
- Relaxation of the 24-hour delivery rule will continue for 2014 and 2015 for those water users in good standing, and so as to give water users the maximum flexibility.

You will be updated as more information is forthcoming over the next several months. **Please complete and return the attached form to receive updates via email.**

Thank you,

Steve Collup

Steve Collup
Engineer-Manager

Enclosure

cc: Board of Directors
Ernest Conant, Esq.
All District Employees

SCC:sj\AEWSD\Landowner.Corresp\Landowner.Water.user.wtr.supply.update.WY.2015. 09.13.doc

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ARVIN-EDISON WATER STORAGE DISTRICT

In order for the District to more timely update landowners/water users we are creating a district-wide ***email*** list of those who wish to be notified.

Please print clearly and/or legibly and include any email addresses that you wish to receive correspondence from the District:

Name of Farming Unit: ______________________________

1. Email:____________________ Name: ____________________

2. Email: ____________________ Name: ____________________

3. Email: ____________________ Name: ____________________

Remember to notify us of any changes as soon as possible. Please mail, fax, or email this form back to the District.

Thanks for your cooperation in this matter.

DAN:sj\AEWSD\Landowner\2014\Farming.Unit.Email.Form.09.14.doc

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ARVIN-EDISON WATER STORAGE DISTRICT

January 16, 2015
Via Electronic Mail & U.S. Mail

Subject: 2015 Water Supply Update

Dear Landowner/Water User:

The United States Department of the Interior Bureau of Reclamation (USBR) will not make a preliminary water supply declaration for water year (WY) 2015 (begins March 1, 2015) until mid-February 2015. Subsequently, the Arvin-Edison Water Storage District (District) must continue to plan in the event WY 2015 is as dry as WY 2014. The following emergency water management programs, similar as to those in WY 2014, continue to be considered:

- A 6-month, April through September prorate of 1.4 af/ac, ***reduced 25%*** from the 1.9 af/ac prorate in WY 2014. A prorate may not be required for the remainder of WY 2015.
- Turnback/Reallocation pools similar to the three (3) pools the District administered in WY 2014.
- A Conveyance Program in District canals for landowner groundwater wells.
- Relaxation of the 24-hour delivery rule will continue in WY 2015 for those water users in good standing, and to also give water users the maximum flexibility.
- In addition, the Board is considering a new trial program of allowing landowners adjacent to District pipelines to pump groundwater directly into the District's pipeline system. This option may require significant investment by the landowner in piping, control valves, and surge protection. **<u>If you have an interest in the pipeline program please notify the District as soon as possible. Proposals will be considered on a case-by-case basis.</u>**

You will be updated as more information is forthcoming over the next few months.

Thank you,

Steve Collup
Engineer-Manager

Enclosure

cc: Board of Directors
Ernest Conant, Esq.
All District Employees

SCC:sj\AEWSD\Landowner.Corresp\Landowner.Water.user.wtr.supply.update.WY.2015.Jan.15.doc

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ARVIN-EDISON WATER STORAGE DISTRICT

February 20, 2015

Subject: 2015 Water Year - Drought Allocation Program

Dear Landowner/Water User:

The Arvin-Edison Water Storage District (District) Board of Directors, pursuant to the District's Rules and Regulations, Article 9b (Proration of Water Delivery: Water Shortage), at the February 10, 2015 Board of Directors meeting approved a Drought Allocation Program for water users for the 2015 Water Year (attached). The 2015 program is very similar to that of 2014 water year Drought Allocation Program, except with less water available, and with the addition of a potential pipeline pump-in program. The Drought Allocation Program components are:

1. A 6-Month Prorate Period
2. Three (3) voluntary turnback/reallocation pools
3. A Landowner well canal pump-in program
4. A Landowner well pipeline pump-in program
5. Relaxation of 24-hour delivery requirement

In summary, the water shortage period is still for the 6-month peak irrigation period of April through September (6-Month Prorate Period) when surface supplies are necessary to supplement District supplied groundwater to provide requested deliveries. For the remaining months of our water year (months of March, and October through February 2016), the irrigation demand can typically be met with the District's instantaneous well production from water bank facilities; and therefore, no prorate is required during the off peak months at this time.

The prorate amount allocated for the 6-Month Prorate Period is 1.3 acre-feet per acre (AF/AC). Note that the historical usage for the 6-Month Prorate Period is 2.1 AF/AC and the 2014 6-Month Prorate was 1.9 AF/AC. Landowners/Water Users will be allowed to combine their turnouts, contracts, and 6-Month Prorate Period allocation into farming units. The total 6-Month Prorate Period allocation can be moved around within those farming units. Initial schedules for the use of 6-Month Prorate Period water will be <u>required</u> and three (3) turnback/reallocation pools (March, June, and August) will be administered by the District to reallocate water from those that do not need their full/remaining 6-Month Prorate Period supplies to those Water Users that request more. Please note the greatly increased cost for Pooled water this year (attached).

The Board has also approved a canal pump-in program to convey landowner well water to those contract lands still suffering from a water supply deficit, or, alternatively, to sell directly to the District. On a case-by-case basis, staff will also consider a pipeline pump-in program to convey landowner well water directly into District pipelines in-lieu of the canal.

Finally, as instituted in May 2014, the Flexible Ordering Program, which relaxed the 24-hour delivery rule, will continue into 2015 for those water users in good standing to give water users the maximum flexibility.

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More specific details of the Final 2015 Drought Allocation Program components are attached.

Please note that your schedules are due by close of business on Friday, March 7, 2015. Schedules may be submitted by email, fax, or mail but email is requested so as to expedite. Note that the schedule has an entry to request contribution to, or delivery from, the first pool. If a schedule is not submitted, the District will assume you do not plan to irrigate this year and your 6-Month Prorate Period allocated amount will be forfeited and made available to others.

Please also note that the District has already started your attached preliminary scheduling form, but feel free to add or subtract turnouts so as to represent the farming unit for which you are scheduling. An electronic copy of this schedule for your use can be made available upon request.

The District is also scheduling landowner meetings for March 12 and 13, at 9:00 a.m. to discuss these programs as well as other issues. Please RSVP as meetings with no attendance will be cancelled.

Lastly, while the District has endeavored to provide you with the most accurate information and expectations, water supplies this year continue to be highly speculative on many fronts, and subsequently, are subject to change.

Please feel free to call the District for further assistance.

Sincerely,

E Camp

Edwin Camp, President

Steve Collup

Steve Collup, Engineer-Manager

Enclosures

cc: Board of Directors
All Employees

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ARVIN-EDISON WATER STORAGE DISTRICT

2015 DROUGHT ALLOCATION PROGRAM

6-MONTH PRORATE PERIOD

(1) **Water Shortage/Prorate Allocation.** District Landowners/Water Users (Water Users) will be subject to water shortage/prorate for only the 6-month peak irrigation period of April through September inclusive (Prorate Period). Unless conditions change significantly, there is no need to prorate deliveries during the remaining six months of the water year. **The 2015 prorate allocation amount is 1.3 acre-feet per contract acre (AF/AC).** Such allocation may be used by Water Users through any turnout serving District contract lands under their ownership or control (Farming Unit), at any time during the Prorate Period and consistent with District Rules and Regulations for Delivery of Water. For those wanting to add additional contract land into their farming unit, the Operating Agent forms must be completed and/or updated. However, certain deliveries may be still subject to additional daily proration due to the historical pumping and pipeline capacity limitations, which occur from time to time during normal operations. Water Users will be curtailed once they reach their allocated amount and those who overuse their 6-Month Prorate Period Allocations will be subject to severe penalties including but not limited to the market cost of replacement supplies (in excess of $2,000/af).

TURNBACK/REALLOCATION POOL

(2) **Schedules.** Please submit a schedule for the 6-Month Prorate Period on the form supplied by the District. These schedules will also be the basis of a turnback pool to reallocate water to others that requested such during the Prorate Period, if any exist. Such schedule shall indicate usage by month, amount of water to be returned, if any, and a request for additional water (beyond the prorated amount) if additional water is desired. <u>The District must receive the schedule by Friday, March 7, 2015</u>. If a schedule is not submitted, the Prorate Period allocation will be forfeited and will be made available to others. Water Users may schedule any portion of the water allocation within the Prorate Period but no prorate allocation may be carried over beyond September 2015. There is no prorate declared after that time so that carryover is moot beyond September 2015.

All Prorate Period water allocation returned into the pool will receive a credit/payment from the District and all additional water allocated from the pool will have an additional charge above all normal and customary water and energy lift charges. Similar to the 2014 Program, the District anticipates having three (3) separate reallocation pools, which are expected in March (initial), June, and August. The Credit/payment and charge for each pool will have varying amounts for example $400/AF, $300/AF and $200/AF, respectively. In addition, the District will assess a pump fee of $75/AF for each pool transaction. For example, a buyer on the initial March pool will pay a total incremental cost of $475/AF ($400 to the seller and $75 to the District), plus all normal and customary water and energy lift charges.

No individual transfers of Prorate Period water allocation will be allowed. Any and all requests and reallocation of water must go through the District.

(3) **Initial reallocation.** Water Users requesting additional Prorate Period water allocation, if it becomes available, will receive notification of the reallocation of water by March 14, 2015. Allocation of returned water will also be prorated on a contract acreage basis among those Water Users requesting additional water. All water requested and received by reallocation shall become a part of the Water User's Prorate Period water allocation, and the additional water shall be charged for at a rate of an additional $475/AF above all normal and customary charges. Payment for the additional water shall be due within 14 days of notice. Payments for normal water/lift charges will follow typical protocol.

(4) **Subsequent reallocations.** After the initial March pool reallocation, the District will administer two additional pools during the Prorate Period, which are anticipated in June and August. All water requested and received by reallocation shall become a part of the Water User's Prorate Period water allocation and the additional water shall be charged at a rate of an additional $375/AF and $275/AF, respectively, above all normal and customary charges. It is possible, however, that the requested amounts may never be met.

(5) In the event that the March 14, 2015 return water requests exceed additional water requests, the District will post, at the District office, the quantity of remaining Prorate Period water and it shall become available for transfer on a first come, first serve basis for the balance of the Prorate Period.

(6) Additional contributions and requests for water received after the August pool will be posted at the District office and also be administered on first-in first-out basis. Additional water credits and charges will remain at $275/AF.

(7) **No water to leave District.** The District's long-standing policy of not allowing the transfer of surface water or groundwater to outside of District boundaries will continue to be enforced.

CANAL PUMP-IN PROGRAM

(8) Landowners with wells may "bank" their groundwater in the District's canal for later delivery by introducing metered groundwater into the District's canal for conveyance and delivery to contract lands within the District. Such water will be conveyed by the District to that landowner's contract lands or contract lands belonging to a landowner they may designate and under conditions outlined herein. If appropriate, the District will require the execution of an agreement and/or transfer forms supplied by the District and signed by both parties.

(9) All delivery of conveyed groundwater will carry the customary "Additional" Energy Lift Charges, if any, but the District's typical "Water Component" and "First Lift" Charges will not apply. The District will not otherwise charge a conveyance fee, however conveyed groundwater will have a 10% loss factor applied.

(10) Water may be "banked" and/or withdrawn from the District only during periods when the District is importing surface water (typically same as

Prorate Period) and all banked water must be used within the Prorate Period or will be forfeited to the District.

(11) Landowners may also pump-in groundwater for direct sale to the District for $200/AF. Payment will be made on the basis of 100% of metered deliveries.

PIPELINE PUMP-IN PROGRAM

(12) On a case-by-case basis, Landowners with wells may "bank" their groundwater in the District's pipeline distribution system for later delivery by introducing metered groundwater into the District's pipeline distribution system for conveyance and delivery to contract lands within the District.

(13) As this program is experimental for 2015, many details remain outstanding including but not limited to the following issues:

a) *Hydraulic considerations:* In order to protect District pipeline, the landowner is responsible for surge protection, such as may occur during a well power failure. Typical installation may range from a direct connection with simple valve(s) to large surge protection pressure vessels.
b) *Demand considerations:* there is limited ability to "bank" in a closed pipeline system. The pump-in flow would have to match an equal or greater demand of water users within the same pipeline network.
c) Water quality *considerations:* water must be suitable for surrounding neighboring water users and flows may need to be adjusted to provide for a suitable mix of water.

FLEXIBLE ORDERING PROGRAM

(14) Continuing on a trial basis, this experimental program allows water users to place orders for irrigation runs for less than 24-hour deliveries, and so to best meet the needs of their farming operations. It is imperative, however, the water user accurately communicate to Watermaster the actual delivery rate and duration (start and stop time) for each turnout.

(15) The District does not have ample field personnel to continue historical practice of locking and unlocking turnouts, and accordingly, all turnouts will be left unlocked (except end-of-line turnouts to prevent damage to District facilities).

(16) Violations of the communication protocols will be enforced and violators may lose privileges to participate in this program at any time.

All of the above programs/procedures are subject to amendment at any time as the District Board of Directors determines to be appropriate. These procedures supersede the District's Rules and Regulations for the Distribution of Water for the Prorate Period, and only to the extent these procedures vary from the Rules and Regulations.

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ARVIN-EDISON WATER STORAGE DISTRICT

March 17, 2015

Subject: 2015 Water Supply Update

Dear Landowner/Water User:

This notice is provided as a follow up to our February 20, 2015 letter regarding the 2015 Drought Allocation Program. Recall that the Program consists of four components:

1. A 6-Month Prorate Period Allocation
2. A Voluntary Turnback/Reallocation Pool
3. A Landowner Well Pump-In Program
4. A Landowner Pipeline Pump-In Program

Items one and two have been initiated. The District has received six-month schedules from all water users with requests to turn-back water (approximately 882 af) as well as requests for additional water (approximately 5,470 af). If your prorate amount has been changed either by turn-back or additional allocation, your new schedule is enclosed.

Schedules for landowners with no changes are the same as previously submitted. For those receiving additional water, please find enclosed the invoice for the additional water at $475/af. This invoice must be **paid within fifteen (15) days** or your additional water purchase will be forfeited and reallocated. Those who turned in water should expect payment once we have received the funds for the purchase of the additional water. If you have any questions about the final schedules, please contact Assistant Manager David Nixon.

The Board has also approved a pump-in program and pipeline pump-in program to convey landowner well water. Please contact Staff Engineer Jeevan Muhar if you would like to participate in either one of these programs to convey landowner well water and/or sell it to the District at $200/af.

The District will continue to check in with water users throughout this prorate period, but in the meantime, please feel free to call the District for further assistance.

Sincerely,

Steve Collup
Engineer-Manager

Enclosures
cc: Board of Directors

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ARVIN-EDISON WATER STORAGE DISTRICT

June 8, 2015

Subject: 2015 Drought Year Update

Dear Landowner/Water User:

The District has now completed two (2) months of the 2015 6-Month Drought Allocation Program. As you will recall, the Program consisted of several components one of which was a voluntary turnback / reallocation pool whereby Farming Units were given the opportunity to turn back water into a pool or to purchase additional water beyond the prorate allocation. The District in the first reallocation pool did receive requests from farming units to turn-back water (837 af) as well as requests for additional water (5,420 af).

Since administration of the original pool, District staff has continued to receive inquiries from those with surplus water as well as those requesting more supplies, all for the six-month April through September period. Subsequently, the Board, at their May 12, 2015 Board of Directors' meeting, approved administration of the second round of the turn back/reallocation pool process.

This second pool will operate similar to the first pool in that request for additional water will be prorated on a per acre basis and the incremental cost of the water will be at $375/af and the District will pay $300/af for those turning back water. For those farming units interested in either selling water from their current allocation, or those interested in purchasing additional water, please respond by Monday, June 15, 2015. The quick turn around is essential for landowners' water supply planning, and late requests can not be honored.

To assist in your planning process a summary of your six-month supply is attached, including those supplies allocated initially and those modified per the first pool process. The spreadsheet also has actual usage by turnout and farming unit for April and May. Recall that six-month prorate supplies remaining unused as of October 1, 2015 will be extinguished as prorate period ends at that time.

If you have any questions please contact David Nixon.

Sincerely

Steve Collup

Steve Collup
Engineer-Manager

Enclosure

cc: Board of Directors

SCC:sj\AEWSD\landownersCorresp\2015\Landowner.Water.User.wtr.supply.program.letter.update.06.08.15.Final.doc

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Telephone (661) 854-5573 · Fax (661) 854-5213 · E-mail: arvined@aewsd.org

ARVIN-EDISON WATER STORAGE DISTRICT

August 4, 2015

Subject: 2015 Drought Year Update - Third Turnback Reallocation Pool

Dear Landowner/Water User:

The District has now completed four (4) months of the 2015 6-Month Drought Allocation Program. As you will recall, the District has administered two turnback/reallocation pools, whereby Farming Units were given the opportunity to turnback water into a pool or purchase additional water. Those pools successfully reallocated 6,371 acre-feet of additional water to those who participated.

District staff continues to receive inquires from those with surplus water as well as those requesting additional water for the remaining two months of the prorate period. Subsequently, the District will administer a third and final turnback/reallocation pool process.

The third pool will operate similar to previous pools in that request for additional water will be prorated on a per acre basis and the incremental cost of the water will be $275/af and those water users turning back water into the pool will be paid $200/af. For those farming units interested in either selling or purchasing additional water, please respond by **Thursday, August 13, 2015** (complete the attached form). As this is a balanced pool, there is no guarantee those with surplus water will be able to sell all their water into the pool or those requesting additional supplies will receive all that they request. Those farming units who purchase additional water in this third pool must make payment to the District within 15 days from the date of the invoice.

To assist in your planning process, a summary of your six-month allocation supply is also attached, including those supplies allocated initially, additions due to well Pump-In Agreements, and the first and second pools. The spreadsheet also has actual usage by turnout and farming unit for April, May, June, and July. The District will make every effort to lock Farming Unit(s) turnouts once they have reached their total prorate period allocation supply, but it is ultimately each Farming Unit(s) responsibility for their usage. Recall, that there are severe financial penalties for those that exceed prorate period allocation supplies.

If you have any questions, please call David Nixon at (661) 854-5573.

Sincerely

Steve Collup
Engineer-Manager

Enclosures

cc: Board of Directors
Supervisors/Foremen

SCC:sj\AEWSD\landownersCorresp\2015\Drought.Allocation.Program.third.pool.ltr.08.04.15.doc

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ARVIN-EDISON WATER STORAGE DISTRICT

2015 <u>THIRD</u> DROUGHT TURN-BACK REQUEST ALLOCATION POOL

<u>TURN-BACK REQUEST</u>

The undersigned Landowner/Water User, hereinafter '***Farming Unit'***, hereby confirms its turn-back to the District up to ________ acre-feet of water at a purchase cost of **$__200.00_____**/AF from the District. The water is to be removed from the Farming Unit's lands currently receiving water service under the 2015 Drought Allocation Program for the 2015 Water Year pursuant to an Agricultural Water Service Contract with the District.

Under the Turn-Back/Reallocation Pool the water to be turned back will be prorated based upon the amount of water requested from the Pool.

Respond Due by: <u>3:30 p.m., Thursday, August 13, 2015</u>

Dated:_________________ 2015

<u>Landowner/Water User/Farming Unit:</u>

____

[Name Farming Unit/Entity]

By: ______________________________

[Signature]

____

Print Name

ARVIN-EDISON WATER STORAGE DISTRICT

2015 <u>THIRD</u> DROUGHT ALLOCATION POOL

<u>POOL REQUEST</u>

The undersigned Landowner/Water User, hereinafter '***Farming Unit'***, hereby confirms its request for an additional _________ acre-feet of water from the District. The request will be prorated on a per-acre basis, which is based on the amount of acre feet turned back at a cost of **$ <u>275.00</u>** /AF. The water purchased will be added to the Farming Unit's lands currently receiving water service under the 2015 Drought Allocation Program for the 2015 Water Year pursuant to Agricultural Water Service Contract with the District.

Respond Due by: <u>3:30 p.m., Thursday, August 13, 2015</u>

Dated:_________________ 2015

<u>Landowner/Water User/Farming Unit:</u>

____

[Name Farming Unit/Entity]

By: _______________________________

[Signature]

____

Print Name

ARVIN-EDISON WATER STORAGE DISTRICT

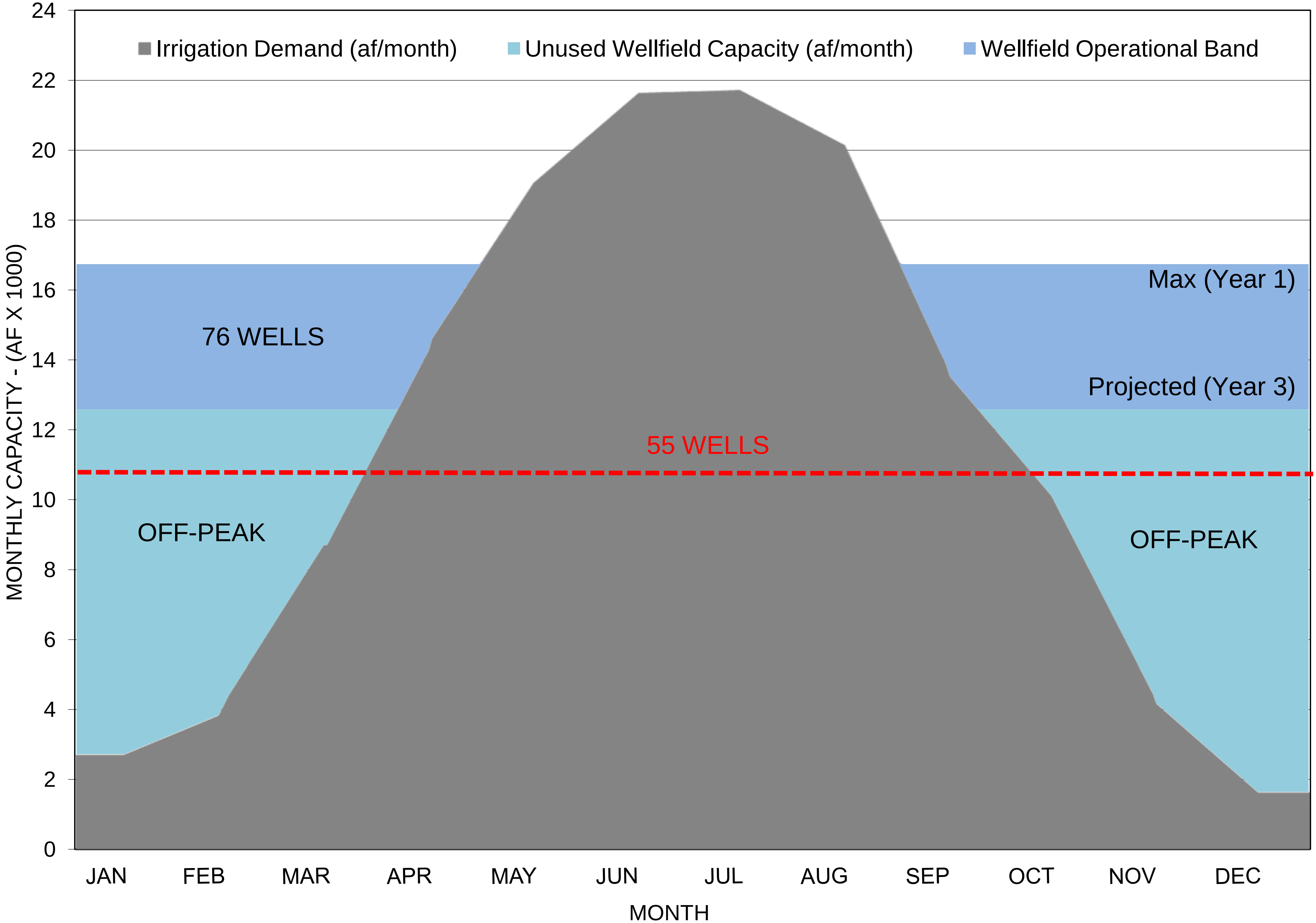
DROUGHT MANAGEMENT PLAN

EXHIBIT D

Irrigation Demand vs. Water Supply (Wellfield and Import)

ARVIN-EDISON WATER STORAGE DISTRICT

IRRIGATION DEMAND VERSUS WELLFIELD CAPACITY



ARVIN-EDISON WATER STORAGE DISTRICT

DROUGHT MANAGEMENT PLAN

EXHIBIT E

Delivery flexibility with 24-hour rule change

ARVIN-EDISON WATER STORAGE DISTRICT

April 21, 2014

Dear Landowner/Water User

Re: Dry Year Update – Temporary Change in Water Order Procedure

Prior to implementing a drought year water management program for 2014, the District held a series of meetings with landowners and water users to discuss various issues. The responses and feedback we received were very insightful and helped shape the program that is underway this year.

One recurring issue in discussions with water users is the requirement to order and use water on a 24-hour basis as specified in the District's Rules and Regulations. In short, there appears to be a lot of interest in exploring how much flexibility can be given to water users to irrigate on something less than a 24-hour requirement. In other words, can water orders be placed for just 12 hours, 8 hours, 6 hours or less?

Of primary bearing on the issue is the original design of District facilities. The canal, pumping plants, and pipelines were all designed with the goal of delivering a specific amount of water in a 24-hour period. The distribution system was not designed for delivering twice the flow rate in 12 hours, or 4 times the flow rate in 6 hours, etc. Coupled with the design of the distribution system is the District's ability to balance the 45 miles of District canals while making daily deliveries. The District canals were also designed to move a constant flow through the facilities for a full 24-hour period with minimal ability to regulate imbalances throughout the day. The District itself must also order its water supply from the Bureau of Reclamation and others as a constant flow for 24-hours as well as make power purchases for a uniform power use.

Nonetheless, the District has greatly expanded its ability to convey and regulate flows in recent years. Subsequently, we have developed some additional flexibility in our operations. Whether or not this improved regulation capacity is enough to allow for less-than-24-hour irrigation runs in the District remains to be seen. It was also noted by our Board that if the District were ever to consider a change in the water ordering policy that this year, with reduced water supplies and enforced prorates, is the time a more flexible policy that would help farmers maximize their efficiencies with limited water supplies.

Subsequently, the Board has approved a flexible ordering program on a trial basis. This experimental program will allow water users to place orders for irrigation runs that best meet their farming operations. When an irrigator calls in to place an order, in addition to the date, turnout number, and desired flow rate, the irrigator will also need to **specify the start and stop time** requested. The Watermaster will then convert that to a volume of water to order for you for that day.

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We anticipate offering this experimental program through September, coinciding with the end of the 6-month prorate period. There is no guarantee, however, that we can successfully operate for that entire period and we may have to terminate the program earlier. We may find, for example, that allowing less than 24-hour runs might generate more frequent lateral prorates. What is clear however is that our chances of success in this endeavor relies on the ability of water users to accurately order their water and then to operate consistent with their order. In that regard, while the duration of your irrigation run may vary, we ask that you continue to order start times for the morning hours. In addition, please understand by allowing water users this flexibility, District staff will have to monitor and police operations even more closely than before. For example, a turnout with a 4-hour order simply cannot be allowed to run 5 or 6 hours and will be shut off and locked when found. Turnouts being served from end-of-the-line pumping plants may also have more specific requirements. In short, the District will be running close to the wire under this temporary program with little room for error.

We look forward to implementing these new procedures, and to see what lessons we learn from the experimental program. Staff is in the process of adapting our procedures with the goal of initiating the new policy on Thursday, May 1, 2014.

If you have additional questions, please do not hesitate to contact the Watermaster.

Sincerely,

Steve Collup

Steve Collup
Engineer-Manager

cc: Board of Directors
Ernest Conant, Esq.

SCC:sj\AEWSD\Landowner.Correspondence\2014\new.temporary.procedure.wtr.orders.04.14.doc

ARVIN-EDISON WATER STORAGE DISTRICT

May 21, 2014

Dear Landowner/Water User:

Re: Update to Temporary Change in Water Order Procedures

By Letter dated April 21, 2014 Landowners/Water Users were notified that the Board had approved a Flexible Ordering Program on a trial basis beginning May 1 and ending September 30, coinciding with the 6-month prorate period. This experimental program allows water users to place orders for irrigation runs that best meet their farming operations.

The District has been operating under this trial program for three (3) weeks and in order for this program to continue to be successful, we must make some immediate changes to the normal daily operating procedures of our field personnel. It has become obvious with the less than 24-hour runs; the District does not have ample staffing to continue the historical practice of locking and unlocking turnouts as water users go on and off.

Therefore, beginning Monday, May 26, all turnouts with water available during the prorate period will be left unlocked. This will allow our field personnel more time to police and monitor water orders and insure that operations is running in accordance with the orders that were placed for the day. One exception to this new procedure is that turnouts being served by end-of-the-line pumping plants will still have to be locked and unlocked for the orders that have been placed to prevent damage to District facilities (see attached list of end-of-the-line turnouts).

Unfortunately, the District is still experiencing, on a limited basis, water users that are not running in compliance with their water orders. For this Flexible Ordering Program to be successful, it is imperative that all water users are in compliance with the water order they have placed. So beginning Monday, May 26, if a turnout is found not complying with their water order the turnout will be locked for the remainder of the day. The water user must then call into the Watermaster and explain the reason before they will be allowed to run again. If the same turnout is caught a second time the turnout will be locked, and the water user must make an appointment to meet with either the District's Assistant Manager or Staff Engineer before they will be allowed to run again. Should a turnout be caught a third time not complying, they will no longer be able to participate in the trial program and will have to return to the policy of a minimum 24-hour run.

The District is still very early in the 6-month prorate period and we will continue to make adjustments when necessary to make this Flexible Ordering Program successful.

Should you have any questions, please do not hesitate to contact the Watermaster.

Thank you,

Steve Collup

Steve Collup
Engineer-Manager

Enclosure

cc: All Supervisors/Foreman
Board of Directors
Watermaster(s)

DAN:sj\AEWSD\Landowner.Corresp\2014\ new.temporary.procedure.wtr.order.update.05.14.doc

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Telephone (661) 854-5573 · Fax (661) 854-5213 · E-mail: arvined@aewsd.org

Arvin-Edison Water Storage District
End-of-Line-Turnouts

North Side

N1-P4	E-1
	E-2
	E-3
	E-5
	E-6
	E-7
N1-P6	E-27
	E-65
	E-80
	E-81
	E-85
	E-86
	E-87
	E-88
	E-96
	E-99
N1-P7	E-84
	E-93
N1-P8	E-4
	E-10
	E-15
	E-16
	E-19
	E-20
	E-22
	E-23
N8-P4	A-57
	A-58
	A-62
	A-63
	A-69
	A-A
N24-P1	A-34
	A-38
	A-41
	A-42
	A-74
	A-78
	A-79
	A-81
	A-82
	A-B
N41-P2	A-30
	A-31
	A-35
	A-36
	A-71
	A-88
N55-P5	C-77
	C-78
	C-79
	C-85
N55-P8	C-1
	C-4
	C-8
N55-P10	C-12
	C-16
N55-P12	C-41
N55-P13	C-48
	C-58
	C-59
N55-P14	C-37
	C-42
	C-90
	C-102
N55-P15	C-81

South Side

S32-P1	T-43
	T-45
	T-81
S68-P1	W-39
S73-P4	W-1
	W-63
S88-P1	W-29
	W-36
	W-37
	W-72
	W-73
	W-74
S93-P2	M-1
	M-9
	M-18
	M-26
	M-27
	M-33
	M-57
	M-58

ARVIN-EDISON WATER STORAGE DISTRICT

DROUGHT MANAGEMENT PLAN

EXHIBIT F

Surcharge for exceeding water allocation

ARVIN-EDISON WATER STORAGE DISTRICT

July 17, 2015

Subject: 2015 Prorate Period Allocation Schedule Update

Enclosed please find a 2015 Prorate Period Allocation Schedule for your Farming Unit updated to reflect the period April 1, 2015 through July 15, 2015.

You are reminded that the Board has approved a Third Turnback Reallocation Pool and the forms to participate in this pool will be mailed on or about Thursday, August 6, and will need to be returned/submitted to the District by **Thursday, August 13, 2015**.

The 2015 Prorate Period is from April 1 through September 30, 2015. In order to help insure that farming units will not overrun their Prorate Period allocation and purchases for the benefit of all water users during this critically dry year, the Board approved a "Prorate Period Close Out – Policy." As authorized by the water service contract, this Policy will consist of three Tiers for overuse and will be administered by farming unit(s) as follows:

A. $1,000/af surcharge for 0 to 0.1 af/ac of overuse
B. $2,000/af surcharge for that portion between 0.1 af/ac <0.2 af/ac of overuse
C. $3,000/af surcharge for that portion of >0.2 af/ac of overuse

Example: 160 acre farming unit, overused 50 af beyond their prorate amount plus additional purchases:

A.	160 ac x 0.1 =	16 af x $1,000 =	$16,000 surcharge
B.		16 af x $2,000 =	$32,000 surcharge
C.		18 af x $3,000 =	$54,000 surcharge
Total Penalties		50 af	$102,000 surcharge

Keep in mind that these surcharges are in addition to the normal and customary charges. If you have any questions, please call David Nixon at (661) 854-5573.

Sincerely,

Steve Collup

Steve Collup
Engineer-Manager

Enclosure

cc: Board of Directors
David A. Nixon, Assistant Manager
Jeevan Muhar, Staff Engineer
Millie Kovacevich, A/R
Watermaster(s)
All Supervisors/Foremen

SCC:DAN:sj\AEWSD\Landowner.Corresp\2015\Drought.Allocation.Program.Final.07.17.15.doc

ATTACHMENT T

Contract for Intermittent Water Deliveries In Lieu of Groundwater Pumping

FOR THE BENEFIT OF THE DISTRICT
RECORDING REQUESTED BY:

ARVIN-EDISON WATER STORAGE
DISTRICT, AS OFFICIAL BUSINESS.

WHEN RECORDED MAIL TO:

ARVIN-EDISON WATER STORAGE DISTRICT
Post Office Box 175
Arvin, California 93203-0175

CONTRACT BETWEEN

ARVIN-EDISON WATER STORAGE DISTRICT

AND

____

FOR INTERMITTENT WATER DELIVERIES IN LIEU OF GROUNDWATER PUMPING

TABLE OF CONTENTS

THIS CONTRACT, is entered into on the date appearing at page 8 hereof, in pursuance of powers granted by Division 14 of the California Water Code, between ARVIN-EDISON WATER STORAGE DISTRICT, hereinafter referred to as "District", a California water storage district organized under provisions of said Division 14 of the California Water Code, and the undersigned Landowner(s), hereinafter referred to as “In-Lieu Water User”, collectively referred to as parties.

WITNESSETH, that:

EXPLANATORY RECITALS

WHEREAS, District has constructed and operated the Arvin-Edison Water Storage District Distribution System and related facilities to deliver water from the Federal Central Valley Project and other sources to Landowners/water users within the District in order to improve and attempt to stabilize groundwater conditions within the District; and

WHEREAS, District has executed a contract with the United States dated August 30, 1962, pursuant to the Act of Congress of June 17, 1902, (32 Stat.388) and acts amendatory thereof or supplementary thereto, all collectively referred to as the Federal Reclamation laws, providing for water service to District from said Central Valley Project, which contract expired on February 28, 1995. The District subsequently entered interim renewal contracts providing for continuation of such water service through February 28, 2001**,** entered a long term renewal contract effective March 1, 2001 for a term of twenty-five years, and entered a permanent Water Service Contract with the United States superseding the prior renewal contact (sometimes referred as a 9(d) repayment contact), effective November 1, 2010, all pursuant to Federal Reclamation laws, and as otherwise provided by law; and

WHEREAS, District's Board of Directors first adopted "Rules and Regulations for Distribution of Water," dated 1968, which have been amended from time to time; and

WHEREAS, District has adopted a Surface Water Service Area for delivery of water, and which area comprises lands whose owners have executed individual contracts with the District; and

WHEREAS, the District desires to invest in additional groundwater banking programs and increase the importation of surface water deliveries, which this Contract and associated construction of new distribution system allows for both groundwater banking and increased importation of surface water deliveries; and

WHEREAS, the District has supplies available from time to time under its contract with the United States and from other sources, including water provided under groundwater banking contracts with other agencies, in excess of the then current needs of the lands within the Surface Water Service Area, that could be delivered to In-Lieu Water User and similarly situated Landowners in lieu of (i) the District directly recharging such supplies in its groundwater recharge facilities and (ii) In-Lieu Water User pumping groundwater; and

WHEREAS, the undersigned is an owner of land within the District that desires to contract for surface water deliveries from District as In-Lieu Water User under the terms hereof including granting to the District a permanent easement, in a form provided by the District, for the new conveyance facilities (turnout(s), pipeline(s), meter(s), etc.) as a result of this Contract;

NOW, THEREFORE, it is agreed between the parties to this Contract as follows:

1. DEFINITIONS

Agricultural Use means use of water primarily in the production of agricultural crops or livestock, including uses incidental to agricultural. Water for agricultural use **shall not** be used for municipal, industrial or domestic uses, including watering landscaping, or for pasture for animals kept for personal enjoyment (e.g. horses), or for delivery to parcels of less than five acres in size, unless it is established to the satisfaction of the United States Bureau of Reclamation that use of water delivered to such parcel is for agricultural purposes.

Board of Directors means the body of members duly elected as the Board of Directors of the Arvin-Edison Water Storage District.

District means Arvin-Edison Water Storage District.

In-Lieu Water Users means the undersigned and all persons or entities executing contracts for in-lieu water deliveries similar in form to this Contract, or their successors in interest.

In-Lieu Water Delivery Contract means this agreement for In-Lieu Water Deliveries between District and In-Lieu Water User.

Landowner means that person or entity owning land within the District.

Project or Project Facilities means District's distribution system and groundwater recovery system and related facilities, including installations owned, controlled and operated by District, having the purpose of diversion, conveyance, control, measurement, pumping, spreading, and delivery of water.

Surface Water Service Area means that area originally designated to receive surface water through District turnouts, as it has been amended from time to time, which consists of approximately 51,000 acres, the owners of which have executed long-term Water Service Contracts with the District.

Temporary Water Service Area, means the area provided with temporary water service when water in excess of the needs of the Surface Water Service Area is available.

Turnout means any facilities constructed for the purpose of delivering water to In-Lieu Water User from any of the District-owned facilities.

In Lieu Water Use Charge means the charge in dollars per acre-foot which In-Lieu Water User shall pay for each acre-foot of water delivered to In-Lieu Water User under conditions of this Contract.

Year means the twelve-month period from and including March 1 of each year through the last day of February of the following year.

2. IN-LIEU WATER DELIVERIES

(a) The District's surface water distribution system will generally be constructed to serve the well site(s) of In-Lieu Water User or other convenient location, such that when the well(s) are not being used by In-Lieu Water User, groundwater can be conveyed from the well(s) to the District's distribution system under conditions specified below at Section 6. The turnout(s), pipeline(s), and well(s) will be equipped with measurement devices operated and maintained by the District.

(b) Upon completion of the District's surface water distribution system serving lands shown on Exhibit A, District will give notice to In-Lieu Water User in any given year or period of the commencement of in-lieu water deliveries for In-Lieu Water User's lands or any portion thereof, said notice to be given at least seven (7) days preceding commencement of In-Lieu Water Deliveries, and In-Lieu Water Deliveries and the provisions for payment for such In-Lieu Water Deliveries provided in Section 5 of this Contract shall become effective upon commencement of In-Lieu Water Deliveries.

(c) Subject to the provisions of this Contract, District agrees to deliver water to In-Lieu Water User, when water is available, as determined by the District. Said water may be made available from water supplies available to the District up to such quantities the District determines the In-Lieu Water User would have pumped from the groundwater basin for lands shown on Exhibit A absent this Contract.

(d) In-Lieu Water User warrants and acknowledges that land described at Exhibit "A" hereto has for at least the past five years been irrigated utilizing groundwater. Recognizing that in-lieu water deliveries to be provided under this Contract will be on an interruptible basis, In-Lieu Water User shall maintain at his/her sole cost and expense an operating well(s) sufficient to irrigate the lands described in Exhibit "A" hereto when water supplies are not available under the Contract, in whole or in part.

3. DELIVERY OF WATER

(a) District will deliver water to In-Lieu Water User through District's distribution system at locations listed in Exhibit A of this Contract and In-Lieu Water User shall only utilize said surface water for Agricultural Use, and only for those lands described in said Exhibit A.

(b) Unless otherwise agreed to between the parties or otherwise provided for at Exhibit A hereof, water will be delivered at each turnout with sufficient pressure to provide a residual pressure head of not less than five (5) feet of water above maximum elevation of the parcel to be served therefrom providing for turnout head losses and friction head losses of up to four (4) feet per 1,000 feet of distance between the turnout and the location of the maximum elevation of the parcel. In-Lieu Water User shall be responsible to increase head pressure from the District turnout, if necessary, to meet their operational needs.

(c) The water supply which District will deliver to In-Lieu Water User may include water received from Central Valley Project or water acquired from other sources.

(d) In-Lieu Water User shall not have a right to discharge tail water, water stored in reservoirs, or other runoff into the District's distribution system and shall control such water upon In-Lieu Water User property.

(e) To the extent that In-Lieu Water User shall make use of surface water delivered under this Contract, it shall be deemed that an equal quantity would have otherwise been pumped by In-Lieu Water User and said quantity (less appropriate losses determined by the District) shall be deemed to be in storage and available for subsequent recovery by District. In no event, however, regardless of the source of supply, shall the In-Lieu Water User be deemed to have forfeited his/her rights to pump groundwater for use on his/her lands described at Exhibit "A" hereto as a result of entering into this Contract. In-Lieu Water User also agrees to recognize and be bound by the groundwater pumping rights similarly preserved to other surface water users and In-Lieu Water Users in the District pursuant to other water service contracts heretofore and hereafter executed. It is further agreed that, as a result of District's spreading of water and percolation thereof to underground storage, either by direct recharge ponds or through deliveries in lieu of Landowners pumping groundwater, District shall have the exclusive right to use of the underground storage for (i) spreading and recovery of water in connection with supplying water to other Landowners in the Surface Water Service Area, (ii) providing stored water to third parties which have contracted with the District or (iii) for any other lawful purpose. This Contract shall be administered in a manner consistent with any adopted Groundwater Sustainability Plan adopted pursuant to the Sustainability Groundwater Management Act (Water Code Section 10720 et seq).

(f) District will deliver water to In-Lieu Water User through a metered turnout only, which metered turnout will be owned and maintained by District. Only District employees shall operate turnout valves and other diversion mechanisms except as otherwise provided in the Rules and Regulations for Distribution of Water, and said employees shall have authority to stop water delivery to In-Lieu Water User when In-Lieu Water User is in violation of this Contract and/or the Rules and Regulations for Distribution of Water.

(g) District will not be responsible for the control, carriage, handling, use, disposal, or distribution of water delivered to In-Lieu Water User outside the facilities then being operated and maintained by District. In-Lieu Water User does hereby indemnify and shall assume the defense of and hold harmless the District and its officers, agents and employees from any and all loss, damage, liability, claims, or causes of action of every nature whatsoever, for damage to or destruction of crops, persons, property, including the District's property, or for injury to or death of persons, in any manner arising out of or incidental to the control, carriage, handling, use, disposal, or distribution of water outside such District facilities.

(h) The character and quality of water furnished hereunder may vary from time to time, and District does not guarantee in any respect the character or quality of the water delivered pursuant to this Contract, provided that it shall be of at least the quality as provided to the Surface Water Service Area. If at any time during the term hereof District determines that such water as is available is not of a quality suitable for irrigation, then during such time the obligations of District to deliver and of In-Lieu Water User to pay under this Contract may be suspended, such obligations to resume when District determines that it is once again able to deliver water of suitable irrigation quality. Any determination by District as to the suitability of the water for irrigation purposes shall be final and conclusive. Provided, however, that, if the In-Lieu Water User disagrees with the District's findings the parties shall meet and confer in an effort to find a mutually agreeable resolution. In-Lieu Water User shall be responsible for installing, operating, maintaining and repairing filtration system(s) necessary, if any, to use the water for its Agricultural Use.

(i) District may temporarily discontinue or reduce the amount of water to be furnished to In-Lieu Water User as herein provided for the purpose of such investigation, inspection, maintenance, repair or replacement as may be reasonably necessary, of any of the Project Facilities for the furnishing of water to In-Lieu Water User, but, so far as feasible, District will give In-Lieu Water User due notice in advance of such temporary discontinuance or reduction, except in case of emergency, in which case no notice need be given. In no event shall any liability accrue against District or any of its officers, agents or employees, for any damage, direct or indirect, arising from such temporary discontinuance or reduction of water deliveries. In-Lieu Water User shall provide access for operation and maintenance of District facilities by District personnel. In event of such a temporary discontinuance or reduction of in-lieu water deliveries, In-Lieu Water User will have a first right to use well(s) identified at Exhibit A, consistent with that provided at paragraph 6(a).

(j) Water shall be provided by the District to In-Lieu Water User under this Contract only on a non-firm and intermittent basis as surface water supplies are available to the District, and as determined by the District. As a general matter water will be made available at such times and during periods when the needs of the Surface Water Service Area have been met first, but generally before delivering water to the District's direct recharge facilities and/or providing water to meet the needs of the Temporary Water Service Area. In no event shall any liability accrue against District or any of its officers, agents, or employees, for any damage, direct or indirect, arising from such a shortage on account of problems in delivery, drought, or any other cause whatsoever.

(k) Pursuant to powers granted by Section 43004 of the California Water Code, as a general matter water will be apportioned among the In-Lieu Water Users in the event of shortage, to each In-Lieu Water User upon the basis of the ratio of each In-Lieu Water User's acreage as listed in Exhibit A of this Contract to the total acreage subject to the District's contracts for Intermittent Water Deliveries In Lieu of Groundwater Pumping. Provided, however, that, the District may allocate water among In-Lieu Water Users in event of shortage in a different manner taking into account conditions such as balances among In Lieu Water Users and groundwater conditions in specific areas.

(l) At times in-lieu water deliveries are not available hereunder, in event of a sudden well failure resulting in imminent threat of loss or damage to In-Lieu Water User's crops, the District will endeavor to provide emergency water service to In-Lieu Water User lands described in Exhibit A for so long as the District determines is reasonably necessary for the In-Lieu Water User to repair or replace such In-Lieu Water User well or obtain an alternative supply.

4. TIME OF DELIVERY OF WATER

(a) In-Lieu Water User shall schedule water deliveries pursuant to the "Rules and Regulations for Distribution of Water," as they may be amended from time to time.

(b) Consistent with the design and operational objectives of District's distribution facilities and giving consideration to requests for water service from all Landowners, District will schedule water deliveries and deliver water to In-Lieu Water User as nearly in accord with In-Lieu Water User's requests as is practicable, and when available, and District's determinations with regard to such scheduling of water deliveries shall be final and conclusive. If the in Lieu Water User is irrigating from his/her well, at the time the District determines that in-lieu water deliveries can be made, the In-Lieu Water User will have at least seven (7) days from the District's date of notification to switch from groundwater to water made available under this Contract.

5. PAYMENT FOR WATER

(a) In-Lieu Water User shall pay for water delivered under the provisions of this Contract through the In-Lieu Water Use Charge(s). Such charges shall not be more than 90% of the average cost of producing groundwater within the entire District, including capital, operations, maintenance, repairs and energy, as annually determined by the District, unless an alternative pricing structure is developed in consultation with In-Lieu Water User. A Standby Charge shall not be levied on In-Lieu Water User. Said In-Lieu Water Use Charge shall be annually fixed by the Board of Directors.

(b) Payment of the foregoing charges shall be made at such manner as provided in the aforementioned "Rules and Regulations of Distribution of Water," as they may be amended from time to time.

(c) Recognizing that the District must expend significant resources to make water available hereunder, and that In-Lieu Water User Charges paid pursuant to Section 5(a) partially funds such cost, In-Lieu Water User agrees to take delivery of water hereunder in-lieu of pumping his/her well(s) at times water is made available. To that end, and subject to Section 3(h), if at any time In-Lieu Water User pumps groundwater to serve the lands described at Exhibit A hereto when water is available under this Contract, In-Lieu Water User shall pay to the District a non-performance fee equal to the In-Lieu Water User Charge as established in Section 5(a) for each acre-foot pumped by the In-Lieu Water User.

(d) The charges provided for herein are authorized by Sections 43006 and 47180 of the California Water Code and are intended to be provisionally in lieu of assessments authorized under said Code. Nothing contained herein shall limit the power of District to levy charges and assessments from time to time, in accordance with benefits and as provided in said Water Code and otherwise provided by law, and to collect such amounts as may be found necessary by District to meet its financial requirements, including but not limited to the District's General Administrative and General Project Service Charges.

(e) No water will be delivered to land subject to this Contract if In-Lieu Water User is delinquent in the payment of any charges under this Contract and/or charges or assessments or charges levied under said Water Code. If this Contract provides for service to multiple turnouts or parcels, a delinquency of any turnout or parcel subject to this Contract will result in water service ceasing to all lands subject to this Contract, unless otherwise provided for by the Rules and Regulations.

(f) In the event that any charge hereunder or any obligation of In-Lieu Water User arising from this Contract becomes delinquent as described in the District's "Rules and Regulations for Distribution of Water", it shall bear interest, be subject to penalty, shall become a lien on the land and shall be collectible, all as provided in Section 47181 to 47185, inclusive, of the said California Water Code.

(g) The District shall investigate further the feasibility and cost effectiveness of the District supplying power to In-Lieu Water User's well(s) subject to this Contract, and if implemented, a mutually agreeable cost of service for such power from District to In-Lieu Water User.

6. USE OF IN-LIEU WATER USER'S WELL(S)

The well(s) identified at Exhibit A hereto and the associated pumping and conveyance equipment shall be made available for the District's uses under the following conditions:

a. Subject to the conditions set forth in this Section 6, including, but not limited to, paragraph (k), in any year in which the District needs a groundwater supply to meet its obligations to the Surface Water Service Area or to return water to other agencies that have previously stored and banked water with the District, In-Lieu Water User agrees to make its well(s) available to the District to return as much groundwater as reasonably possible, under conditions hereinafter set forth. At all times, In-Lieu Water User has the first right to use of the well(s) identified at Exhibit A, provided, however, that, the In-Lieu Water User shall meet a minimum performance standard for the return of groundwater to the District as further described in Exhibit B.

b. During the period that groundwater is actually pumped by In-Lieu Water User on behalf of the District, hereinafter referred to as the "pumping period," the District agrees to pay its respective share of In-Lieu Water User electrical demand charges and energy charges (including all standby or other similar charges incurred during the "pumping period"). In addition, the District agrees to pay In-Lieu Water User an Operations, Maintenance and Repair (O,M&R) charge, for each acre-foot of groundwater returned into the District's system for consideration of In-Lieu Water User future operational, maintenance, repair and/or replacement well cost among other things. This payment shall be adjusted at the beginning of each year based on the “capital, operational and maintenance” cost components from the same average cost of producing groundwater determination and same associated percentage factor (90%) provided for in Section 5(a). Said O,M&R charge shall be annually fixed by the Board of Directors.

c. The District agrees to give In-Lieu Water User seven (7) days prior notice of its intent to start the "pumping period" under provisions of this Section 6.

d. During the "pumping period," the District agrees to facilitate the delivery of water service to In-Lieu Water User for his/her own use as needed for the lands described at Exhibit A hereto. The District's source of supply will be either through the surface water system or directly from the In-Lieu Water User well(s). The District shall reconcile monthly the quantity of water pumped from the well(s), the quantity of water delivered to the In-Lieu Water User, and the quantity of water delivered to the District.

e. In-Lieu Water User shall operate and maintain the well(s) during the "pumping period" on a continuous basis for the benefit of the District and In-Lieu Water User. In-Lieu Water User shall notify District immediately upon any changes to the operation of any well(s).

f. Payment to In-Lieu Water User for water delivered into District facilities will be made monthly within thirty (30) days based on an estimated recovery charge.

However, the recovery charge shall be reconciled to actual cost at Year's end based on all applicable electrical energy bills (as provided in a timely manner by In-Lieu Water User) and water meter readings by District personnel.

g. Groundwater to be supplied by In-Lieu Water User to the District shall be delivered into the District's canal and/or pipeline system and will be metered. For such water, the District shall bear all additional costs to deliver water from the well head to the District's canal and/or pipeline system for each well that the District chooses to connect. Delivery of well water into the District's system may be terminated at any time without notice by the District if the District determines that such deliveries of well water may adversely effect District operations or other landowners, as solely determined by the District.

h. All costs of operating, maintaining, repairing, and replacing the well(s), pump(s), motor(s), In-Lieu Water User pipeline(s), and miscellaneous equipment associated therewith shall be the sole responsibility of the In-Lieu Water User.

(i) Without limiting the foregoing, the In-Lieu Water User does specifically assume the risk if the well fails, including while pumping water for the District under this Contract.

(ii) In case of equipment failure (pipeline, motor, pump, column, tube, shaft, etc.), In-Lieu Water User agrees to repair and resume pumping within thirty (30) days of an equipment failure. In-Lieu Water User shall consult with District when repairing/replacing well pump equipment in order to confirm equivalent design for future operations.

(iii) If the well fails, In-Lieu Water User shall expeditiously repair or replace the well; provided, however, that, if the In-Lieu Water User elects to abandon or to take the well out of service for more than one year, In-Lieu Water User shall so notify the District within fifteen (15) days of such long term failure. In the event of a well failure, the District will have no responsibility to supply water to In-Lieu Water User, except under shorter term conditions specified in Section 3(l) of this Contract. If In-Lieu Water User elects to abandon the well and not replace it with another well to serve the lands described in Exhibit A, this Contract shall terminate, unless mutual agreeable terms and conditions of an alternative water supply are reached.

(iv) In the event of a well failure and In Lieu Water User elects to abandon the well as provided at subparagraph (iii) above, and at the District's election within forty-five (45) days of receiving such notice from In Lieu Water User, this Contract shall not terminate and In Lieu Water User shall provide to the District a well site location on the same property of the failed well for the District to construct and equip, at its cost, a replacement well.

(v) In the event a well identified at Exhibit A fails and it is necessary to replace the well, the In-Lieu Water User will bear the costs to reconnect the replacement well to his/her irrigation system and the District will bear the cost to reconnect the replacement well to District facilities. If it is necessary to relocate the replacement well to a different location, the District shall have the option to construct a pipeline to the replacement well site and thereby potentially relocate the location of the turnout, and the In-Lieu Water User shall, without compensation, in a form provided by the District, at a mutually agreeable location, grant to the District a permanent easement for the new pipeline extension. In-Lieu Water User shall consult with District when constructing a new well and/or well pump equipment in order to confirm equivalent design for future operations. In addition, the In-Lieu Water User shall amend Exhibit A accordingly to reflect the changed conditions.

i. In-Lieu Water User waives and forever releases any and all claims which may occur arising out of the In-Lieu Water User supplying the water to the District. In event any third party in possession of In-Lieu Water User's lands alleged that it was not supplied with adequate water, the In-Lieu Water User agrees to indemnify, defend, and hold harmless the District and its directors, officers, employees, and agents for any claim or cause of action arising therefrom; Provided, however, that, by the foregoing neither the District nor the In-Lieu Water User intends to create any third party beneficiary.

j. The District agrees to indemnify, defend, and hold harmless the In-Lieu Water User from any claims or cause of action regarding the quality of groundwater returned from the In-Lieu Water User's well(s) during the pumping period.

k. District will not use In-Lieu Water User's well(s) to pump any more water than was previously delivered to the lands described in Exhibit A under this Contract unless mutually agreeable terms and conditions can be reached for pumping other water previously banked by District in the general surrounding area.

l. The well(s) identified at Exhibit A hereto and the associated pumping and conveyance equipment may be utilized during other times, by the In-Lieu Water User, under mutually agreeable terms and conditions so as not to adversely impact the District's operations.

7. NOTICE

Any notice or announcement which the provisions hereof contemplate shall be given to one of the parties hereto by the other, shall be deemed to have been given if deposited in the United States Post Office, on the part of District in a postage-prepaid envelope addressed to In-Lieu Water User at the address shown in Exhibit A hereof, and on the part of In-Lieu Water User in a postage-prepaid envelope addressed to District at Arvin, California, or such other address as from time to time may be designated by written notice from one party to the other, Provided, however, that, this article shall not preclude the effective service, particularly with regards to annual operations, of any such notice or announcement by other means, including but not limited to email.

8. <u>TERM OF CONTRACT</u>

This Contract shall be effective on October 11, 2016, (or such later date as the District's long-term renewal contract with the United States becomes effective), and shall thereafter be effective until February 28, 2040 unless otherwise terminated as provided in Section 6(h). This Contract may be renewed on terms and conditions mutually agreeable to the parties. <u>Provided, however, that,</u> this Agreement will terminate if, and when, the lands described at Exhibit A change from agricultural use to urban use, including but not limited to commercial and industrial, and provided further that (i) remaining water previously banked on account associated with this Agreement has been returned to the District utilizing the well(s) identified at Exhibit A, and (ii) In-Lieu Water User reimburses the District the depreciated book value of improvements installed by the District to implement this Agreement, as determined by a mutually agreeable third party, or pursuant to an alternative agreement among the parties.

9. <u>LIEN AND ASSIGNMENT</u>

(a) The parties of this Contract do hereby declare that: the water to be furnished under this Contract, and the right to such water, are intended to form a part of the appurtenances to the land described in Exhibit A of this Contract; such water and right to water are of direct benefit to said land; the covenants of In-Lieu Water User to pay for said water and for said right to water, and other obligations of Landowner under this Contract, shall run with and bind said land. In-Lieu Water User does hereby expressly create a lien upon said land to secure the obligations of In-Lieu Water User under this Contract, which lien shall bind said land despite any transfer, hypothecation, or alienation thereof. <u>Provided, however, that,</u> said lien created upon said land shall in no manner affect interests in minerals, oil, gas or other hydrocarbon substances underlying said land.

(b) The Provisions of this Contract shall apply to and bind the successors and assigns of the parties hereto; but nothing in this Contract shall be construed as affecting in any manner In–Lieu Water User right to transfer or assign ownership of his said lands, subject, however, to the lien and obligations herein established. <u>Provided, however, that,</u> In-Lieu Water User may assign his/her rights and obligations hereunder or any part thereof, only to another Landowner in District's organized area and only after written permission of District, including terms and conditions of the assignment acceptable to District, is first had and obtained; provided, further, that in event of such requested assignment, the District reserves the right to cancel or assume this Contract for the general benefit of remaining Landowners.

10. <u>GENERAL</u>

(a) Any waiver or claim of waiver at any time by either party to this Contract of its rights with respect to a default, or any other matter arising in connection with this Contract, shall not be deemed to be a waiver with respect to any subsequent default or matter.

(b) Nothing contained in this Contract shall be construed as in any manner abridging, limiting or depriving District of any means of enforcing any remedy, either at law or in equity, for the breach of any of the provisions hereof which it would otherwise have.

(c) Where the terms of this Contract provide for action to be based upon the opinion or determination of either party to this Contract, whether or not stated to be conclusive, said terms shall not be construed as permitting such action to be predicated upon arbitrary, capricious or unreasonable opinions or determinations.

(d) Captions accompanying sections of this Contract are for convenience of reference and do not form a part of this Contract.

(e) Where appropriate in this Contract, words used in the singular shall include the plural and words used in the masculine shall include the feminine or any entity. The laws of the State of California shall govern this Contract and it shall be deemed to have been executed in Kern County.

(f) This Contract contains the entire understanding between the parties hereto and supersedes any prior oral or written agreement between the parties regarding matters which are the subject hereof.

(g) Other contracts executed by District for agricultural water service shall be substantially uniform with respect to basic terms and conditions.

(h) This Contract supersedes any Temporary Water User Agreements and any amendments thereto which was previously executed affecting the lands described in Exhibit A hereto, and after the effective date of this Contract such previously executed contract will have no force and effect, except as to any outstanding delinquent charges.

(i) Contracts entered into with other In-Lieu Water Users as part of this pilot project shall contain terms substantially similar to this Contract. Recognizing that this Contract is part of a pilot project, this Contract may be amended with consent of both parties to incorporate terms of future contracts providing for in lieu water deliveries that would be deemed more favorable to In-Lieu Water User.

Date of Execution: __________________

ARVIN-EDISON WATER STORAGE DISTRICT IN-LIEU WATER USER

BY: ____________________________________ BY: _________________________

END OF WATER MANAGEMENT PLAN