2023

Westlands Water District
Water Management Plan

Prepared for:

U.S. Department of the Interior, Bureau of Reclamation
Mid-Pacific Regional Office
2800 Cottage Way, MP-410
Sacramento, California 95825-1898

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Westlands Water District

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Description of the District

Section I – Description of the District

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A. History

1. Formation of Westlands Water District

Westlands Water District (District) was formed under California Water District Law in 1952 upon petition of landowners located within the District's proposed boundaries. Nearly all land within the current District's boundary was farmed using groundwater prior to the construction of the Central Valley Project (CVP).

Contract negotiations between the District and the United States Bureau of Reclamation (Reclamation) to provide a dependable, supplemental supply of surface water through the Reclamation's Central Valley Project began shortly after the District's formation. At that time, the federal government was considering the development and construction of the CVP. This involved cooperation between the federal and state governments regarding shared water storage facilities and conveyance systems.

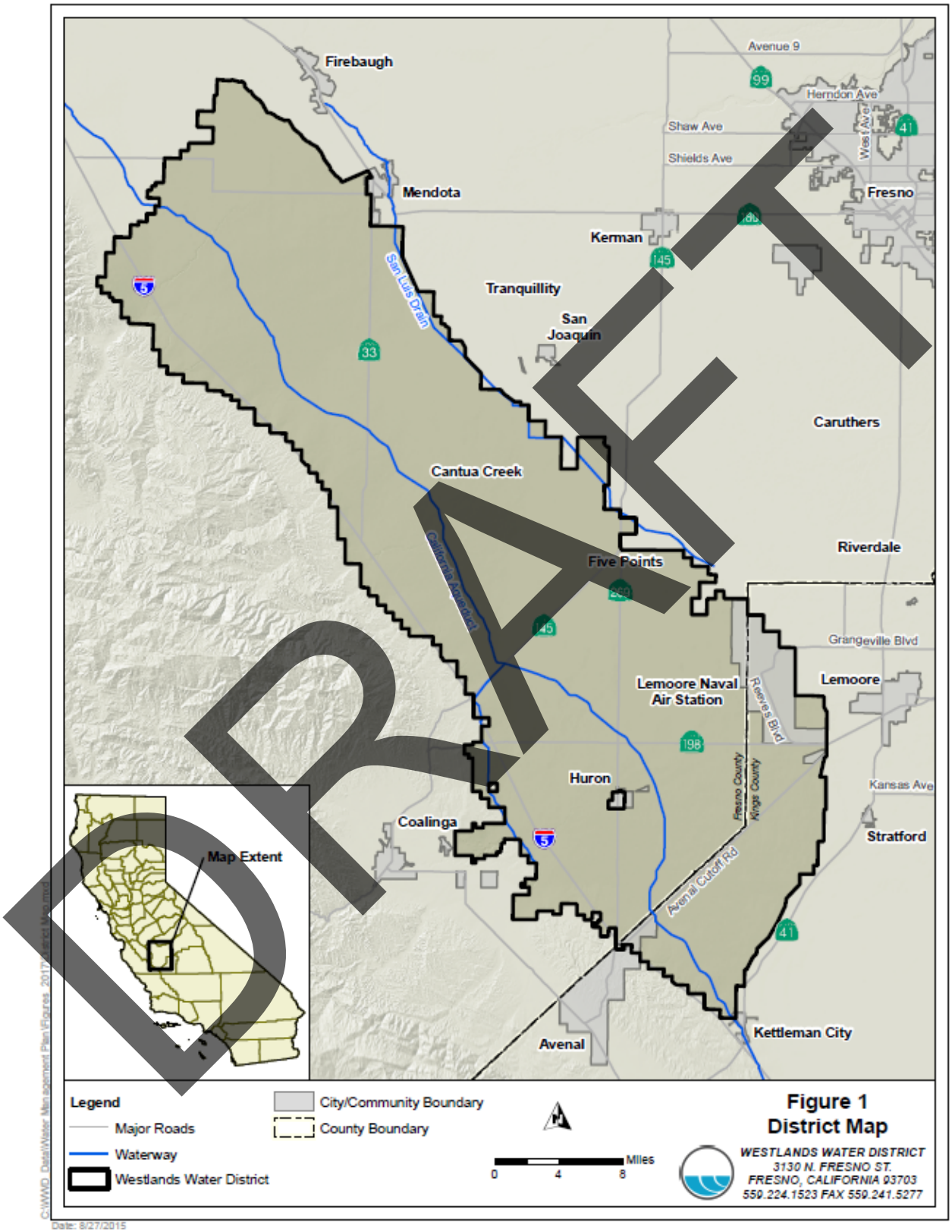
The original District size was approximately 376,000 acres. In 1965, it merged with its western neighbor, Westplains Water Storage District, adding 210,000 acres. Additionally, lands comprising of about 28,000 acres were annexed to the District after the merger in 1965 to form the current 614,000-acre District with an irrigable acreage of 568,000 acres.

Date District Formed: 1952 **Date of First Reclamation Contract:** 1963
Original Size (acres): 376,000 **Current Water Year:** 2021-2022

2. Current Size, Population, and Irrigated Acres

	2021-2022
Size (acres)	614,000
Population Served (For Urban, number of connections)	0
Irrigated Acres	357,868

Figure 1 – Westlands Water District Map



3. Water Supplies Received in 2021-2022

Water Source	Acre-feet
Federal Urban Water (Table 1)	4,151
Federal Agricultural Water (Table 1)	95,777
State Water (Table 1)	6,179
Other Wholesaler (Table 1)	0
Local Surface Water (Table 1)	1,323
Upslope Drain Water (Table 1)	0.00
District Groundwater (Table 2)	185,018
Banked Water (Table 1)	0
Transferred Water (Table 1)	77,438
Recycled Water (Table 3)	0
Other (Table 1)	0
Total	**369,886**

4. Annual Entitlement Under Each Right and/or Contract

Reclamation Agriculture	AF/Year	Source	Contract #	Availability Period(s)
Westlands WD	1,150,000	CVP	14-06-200-495A-IR1-P	June 1, 2020 - in perpetuity
Oro Loma[1]	4,000	CVP	14-06-200-7823J-LTR1-P	October 1, 2020 - in perpetuity
Broadview WD	27,000	CVP	14-06-200-8092-IR5-P	June 1, 2020 - in perpetuity
Widren	2,990	CVP	14-06-200-8018B-IR5-P	June 1, 2020 - in perpetuity
Centinella WD	2,500	CVP	7-07-20-W0055B-IR5-P	June 1, 2020 - in perpetuity
Mercy Springs DD1	6,260	CVP	14-06-200-3365AB-IR5-P	July 1, 2020 - in perpetuity
Mercy Springs DD2	4,198	CVP	14-06-200-3365AC-IR5-P	June 1, 2020 - in perpetuity

[1] Oro Loma and the United States entered into contract for a twenty-five (25) year term, beginning March 1st, 2005, and ending February 28th, 2030.

5. Anticipated Land-Use Changes

For Ag Contractors, also include changes in irrigated acres.

The current land use within the District is primarily agriculture. The District does not anticipate land use changes. The District's cropping patterns, total irrigated acres, and fallowed lands may change in the future due to the implementation of the Sustainability Groundwater Management Act (SGMA).

6. Cropping Patterns (Agricultural)

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

Original Plan (1985)		Previous Plan (2016)		Current Plan (2021)	
Crop Name	**Acres**	**Crop Name**	**Acres**	**Crop Name**	**Acres[2]**
Alfalfa-Hay	10,768	Alfalfa-Hay	3,355	Alfalfa-Hay	2,698
Alfalfa-Seed	14,486	Alfalfa-Seed	1,909	Alfalfa-Seed	99
Almonds	7,959	Almonds	87,912	Almonds	102,883
Apples	18	Apples	110	Apples	-
Apricots	122	Apricots	559	Apricots	234
Artichokes	-	Artichokes	153	Artichokes	-
Asparagus	352	Asparagus	761	Asparagus	7
Barley	24,901	Barley	1,592	Barley	263
Beans-Dry	7,545	Beans-Dry	1	Beans-Dry	-
Beans-Garbanzo	-	Beans-Garbanzo	5,219	Beans-Garbanzo	3,248
Beans-Green	-	Beans-Green	-	Beans-Green	-
Beans-Jojoba	-	Beans-Jojoba	11	Beans-Jojoba	61
Blueberries		Blueberries	80	Blueberries	25
Broccoli	2,308	Broccoli	849	Broccoli	71
Cabbage	-	Cabbage	-	Cabbage	110
Cantaloupes	20,190	Cantaloupes	13,814	Cantaloupes	8,117
Carrots-Bulk	1,176	Carrots-Bulk	-	Carrots-Bulk	231
Carrots-Fresh	-	Carrots-Fresh	-	Carrots-Fresh	-
Cauliflower	-	Cauliflower	-	Cauliflower	-
Celery	-	Celery	-	Celery	-
Cherries	-	Cherries	794	Cherries	342
Corn-Field	7,153	Corn-Field	162	Corn-Field	383
Corn-Sweet	871	Corn-Sweet	3,387	Corn-Sweet	3,833
Corn-Nuts	-	Corn-Nuts	-	Corn-Nuts	-

[2] Crop acres does not include double cropped land.

Original Plan (1985)		Previous Plan (2016)		Current Plan (2021)	
Crop Name	**Acres**	**Crop Name**	**Acres**	**Crop Name**	**Acres**
Cotton-Lint-Acala	286,169	Cotton-Lint-Acala	1,335	Cotton-Lint-Acala	3,889
Cotton-Lint-Pima	-	Cotton-Lint-Pima	22.118	Cotton-Lint-Pima	5,306
Cucumbers	-	Cucumbers	-	Cucumbers	-
Flowers	-	Flowers	54	Flowers	-
Garlic	8,670	Garlic	11,426	Garlic	14,099
Grains-Hay	-	Grains-Hay	16,774	Grains-Hay	-
Grains-Sorghum	-	Grains-Sorghum	191	Grains-Sorghum	238
Grapefruit	-	Grapefruit	53	Grapefruit	50
Grapes-Raisin	-	Grapes-Raisin	1,152	Grapes-Raisin	2,120
Grapes-Table	-	Grapes-Table	995	Grapes-Table	641
Grapes-Wine	6,633	Grapes-Wine	14,704	Grapes-Wine	14,540
Hemp	-	Hemp	-	Hemp	393
Honeydews	225	Honeydews	1,874	Honeydews	1,489
Honeydew (Casabas)	-	Honeydew (Casabas)	-	Honeydew (Casabas)	-
Lemons	-	Lemons	674	Lemons	358
Lettuce-Fall	5,879	Lettuce-Fall	3,497	Lettuce-Fall	4,042
Lettuce-Spring	8,813	Lettuce-Spring	4,126	Lettuce-Spring	3,502
Melons-Mixed	-	Melons-Mixed	-	Melons-Mixed	-
Mustard		Mustard	-	Mustard	-
Nectarines	72	Nectarines	271	Nectarines	319
Nursery	-	Nursery	322	Nursery	33
Oats	255	Oats	593	Oats	670
Olives	423	Olives	-	Olives	-
Onions-Dehy.	9,954	Onions-Dehy.	4,379	Onions-Dehy.	4,909
Onions-Fresh	-	Onions-Fresh	4,868	Onions-Fresh	5,461
Oranges	163	Oranges	1,598	Oranges	1,608
Parsley	-	Parsley	953	Parsley	1,124
Pasture	261	Pasture	590	Pasture	242
Peaches	54	Peaches	1,519	Peaches	1,095
Peas-Green	231	Peas-Green	-	Peas-Green	-
Pecans	-	Pecans	-	Pecans	-
Peppers-Misc.	1,392	Peppers-Misc.	89	Peppers-Misc.	-
Pistachios	2,252	Pistachios	42,625	Pistachios	66,436
Plouts	-	Plouts	-	Plouts	-
Plums	-	Plums	228	Plums	404

Original Plan (1985)		Previous Plan (2016)		Current Plan (2021)	
Crop Name	**Acres**	**Crop Name**	**Acres**	**Crop Name**	**Acres**
Pomegranates	521	Pomegranates	2,167	Pomegranates	2,368
Potatoes-Sweet	-	Potatoes-Sweet	-	Potatoes-Sweet	-
Prunes	-	Prunes	140	Prunes	148
Pumpkins	-	Pumpkins	10	Pumpkins	21
Radicchio	-	Radicchio	-	Radicchio	-
Rice	37	Rice	-	Rice	-
Safflower	3,846	Safflower	272	Safflower	45
Seed-Crop-Misc.	434	Seed-Crop-Misc.	828	Seed-Crop-Misc.	182
Seed-Crop-Vegetable	-	Seed-Crop-Vegetable	-	Seed-Crop-Vegetable	-
Sorghum (Milo)	-	Sorghum (Milo)	-	Sorghum (Milo)	-
Spinach	-	Spinach	-	Spinach	448
Squash	-	Squash	16	Squash	66
Stevia	-	Stevia	-	Stevia	-
Sudan Grass	-	Sudan Grass	-	Sudan Grass	-
Sugar Beets	8,841	Sugar Beets	2	Sugar Beets	5
Sunflower	-	Sunflower	-	Sunflower	-
Tangerines	-	Tangerines	1,830	Tangerines	1,934
Tomatoes-Fresh	2,637	Tomatoes-Fresh	5,108	Tomatoes-Fresh	3,414
Tomatoes-Proc.	51,574	Tomatoes-Proc.	58,388	Tomatoes-Proc.	49,258
Vegetable-Misc.	-	Vegetable-Misc.	-	Vegetable-Misc.	-
Walnuts	150	Walnuts	441	Walnuts	513
Watermelons	63	Watermelons	2,264	Watermelons	2,843
Wheat	49,989	Wheat	32,210	Wheat	12,061
Wildlife Area	-	Wildlife Area	-	Wildlife Area	-
Miscellaneous	-	Miscellaneous	-	Miscellaneous	-
NB Trees & Vines	558	NB Trees & Vines	26,433	NB Trees & Vines	27,534
Fallowed	30,579	Fallowed	175,901	Fallowed	207,767
Non-Harvested	3,245	Non-Harvested	3,883	Non-Harvested	4,153
Other (<5%)	-	Other (<5%)	-	Other (<5%)	-
Total	**551,190**	**Total**	**567,569**	**Total**	**568,333**

Figure 2 – 2021-2022 Crop Map

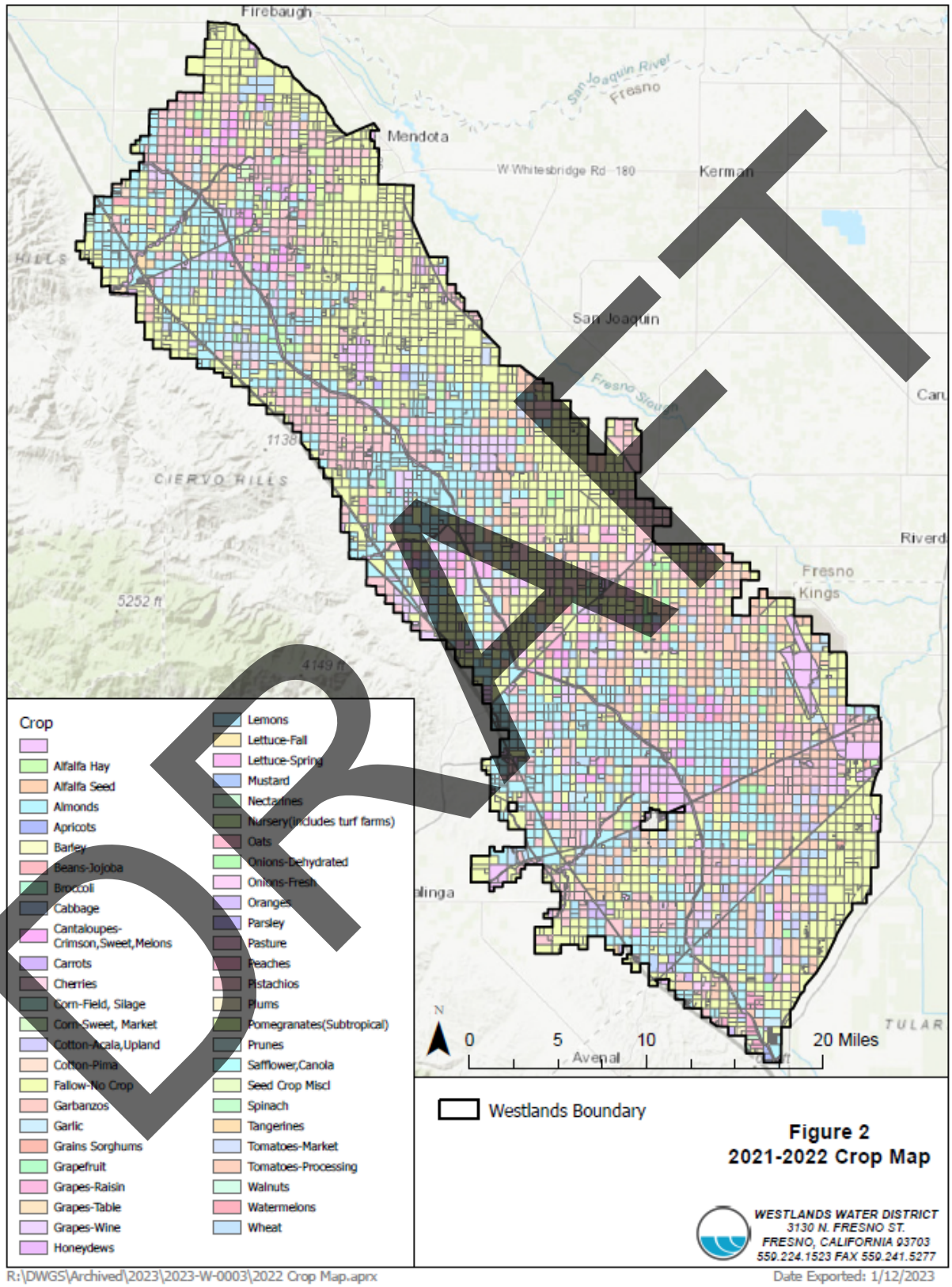
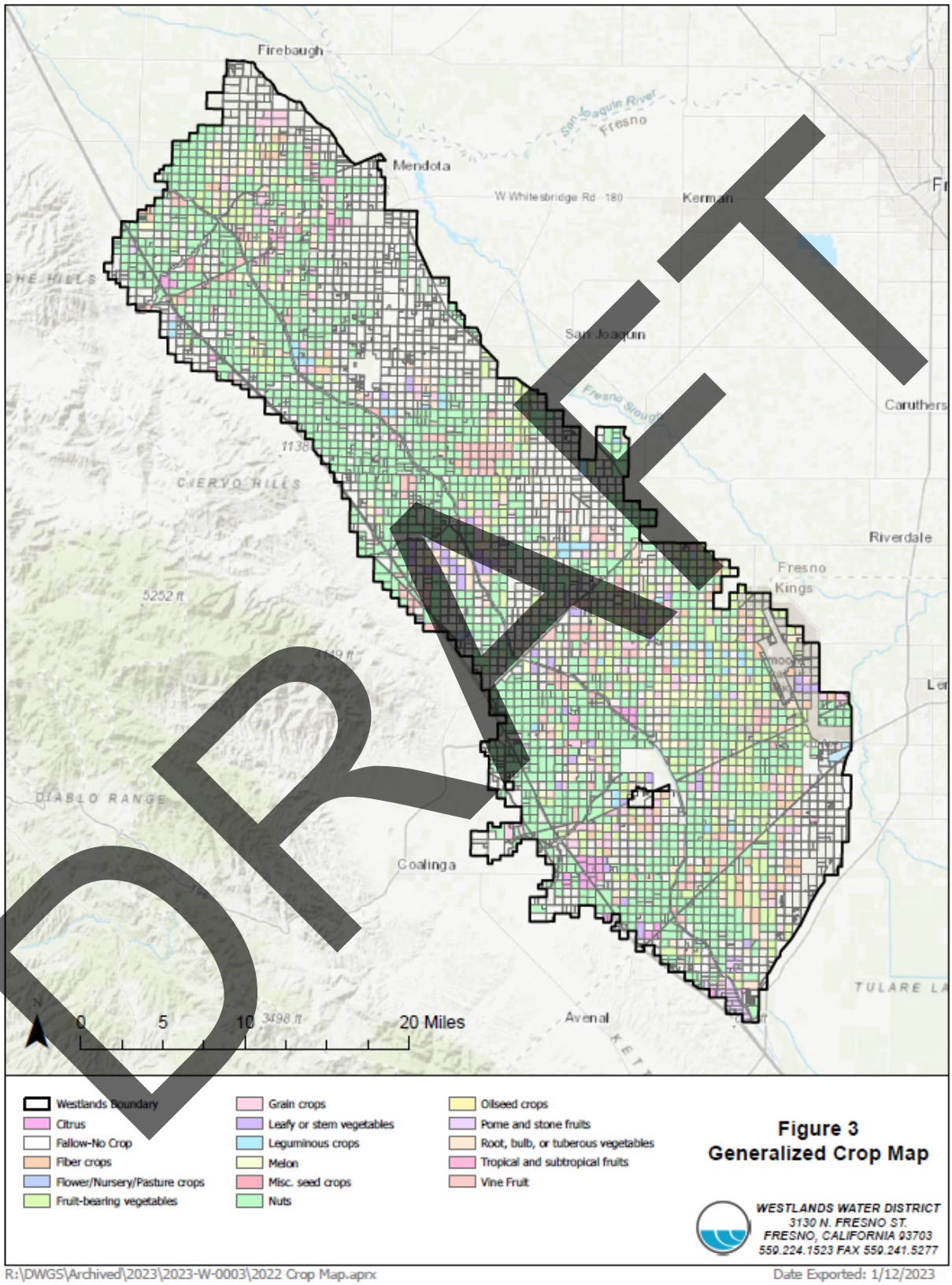


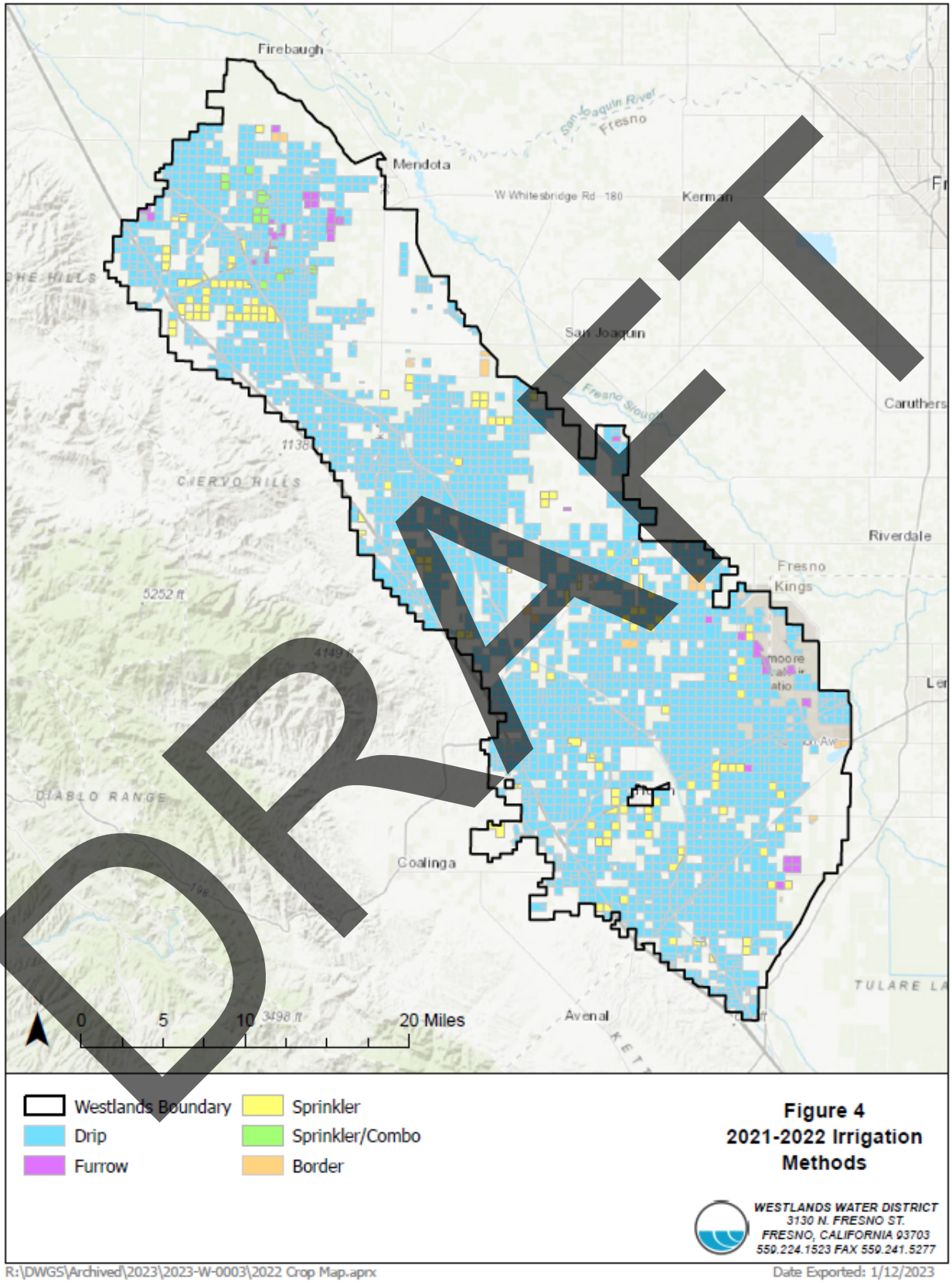
Figure 3 – Generalized 2021-2022 Crop Map



7. Major Irrigation Methods (Agricultural)

Original Plan (1985)		Previous Plan (2016)		Current Plan (2022)	
Irrigation Method	**Acres**	**Irrigation Method**	**Acres**	**Irrigation Method**	**Acres**
Level basin	16,139	Level basin	7,119	Level basin	2,439
Furrow	322,785	Furrow	6,885	Furrow	4,929
Sprinkler	112,975	Sprinkler	18,702	Sprinkler	19,348
Low Volume	5,380	Low Volume	326,954	Low Volume	274,624
Multiple	80,696	Multiple	3,713	Multiple	56,528
Other	-	Other	-	Other	-
Total	**537,975**	**Total**	**363,373**	**Total**	**357,868**

Figure 4 – 2021-2022 Irrigation Methods Map



B. Location and Facilities

See Attachment A on page 96, District Maps for maps containing the following information: headworks turnouts (internal flow) and conveyance system, incoming flow locations, storage tank facilities, M&I locations, weather stations, and delivery points.

1. Incoming Flow Locations and Measurement Methods

The District measures and calibrates all meters used within the District. This provides more accurate data when compared to the manufacturer's specifications. See Attachment C on page 125, Measurement Device Documentation for the manufacturer's data sheets.

Location Name	San Luis Canal Milepost	Type of Measurement Device	Accuracy
WWD 1R	104.18	Venturi	±1%
WWD 1	105.22	Venturi	±1%
WWD 2R	105.23	Venturi	±1%
WWD 2	106.35	Venturi	±1%
WWD 3	108.39	Venturi	±1%
WWD 3R	108.46	Venturi	±1%
WWD 4	110.52	Venturi	±1%
WWD 5	111.93	Venturi	±1%
WWD 6	113.00	Venturi	±1%
WWD 4R	113.77	Venturi	±1%
WWD 5R	114.90	Venturi	±1%
WWD 7	115.43	Venturi	±1%
WWD 6R	117.42	MAG	±2%
WWD 8	117.51	Venturi	±1%
WWD 7R	118.44	Venturi	±1%
WWD 8R	119.63	Saddle	±2%
WWD 9	120.77	Venturi	±1%
WWD 10	121.92	Venturi	±1%
WWD 9R	122.05	Non-Operational	-
WWD 11	124.18	Venturi	±1%
WWD 10R	124.19	Saddle	±2%
WWD 12	126.65	Venturi	±1%
WWD 11R	128.57	Venturi	±1%
WWD 13	129.88	Venturi	±1%
WWD 14	130.85	Venturi	±1%

Location Name	San Luis Canal Milepost	Type of Measurement Device	Accuracy
WWD 15	131.70	Venturi	±1%
WWD 12R	132.74	Venturi	±1%
WWD 16	132.81	Venturi	±1%
WWD 13R	133.81	Venturi	±1%
WWD 17	133.81	Venturi	±1%
WWD 18	134.94	Venturi	±1%
WWD 14R	135.96	Venturi	±1%
WWD 19	136.05	Venturi	±1%
WWD 15R	137.00	Venturi	±1%
WWD 20	137.11	Venturi	±1%
WWD 16R	138.14	Venturi	±1%
WWD 21	138.29	Venturi	±1%
WWD 17R	139.27	Venturi	±1%
WWD 22	139.39	Venturi	±1%
WWD 18R	140.48	Venturi	±1%
WWD 23	140.57	Venturi	±1%
WWD 19R	141.53	Venturi	±1%
WWD 24	141.60	Venturi	±1%
Coalinga Canal	143.16	Acoustic	±1%
WWD 25	145.26	Venturi	±1%
WWD 20R	145.32	Venturi	±1%
WWD 26	147.02	Venturi	±1%
WWD 27	149.12	Venturi	±1%
WWD 21R	149.55	Venturi	±1%
WWD 28	150.88	Venturi	±1%
WWD 22R	151.19	Venturi	±1%
WWD 29	152.35	Venturi	±1%
WWD 30	154.11	Venturi	±1%
WWD 23R (Huron)	156.34	Venturi	±1%
WWD 31	156.40	Venturi	±1%
WWD 32	158.47	Venturi	±1%
WWD 24R	158.47	Venturi	±1%
WWD 25R	160.45	Venturi	±1%
WWD 33	160.45	Venturi	±1%
WWD 34	161.60	Venturi	±1%

Location Name	San Luis Canal Milepost	Type of Measurement Device	Accuracy
WWD 26R	161.60	Venturi	±1%
WWD 35	162.63	Venturi	±1%
WWD 36	163.69	Venturi	±1%
WWD 27R	163.69	Venturi	±1%
WWD 28R	164.79	Venturi	±1%
WWD 37	167.04	Venturi	±1%
WWD 29R	167.84	Venturi	±1%
WWD 38	169.30	Venturi	±1%
WWD 30R	171.51	Venturi	±1%
WWD PP 6-1	N/A	Venturi	±1%
WWD PP 7-2	N/A	Propeller	±1%

2. 2021-2022 Agricultural Conveyance System

Miles of Unlined – Canal	Miles of Lined – Canals	Miles of Pipe	Miles - Other
7.4	12.8	1,034	0

3. 2021-2022 Urban Distribution System

Miles of AC Pipe	Miles of Steel Pipe	Miles of Cast Iron Pipe	Miles - Other
0	0	0	0

The District's Urban Distribution System utilizes the Agricultural Conveyance System. The District achieves dual use of the system because the District does not provide potable water to its customers.

Figure 5 – Incoming Flow Locations Map

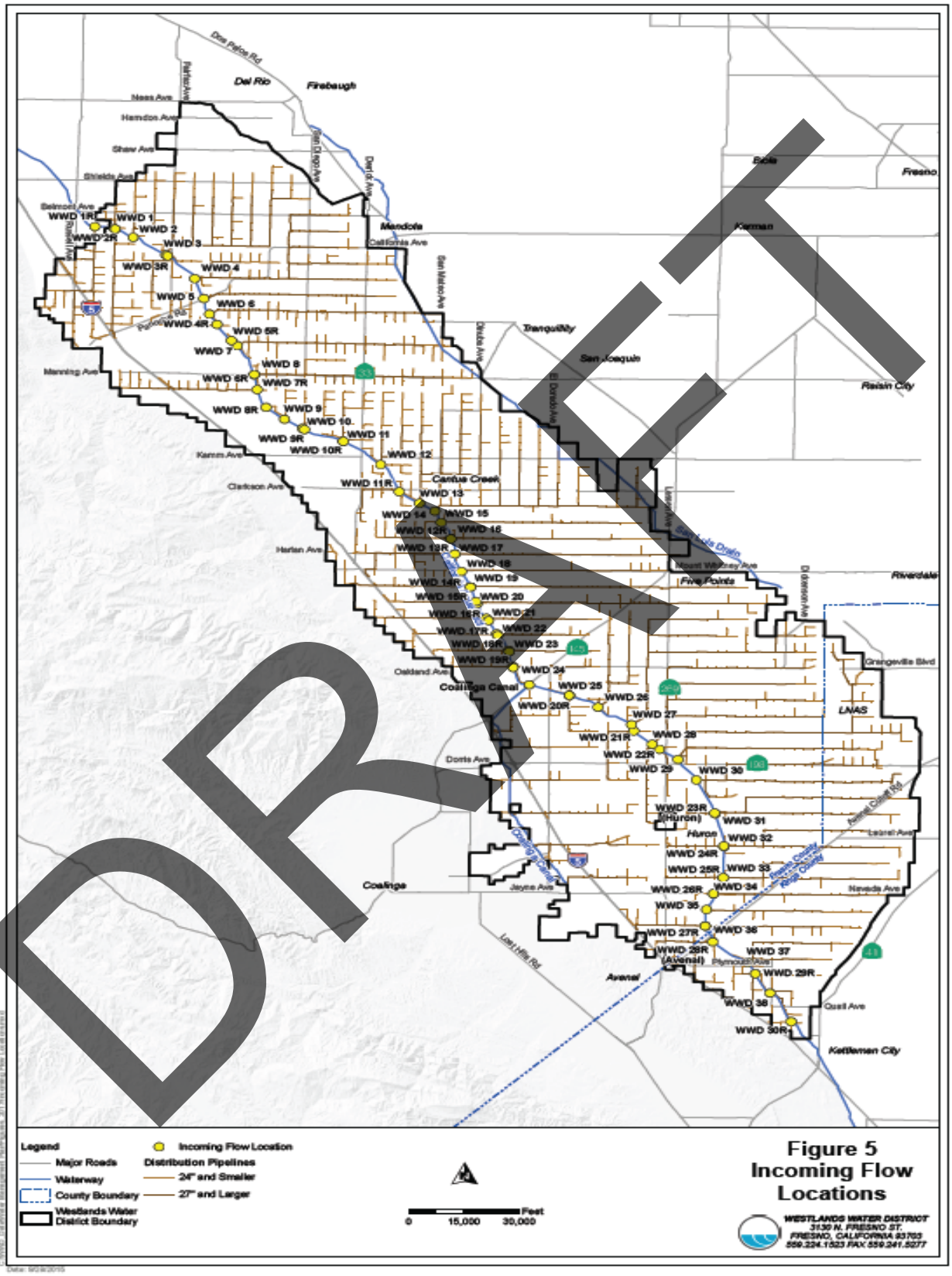


Figure 6 – Agricultural Conveyance Systems Map

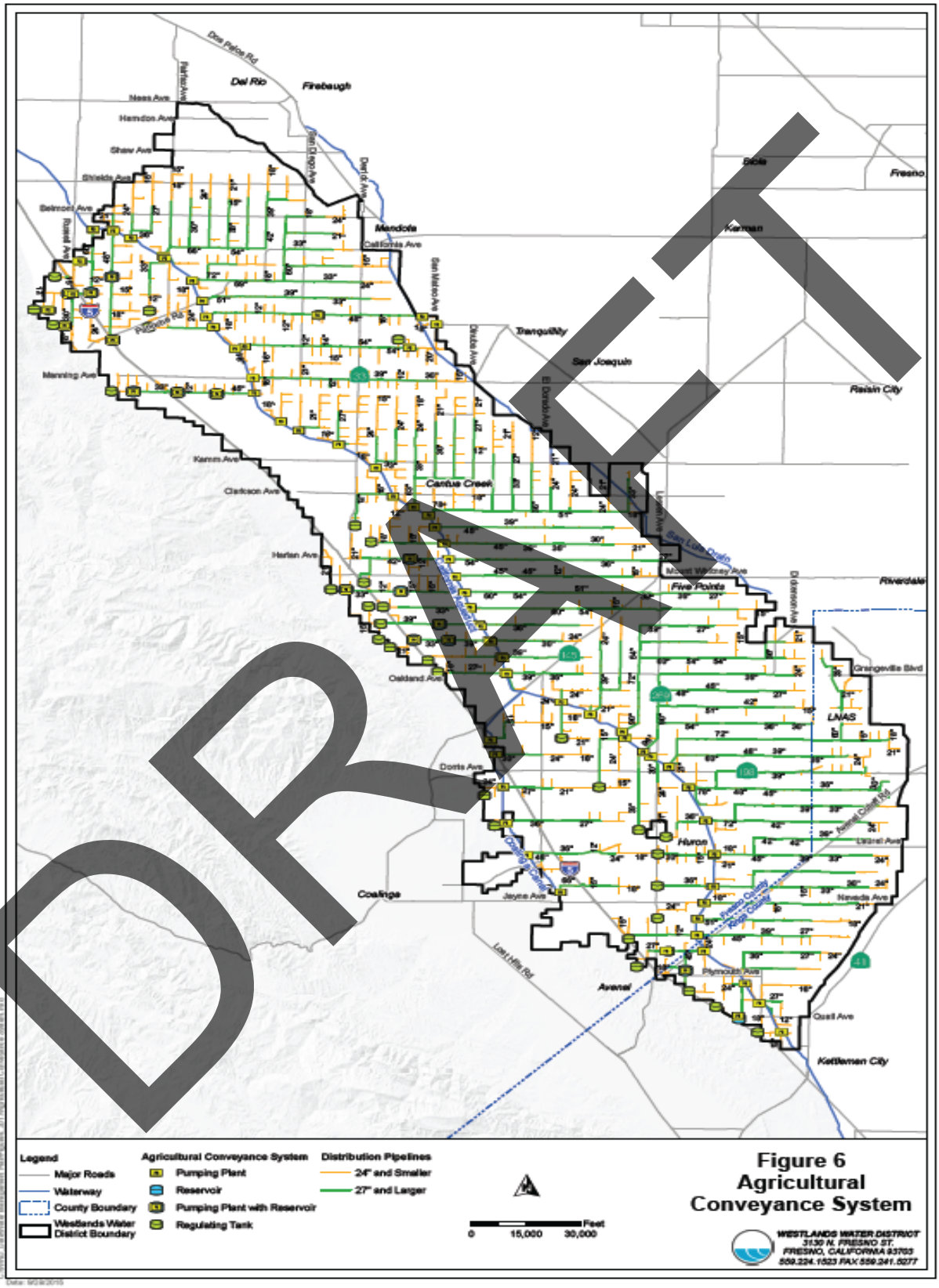


Figure 7 – Municipal & Industrial (M&I) Locations

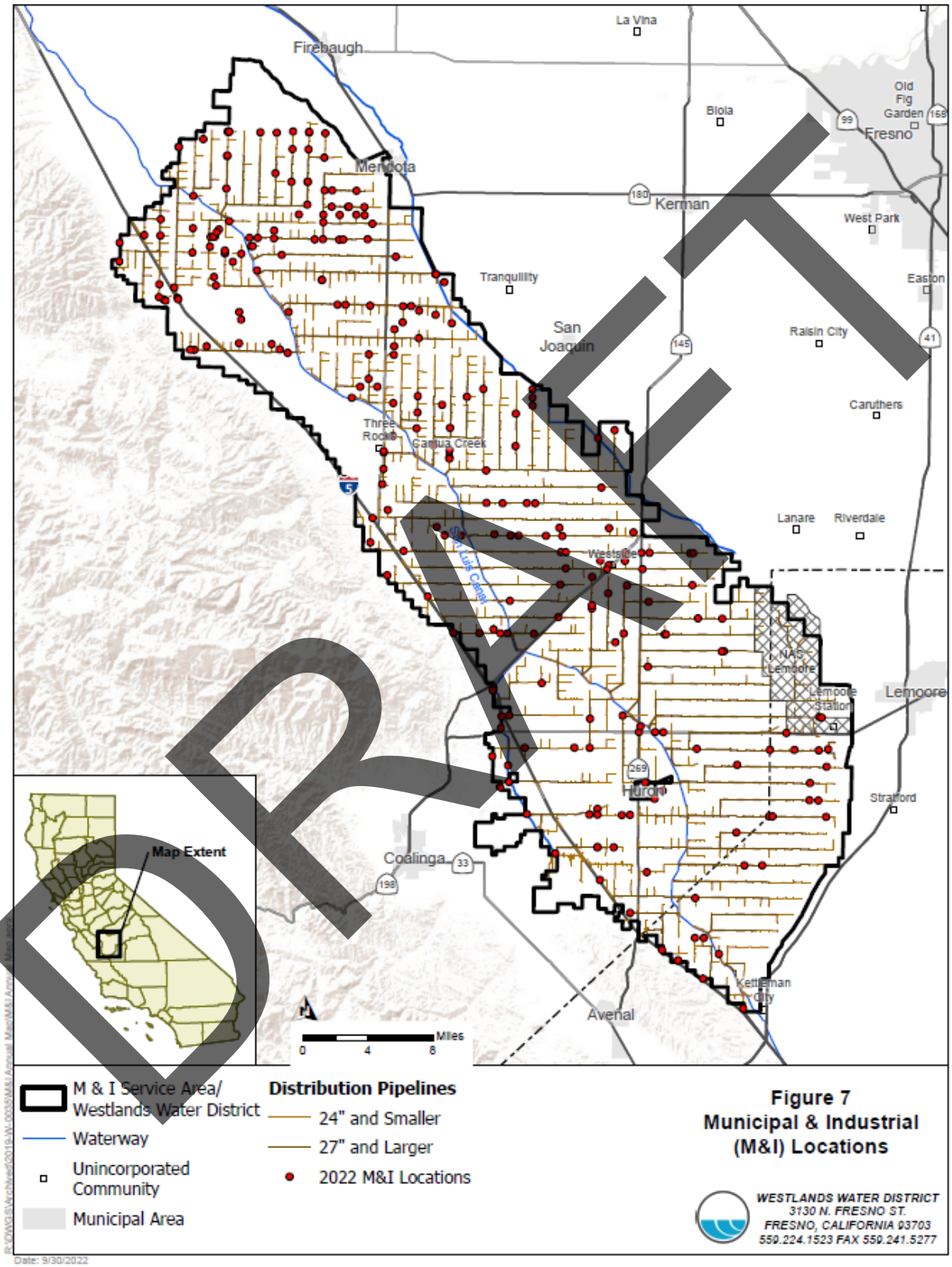
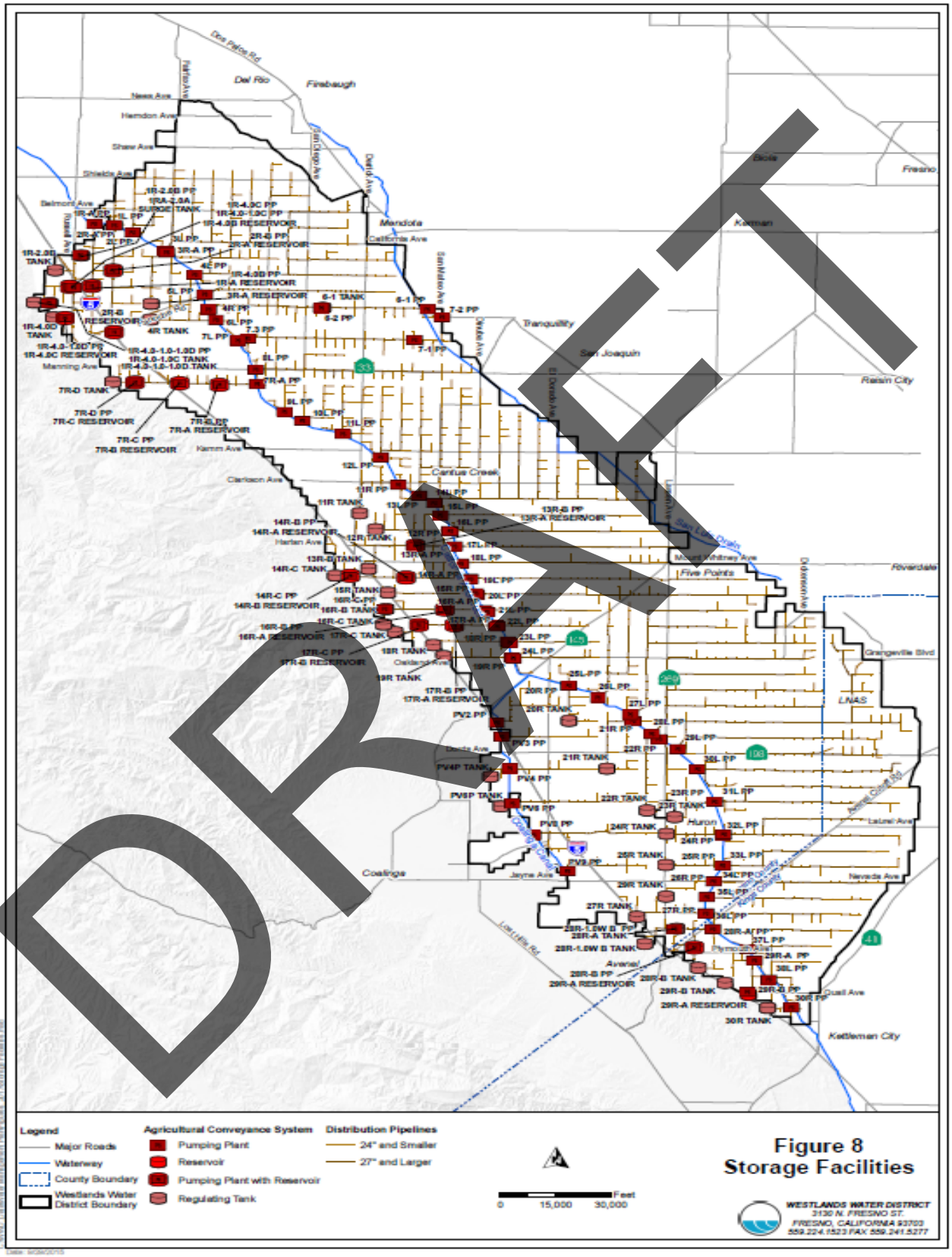


Figure 8 – Storage Facilities Map



4. **Storage Facilities – tanks, reservoirs, regulating reservoirs**

Name	Type	Capacity (AF)	Distribution or Spill
6-2	Tank	1.71	Distribution
1R-2.0A	Tank	0.10	Distribution
1R-2.0B	Tank	0.82	Distribution
1R-4.0A	Reservoir	4.36	Distribution
1R-4.0B	Reservoir	3.23	Distribution
1R-4.0C	Reservoir	1.58	Distribution
1R-4.0-1.0-1.0C	Tank	2.83	Distribution
1R-4.0-1.0-1.0D	Tank	0.76	Distribution
1R-4.0D	Tank	0.40	Distribution
2RA	Reservoir	2.67	Distribution
2RB	Reservoir	1.36	Distribution
3RA	Tank	1.26	Distribution
4RA	Tank	1.21	Distribution
7RA	Reservoir	2.14	Distribution
7RB	Reservoir	1.80	Distribution
7RC	Reservoir	1.85	Distribution
7RD	Tank	0.65	Distribution
11RA	Tank	1.85	Distribution
12RA	Tank	1.34	Distribution
13RA	Reservoir	2.77	Distribution
13RB	Tank	1.56	Distribution
14RA	Reservoir	2.39	Distribution
14RB	Reservoir	1.60	Distribution
14RC	Tank	0.61	Distribution
15RA	Tank	1.59	Distribution
16RA	Reservoir	2.28	Distribution
16RB	Tank	3.00	Distribution
16RC	Tank	0.85	Distribution
17RA	Reservoir	1.81	Distribution
17RB	Reservoir	1.56	Distribution
17RC	Tank	0.80	Distribution
18RA	Tank	1.36	Distribution
19RA	Tank	1.19	Distribution
20RA	Tank	1.26	Distribution
21RA	Tank	0.92	Distribution
22RA	Tank	1.57	Distribution
23RA	Tank	1.00	Distribution

Name	Type	Capacity (AF)	Distribution or Spill
24RA	Tank	2.05	Distribution
25RA	Tank	1.57	Distribution
26RA	Tank	0.50	Distribution
27RA	Tank	1.35	Distribution
28RA	Reservoir	2.63	Distribution
28R-1.0WA	Tank	0.08	Distribution
28R-1.0WB	Tank	0.88	Distribution
28RB	Tank	1.24	Distribution
29RA	Reservoir	1.56	Distribution
29RB	Tank	0.44	Distribution
29R-SURGE	Tank	0.02	Distribution
30RA	Tank	0.90	Distribution
PV4P	Tank	1.16	Distribution
PV6P	Tank	0.49	Distribution

5. Description of the Agricultural Spill Recovery System and Outflow Points.

The agricultural spill recovery and overflow is situated on Mile Post 15.52 of the Coalinga Canal into the Los Gatos Creek. This overflow structure is designed to spill into the east side of the canal 100 feet downstream of the Los Gatos siphon. When the water level encroaches the free board limits, water spills into a concrete channel that conveys water into the Los Gatos Creek. The District manages the water pumped in to the Coalinga Canal to meet demands. The Los Gatos siphon is only employed during an emergency.

In addition, the District does not allow tail water outside its boundaries and water users are responsible for controlling tail water on their farms. Any water user found in violation of these regulations could have their water service discontinued.

See Attachment B, Section 2.6 G, H, & I, on page 97, District Rules and Regulations (water related).

6. Agricultural Delivery System Operation

Scheduled	Rotation	Other
Applicable		

The District receives water orders in person, by phone, fax, or through the District's website. The schedule for placing water orders is as follows: water orders are to be placed twenty-four (24) hours prior to water use on Tuesday through Saturday, before 9:30 a.m., and by 12:00 p.m. the Friday before water use on Monday through Sunday. Water orders

placed on the District's website are accepted until 10:00 a.m. for the following day. Water orders run for the duration of the indicated water order, or until required to shutoff as a result of the verifiable emergency.

See Attachment B on page 97, District Rules and Regulations (water related), for more details on agricultural water deliveries.

7. Restrictions on Water Sources

Source	Restriction	Cause of Restriction	Effect on Operations
Federal CVP	Dedicating 300,000 total acre-feet (TAF) annually to wildlife refuges.	Implementation of Central Valley Project Improvement Act (CVPIA)	The CVPIA was enacted in 1992 and contains many requirements that reduce the District's water supply. A key requirement in the Act impacting water supply is the reallocation of 800,000 acre-feet of CVP yield to environmental purposes. CVPIA also reallocates an additional 300,000 acre-feet of annual supply to wildlife refuges. A majority of the 1.1 million acre-feet of reallocated water reduces water supply reliability for CVP Ag districts.
Federal CVP & SWP	Dedication of storage releases for outflow and salinity standards.	Implementation of Clean Water Act and Decision 1641	The Bay-Delta Accord was signed in 1995 to meet the requirements of the Clean Water Act and was adopted by the SWRCB in 2000 as Decision 1641. D-1641 contains flow and salinity requirements for numerous locations in the Delta as well as export pumping limitations. Although there are numerous Delta divertors, the responsibility for meeting the D-1641 requirements falls solely on the CVP and SWP. D-1641 reduces CVP supply reliability by reducing the amount of CVP exports.

Source	Restriction	Cause of Restriction	Effect on Operations
Federal CVP	Dedication of minimum annual release to the Trinity River of 29 TAF to 475 TAF.	Trinity River Record of Decision	The Record of Decision was signed in 2000 and established a flow restoration program that increased the minimum annual release to the Trinity River by 29 TAF to 475 TAF during critically dry to extremely wet years, respectively. In all but the wettest years, the additional release requirement reduces the amount of water that is available to supplement Sacramento River flows and support increased CVP exports.
Federal CVP & SWP	2018 Coordinated Operations Agreement (COA)	Reclamation and DWR	The amended COA modified how the CVP and SWP share the in-Delta responsibilities for meeting the requirements of the State Water Resources Control Board's Decision 1641 and Biological Opinions. The COA amendments helped to improve water supply reliability for CVP contractors.
Federal CVP & SWP	BiOps issued to protect endangered chinook salmon and Delta Smelt.	Implementation of Endangered Species Act (ESA)	Under the ESA, new biological opinions (BiOps) were issued in 2019 to protect endangered chinook salmon and Delta smelt. The BiOps reduce water supply reliability to CVP contractors by imposing additional requirements on upstream reservoir operations, in-river flows, Delta outflow, and export operations.

8. Proposed Changes or Additions to Facilities and Operations for the next 5 years.

The District and landowners have developed and plan to develop groundwater recharge projects to improve groundwater conditions and promote in- lieu recharge. Approved recharge projects include private ASR wells (including five ASR wells approved in the 2022 water year), sublateral recharge, over-irrigation, and percolation projects.

Currently, the District is evaluating several capital improvement projects with the potential to enhance water supply reliability. The proposed projects include groundwater recharge, storage, and conveyance projects. The District plans to construct serval groundwater recharge projects and conveyance projects with the next 5 years.

C. Topography and Soils

1. Topography of the District and its Impact on Water Operations and Management

Topography of the San Joaquin Valley is a wide bedrock basin filled with thousands of feet of alluvial sediment deposited by streams and rivers flowing out of the adjacent mountains on both the east and the west. The District is located near the centerline of this basin, bordered on the east by the Fresno Slough and on the west by the Diablo Range of the California Coast Ranges.

The Diablo Range consists of complex, folded, and uplifted mountains, which are composed predominantly of metamorphosed sandstone and shale of marine origin. Eroded by creeks flowing from the Diablo Range, sediments form gentle sloping alluvial fans. The texture of the Diablo Range deposits depends on the relative position on the alluvial fan and ranges from coarse sand and gravel to fine silt and clay. Generally, those portions of the District lying high on the alluvial fans contain permeable, medium-textured soils. With decreasing elevation from the west to east, soil textures become finer. Fine textured soils are characterized by low permeability and increased concentrations of water-soluble solids, primarily salts and trace elements.

The Sierra Nevada on the east side of the Valley is predominately comprised of uplifted granite rock overlaid in areas by sedimentary and metamorphic rock. Sierran alluvial deposits in the District consist primarily of well-sorted sands, with minor amounts of clay. The Sierran alluvium decreases in thickness and increases in depth below the surface toward the west. These coarse-textured sediments are characterized by high permeability and a low concentration of water-soluble solids.

One of the principal subsurface geological features of the San Joaquin Valley is the Corcoran Clay (CC) formation. Formed within an ancient lakebed about 600,000 years ago, this clay layer ranges in thickness from 20 to 200 feet and underlies most of the District. Varying depths from 200 to 500 feet in the Valley through to 850 feet along the Diablo Range, the Corcoran Clay divides the groundwater system into two major aquifers: an upper and lower aquifer.

Water is distributed through 1,034 miles of buried pipe, varying in diameter from 10 to 96 inches. Gravity and pumps feed 38 lateral pipelines from the east bank of the San Luis Canal (SLC), while water is pumped into 27 laterals on the west bank. There are six partially completed laterals which service most of the land in the District east of the SLC.

Land on the eastern boundary of the District slopes gently from an elevation of about 320 feet to about 160 to 200 and majority of this land is gravity serviced from the SLC. Small re-circulating pumping plants at the headwork's of each of the gravity laterals pressurizes the laterals serving the lands adjacent to the SLC that are too high in elevation to be served through the gravity laterals. The lands lying west of the SLC are at higher elevations.

2. District Soil Association Map (Agricultural)

See Attachment A, Figure 10 on page 96, District Soils Map

3. Agricultural Limitations Resulting from Soil Problems

Soil Problem	Estimated Acres	Effect on Water Operations and Management
Salinity (Soil Types)		
Tachi-Armona-Gephord	1,000	These soils are deep, poorly drained, and Saline-sodic. Effective rooting depth of the crops commonly grown in the area is limited by a perched water table that is at a depth of less than 6 feet. Tachi and Gepford soils have clayey textures with a high shrink-swell potential. Armona soils have loamy textures and are stratified. Effect on water operations and management and any limitations on agriculture resulting from soil problems within the Westlands Water District. If this unit is used for irrigated crops, the main limitations are salinity and sodicity, a high perched water table, very slow permeability and flooding. Intensive management is required to reduce the salinity and maintain soil productivity. Gypsum, sulfur, and sulfuric acid are among the soil amendments that can be used to reclaim this soil. If sulfur or sulfuric acid is used, lime should be present in the surface layer. Content of salts can be reduced by leaching, applying proper amounts of soil amendments, and returning crop residue to the soil. Because of the very slow permeability on the Tachi and Gepford soils and stratification on the Armona soil, the application of water should be regulated so that water does not stand on the surface and damage the crops.

Soil Problem	Estimated Acres	Effect on Water Operations and Management
Salinity (Soil Types)		
Westhaven-Panoche-Excelsior	47,000	These soils are very deep, well drained and moderately well drained soils on low lying alluvial fans and low fan terraces. Because of the moderately slow permeability of these soils, the length of runs should be adjusted to permit adequate infiltration of water. Westhaven soils are stratified and have silty textures. Panoche soils have loamy textures and Excelsior soils are stratified and have coarse-loamy textures. If this unit is used for irrigated crops, the main limitations are stratification and moderately slow permeability. The Westhaven and Excelsior soils are limited by a stratified profile that restricts permeability. Because of the moderately slow permeability of these soils, the length of runs should be adjusted to permit adequate infiltration of water. Good irrigation water management on these stratified soils requires that irrigation amounts, and timing be adjusted to account for the available water capacity which can vary depending on the size, depth and texture of the strata.
Ciervo-Cerini-Lillis	72,000	These soils are very deep, moderately well drained to poorly drained, saline-sodic soils with a high perched water table on distal alluvial fans and low stream terraces. Ciervo soils have clayey textures which usually become coarser with depth. Cerini soils are stratified and have fine-loamy textures and Lillis soils are clayey with a high shrink-swell potential. If this unit is used for irrigated crops, the main limitations are salinity and sodicity, a high perched water table and slow permeability. The high shrink-swell potential on the Lillis soil should be considered before installing cement structures. High shrink-swell clay can cause cement structures to buckle. Intensive management is required to reduce the salinity and maintain soil productivity Gypsum, sulfur, and sulfuric acid are among the soil amendments that can be used to reclaim this soil. The Ciervo and Lillis soils have very slow permeability. The Cerini soil is limited by a stratified profile that restricts permeability and creates a perched water table. Because of the very slow and slow permeability of these soils, the application of water should be regulated so that water does not stand on the surface and damage the crops.

Soil Problem	Estimated Acres	Effect on Water Operations and Management
Salinity (Soil Types)		
Lethent-Panoche-Westhaven-Cerini	40,000	These soils are very deep, moderately well drained and well drained, saline-sodic soils on distal alluvial fans and flood plains. Westhaven and Cerini soils have slow permeability. Panoche soils have moderately slow permeability. If this unit is used for irrigated crops, the main limitations are salinity and sodicity, a high perched water table, slow permeability and stratification. Intensive management is required to reduce the salinity and maintain soil productivity. Gypsum, sulfur, and sulfuric acid are among the soil amendments that can be used to reclaim this soil. If sulfur or sulfuric acid is used, lime should be present in the surface layer. Content of salts can be reduced by leaching, applying proper amounts of soil amendments, and returning crop residue to the soil. The Ciervo and Lillis soils have very slow permeability. The Cerini soil is limited by a stratified profile that restricts permeability and creates a perched water table. Because of the very slow and slow permeability of these soils, the application of water should be regulated so that water does not stand on the surface and damage the crops.
Ciervo-Cerini-Panoche, Saline Sodic	57,000	These soils are very deep, moderately well drained, saline-sodic soils on alluvial fan and flood plains. Intensive management is required to reduce the salinity and maintain soil productivity. Ciervo soils have clayey textures which usually become coarser with depth. Cerini soils are stratified and have fine-loamy textures and Panoche soils have loamy textures. If this unit is used for irrigated crops, the main limitations are salinity and sodicity, moderately slow permeability to very slow permeability, and a high-perched water table in some areas. Intensive management is required to reduce the salinity and maintain soil productivity. Gypsum, sulfur, and sulfuric acid are among the soil amendments that can be used to reclaim this soil. If sulfur or sulfuric acid is used, lime should be present in the surface layer. Content of salts can be reduced by leaching, applying proper amounts of soil amendments, and returning crop residue to the soil. Ciervo soils have very slow permeability. Cerini soils have slow permeability. Panoche soils have moderately slow permeability. Because of the moderately slow permeability to very slow permeability of these soils, and stratification on the Cerini soils, the application of water should be regulated so that water does not stand on the surface and damage the crops.

Soil Problem	Estimated Acres	Effect on Water Operations and Management
Salinity (Soil Types)		
Ciervo-Cerini-Panoche	342,000	These soils are very deep, moderately well drained and well drained soils on alluvial fans and flood plains. Ciervo soils have clayey textures, which usually become coarser with depth. Cerini soils are stratified and have fine-loamy textures and Panoche soils have loamy textures. If this unit is used for irrigated crops, the main limitations are stratification on Cerini soils and slow permeability or moderately slow permeability. Ciervo and Cerini soils have low permeability. Because of the low permeability, water should be regulated so that it does not damage the crops. Good irrigation water management on these soils requires that irrigation amounts, and timing are adjusted to account for the available water capacity which can vary depending on the size, depth and texture of strata.
Panoche-Cerini, Subsided	45,000	These soils are very deep, well-drained soils on alluvial fans and flood plains, which have subsided unevenly across the landscape due to near-surface subsidence. Panoche soils have loamy textures and Cerini soils are stratified and have fine- loamy textures. If this unit is used for irrigated crops, the main limitations are near-surface subsidence, moderate hazard of water erosion, moderately slow permeability on the Cerini soil, and occasional flooding in low-lying areas. Sprinkler or trickle irrigation is best suited where subsidence has occurred near the surface. Hollow areas caused by subsidence make furrow and border irrigation more difficult. Irrigation water needs to be applied at a rate that ensures optimum production without increasing deep percolation, runoff and erosion. Because of the moderately slow permeability of the Cerini soil, the application of water should be regulated so that water does not stand on the surface and damage the crops. To avoid over-irrigating, applications of irrigation water should be adjusted to the available water capacity, the water intake rate and the crop needs. Use of pipe, ditch lining or drop structures in irrigation ditches facilitates irrigation and reduces ditch erosion.

Figure 9 – Topography Map

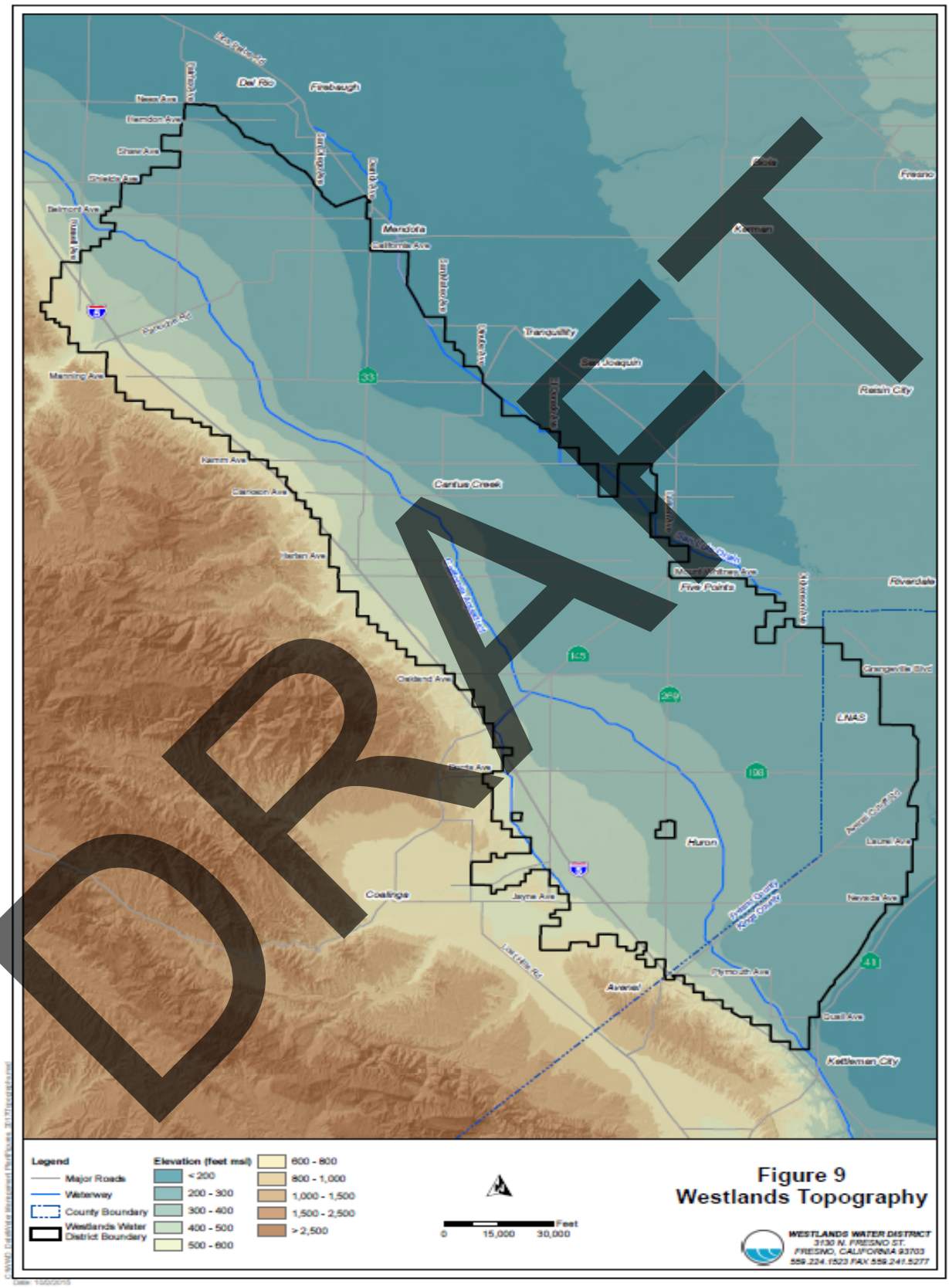


Figure 10 – Soils Map

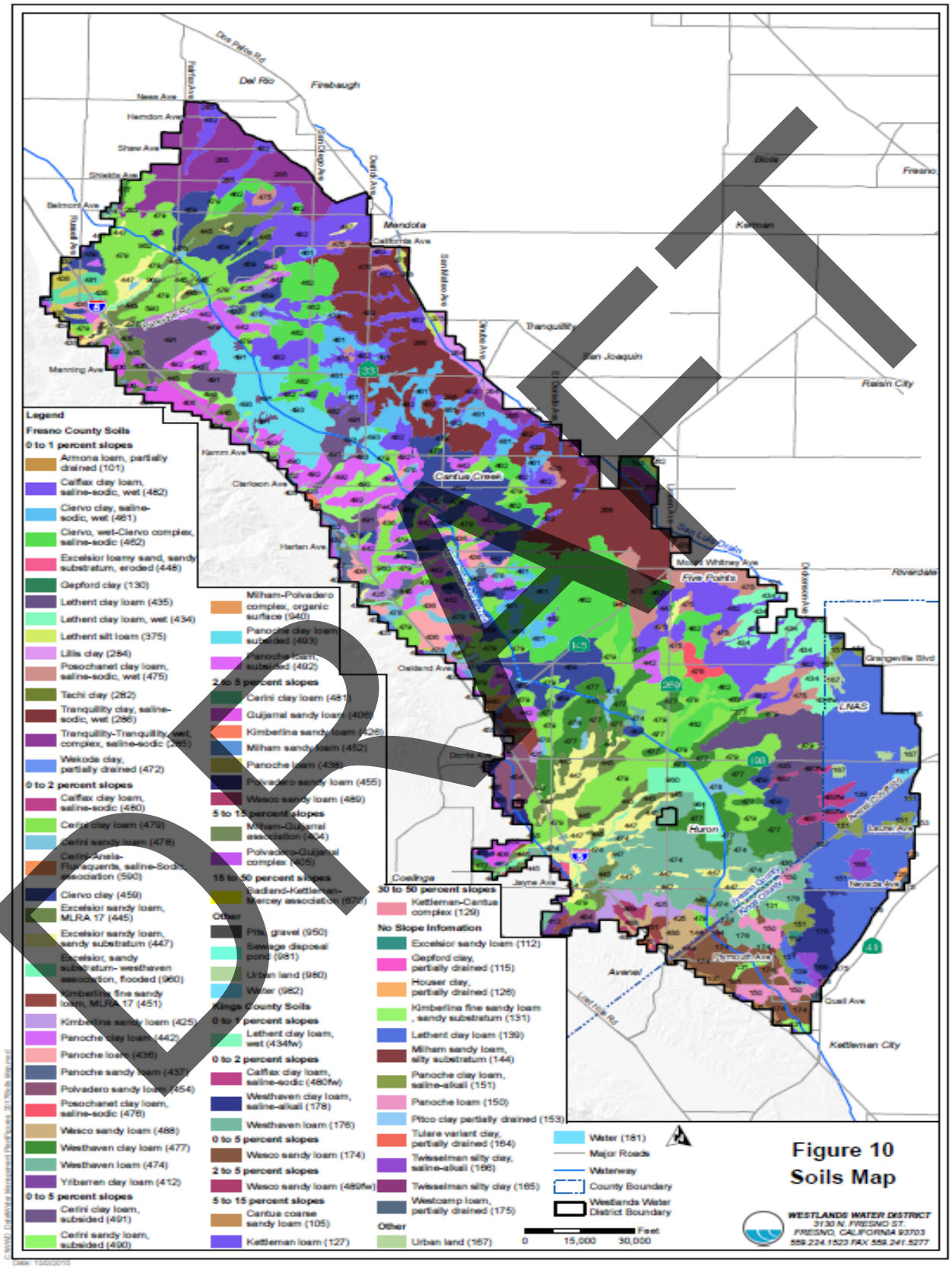


Figure 11 – Generalized Soils Map

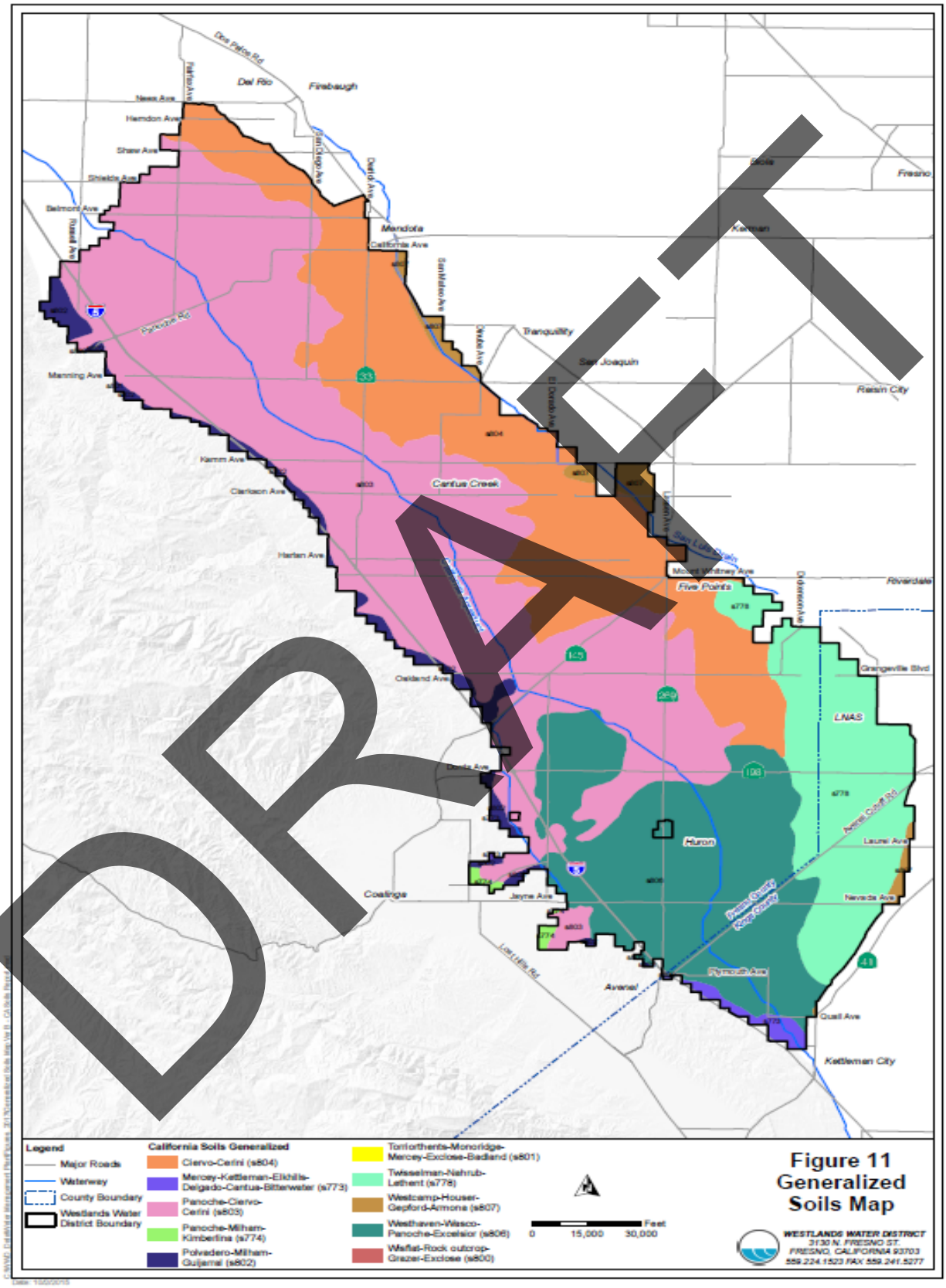
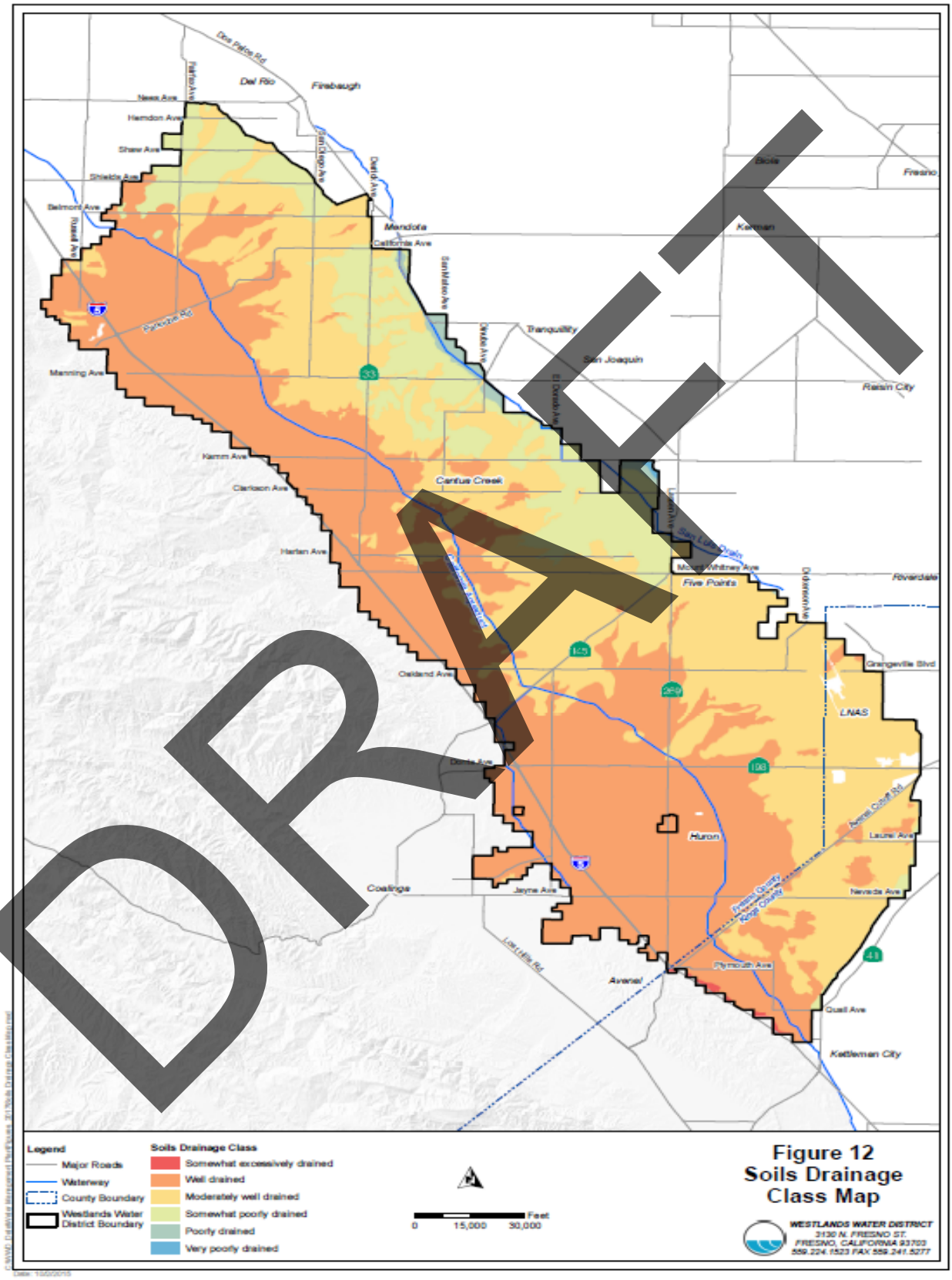


Figure 12 – Soils Drainage Class Map



D. Climate

1. General Climate of the District Service Area

The District receives an average of over seven inches of annual precipitation, the majority of which falls between the months of December and March. During the summer months, maximum temperatures frequently exceed 100˚ F, and the winter months, temperatures will occasionally fall below freezing. The District had a mean annual temperature of 62˚ F and an average frost-free growing season of 335 days.

The District monitors three weathers stations located in the Northern, Central, and Southern zones of the District. The tables below summarize the average, maximum, and minimum temperatures, weather and ET stations, and the average annual frost-free days of each climate zones[3].

Northern Zone

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. Precip.	1.36	1.09	1.03	0.46	0.51	0.04	0.01	0.00	0.01	0.40	0.61	0.96	**6.48**
Avg. Temp	46	50	56	61	69	76	80	79	74	64	53	45	**63**
Max Temp	58	63	70	76	85	92	97	95	91	80	67	57	**78**
Min. Temp	37	39	42	46	52	58	63	61	57	48	40	35	**48**
ETo	0.04	0.08	0.13	0.20	0.27	0.31	0.30	0.27	0.22	0.14	0.07	0.04	**2.07**

Weather Station ID: CIMIS Weather Station, Westlands
ET Station ID: CIMIS Weather Station, Westlands
Data Period: 1992 to 2022
Average Annual Frost-free Days: 332

[3] Data available back to 1982 for all three Climate Zone tables on CIMIS website.

Central Zone

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. Precip.	1.61	1.37	1.44	0.82	0.39	0.13	0.03	0.10	0.23	0.79	0.55	1.12	**8.58**
Avg. Temp.	47	50	56	61	68	75	80	79	73	63	52	45	**62**
Max Temp.	59	64	69	75	83	91	96	95	90	79	67	57	**77**
Min. Temp.	38	38	42	46	52	58	63	61	57	48	40	36	**48**
ETo	0.04	0.09	0.14	0.20	0.26	0.30	0.30	0.27	0.22	0.14	0.07	0.04	**2.07**

Weather Station ID: CIMIS Weather Station, Five Points
ET Station ID: CIMIS Weather Station, Five Points
Data Period: 1992 to 2022
Average Annual Frost-free Days: 339

Southern Zone

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. Precip.	1.57	1.34	1.11	0.53	0.37	0.04	0.01	0.00	0.05	0.67	0.42	1.34	**7.45**
Avg. Temp.	47	51	56	62	69	76	81	79	74	64	53	46	**63**
Max Temp.	57	63	69	76	84	92	97	95	91	80	67	57	**77**
Min. Temp.	37	39	43	46	53	58	63	62	57	48	40	36	**49**
ETo	0.04	0.08	0.13	0.20	0.26	0.30	0.29	0.26	0.21	0.14	0.07	0.04	**2.02**

Weather Station ID: CIMIS Weather Station, Stratford
ET Station ID: CIMIS Weather Station, Stratford
Data Period: 1992 to 2022
Average Annual Frost-free Days: 335

2. Impact of Micro-climates on Water Management within the Service Area

The District is unaware of any impacts from micro-climates on crop production.

Figure 13 – Weather Stations and Climate Zones Map

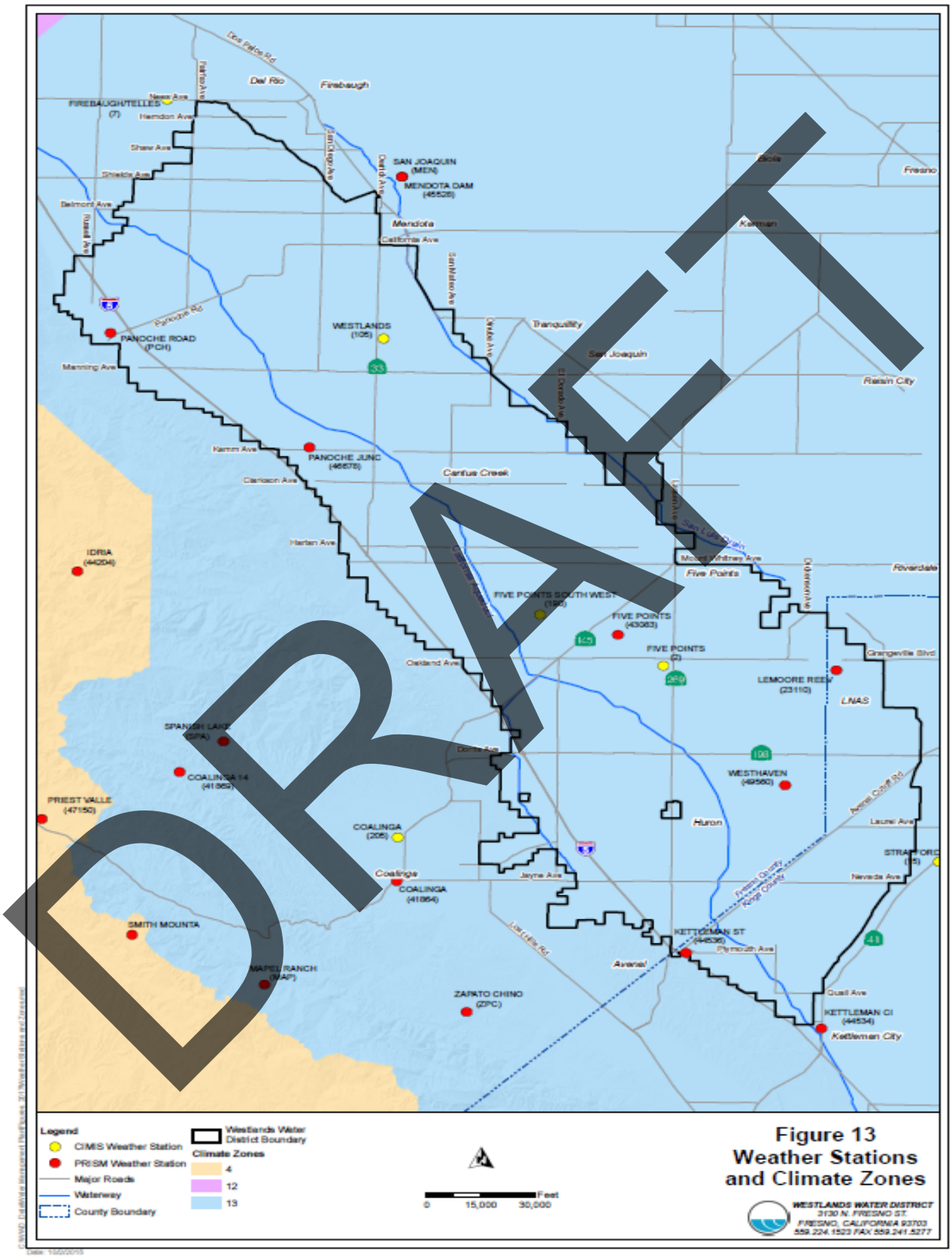


Figure 14 – Average Annual Precipitation Map

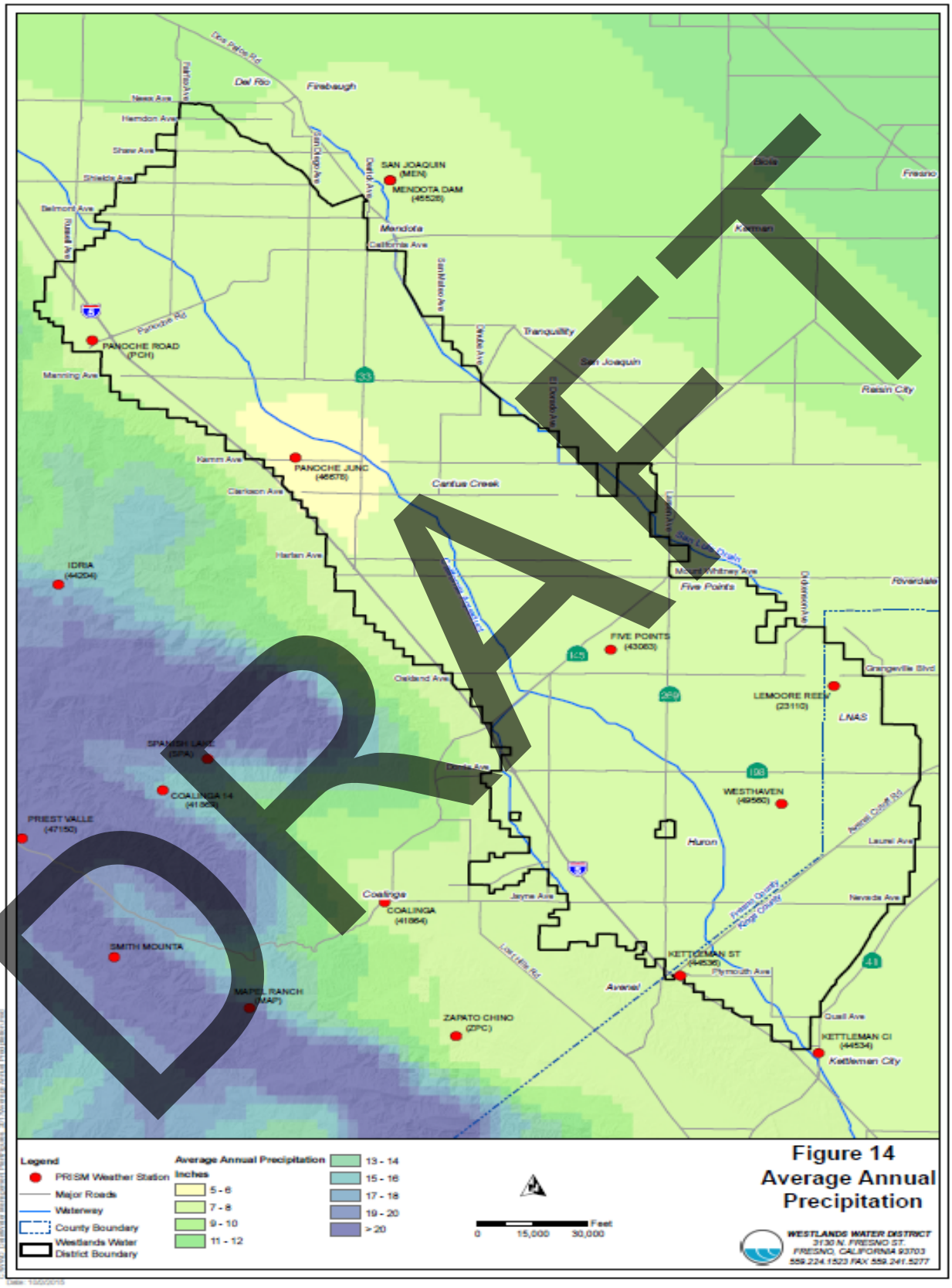


Figure 15 – EvapoTranspiration (ETo) Zones

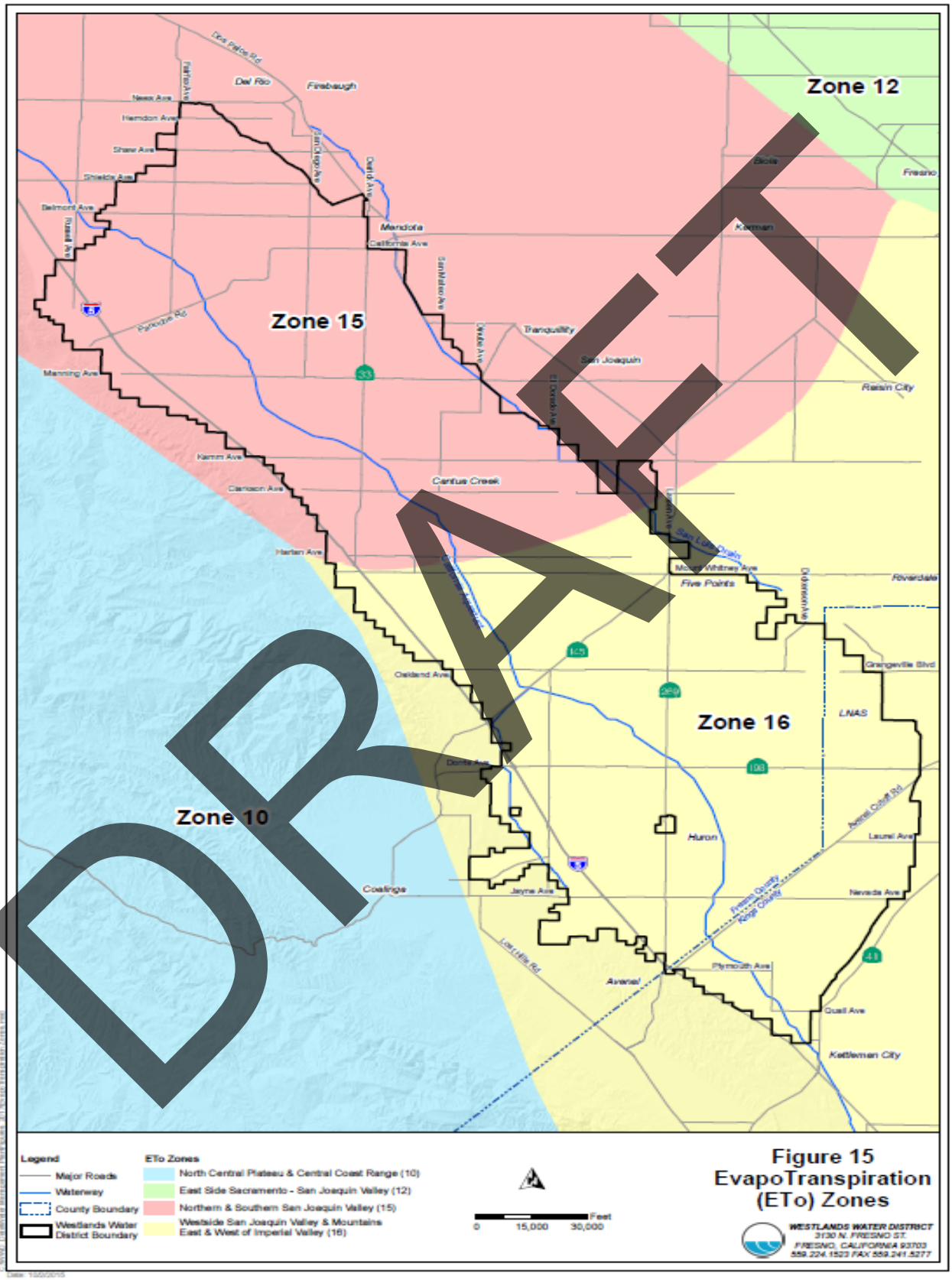
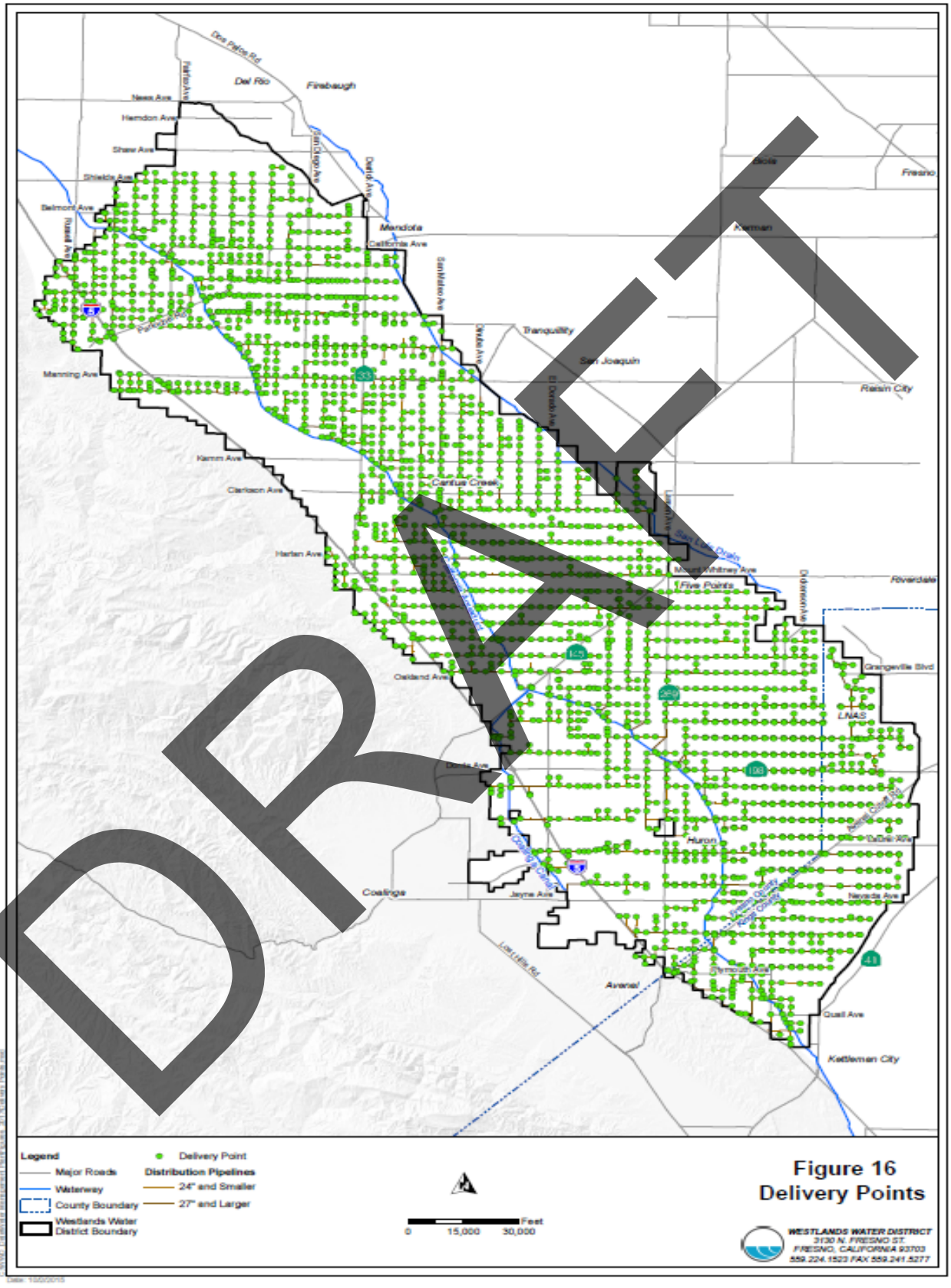


Figure 16 – Delivery Points



E. Natural and Cultural Resources

1. Natural Resource Areas within the Service Area

Name	Estimated Acres	Description
Mendota Wildlife Area	166[4]	Wildlife Habitat managed by California Department of Fish and Wildlife (CDFW)
Pilibos Wildlife Area	128	Wildlife Habitat managed by CDFW, DWR, and Reclamation

2. Description of District Management of these resources in the past or present

The natural resources areas identified in the table under Section E.1 are not managed by the District. The District does deliver water to wildlife areas under conveyance agreements.

3. Recreational and/or Cultural Resource Areas within the Service Area

Name	Estimated Acres	Description
Mendota Wildlife Area	166	Recreational use of the area includes hunting and fishing.
Pilibos Wildlife Area	128	Recreational use of the area includes dove hunting.

F. Operating Rules and Regulations

1. Operating Rules and Regulations

See Attachment B on page 97, District Rules and Regulations (water related)

2. Water Allocation Policy (Agricultural)

Article 2, Section 2.3 A and B., states the District's policy regarding the amount of contract water and who is entitled to receive an allocation.

Article 2, Section 2.3 B,C and 2.4 A, states the District's policy regarding any additional contract water in addition to the amounts stated in Section 2.3 C

See Attachment B on page 97, District Rules and Regulations (water related)

[4] Mendota Wildlife Area consists of approximately 12,425 acres with 166 acres located within the District.

3. **Official and Actual Lead Times necessary for Water Orders and Shut-Off**

The District receives water orders in person, by phone, fax, or through the District's website. The schedule for placing water orders is as follows: water orders are to be placed twenty-four (24) hours prior to water use on Tuesday through Saturday, before 9:30 a.m., and by 12:00 p.m. the Friday before water use on Monday through Sunday. Water orders placed on the District's website are accepted until 10:00 a.m. for the following day. Water orders run for the duration of the indicated water order, or until required to shutoff as a result of a verifiable emergency.

See Attachment B on page 97, District Rules and Regulations (water related)

4. **Policies regarding Return Flows (surface and subsurface drainage from farms) and Outflow (Agricultural)**

The District does not allow surface and/or subsurface drainage to leave farms. Article 2, Section 2.6 G states the following: "Each water user shall take reasonable steps to reuse or control tail water. The failure to do so shall constitute a waste of water."

The consequences of a water user not controlling tail water is stated in Article 2, Sections 2.6 H and I. A water user not controlling on-farm tail water may be subject to civil or criminal prosecution.

See Attachment B on page 97, District Rules and Regulations (water related)

5. **Policies on Water Transfers by the District and its Customers**

Article 2, Section 2.6 C., states the following: "A water user may transfer his water to another water user in any area of the District. Such transfer shall be in writing on a form provided by the General Manager."

The District pursues transfers each year to supplement reduced contract deliveries to its customers. Water users are eligible to transfer water within the District between individual or private entities and from other water districts. Generally, transfers out of the District without an obligation to return a similar amount of water must be approved by the Board of Directors.

See Attachment B on page 97, District Rules and Regulations (water related)

G. Water Measurement, Pricing, and Billing

1. Agricultural Customers

Information on Water Measurement for Agricultural Contractors is completed under BMP A.1 on page 60.

See Section III – Best Management Practices (BMPs) for Agricultural Contractors, on page 59.

2. Urban Customers

a. **Total Number of Connections:** 240
b. **Total Number of Metered Connections:** 240
c. **Total Number of Connections not billed by Quantity:** 0
d. **Percentage of water that was measured at Delivery Point:** 100%
e. **Percentage of delivered water that was billed by Quantity:** 100%
f. **Measurement Device Table**

Meter Size and Type	Number	Accuracy[5] (+/- Percentage)	Reading Frequency (Days)	Calibration Frequency (Months)	Maintenance Frequency (Months)
5/8" - 3/4"	28	Factory[6]	30	Factory	12
1"	36	Factory	30	Factory	12
1-1/2"	83	Factory	30	Factory	12
2"	39	(+/-) 2%	30	60	60
3"	49	(+/-) 2%	30	60	60
4"	2	(+/-) 2%	30	60	60
6"	2	(+/-) 2%	30	60	60
8"	1	(+/-) 2%	30	60	60
10"	4	(+/-) 2%	30	60	60
Compound	-	-	-	-	-
Turbo	-	-	-	-	-
Other	3	(+/-) 2%	30	60	60
Total	**247**				

[5] Documentation verifying the accuracy of the measurement devices is included as Attachment C, Measurement Device Documentation on page 125.
[6] Meters with diameters under 2" are sent to the factory manufacturer for calibration once a year.

3. **Agricultural and Urban Rates**

   a. **2021 Agricultural and/or Urban Water Changes – including rate structures and billing frequency**

See Attachment B on page 97, District Rules and Regulations (water related) for the current year rate ordinance.

4. **Annual Charges collected from Agricultural Customers[7]**

Fixed Charges

Charges	Charge Units ($/Acre)	Units Billed During Year (Acres)	Total $ Collected
District Water Supply Debt - Area 1	$ 3.50	261,970.55	$ 916,896.93
District Water Supply Debt - Area 2	$ 8.10	193,494.51	$ 1,567,305.53
Extraordinary Pipe Repairs - Area 1 & 2	$ 0.42	455,465.06	$ 191,295.33
Drainage Service Area	$ 6.41	171,890.35	$ 1,101,817.14
Westlands Water Quality Coalition	$ 2.92	461,849.86	$ 1,348,601.59
USBR Capital Repayment Debt Service	$ 12.85	455,465.06	$ 5,852,726.02
Sustainable Groundwater Management Act	$ 1.31	487,588.89	$ 638,741.45

Volumetric Charges for Agricultural Customers

Charges	Charge Units	Units Billed During Year	Total $ Collected
CVP Water	$ 277.95	91,989 AF	$ 25,568,342.55
Water User Acquired Supply	$ 225.63	63,022 AF	$ 14,219,653.86
District Acquired Supply	$ 1,075.00	20,595 AF	$ 22,139,625.00

Volumetric Charges for Urban Customers

Charges	Charge Units	Units Billed During Year	Total $ Collected
Acquired M&I Supply	$ 388.18	2,568 AF	$ 996,846.24
Acquired M&I Supply - NASL	$ 394.41	2,107 AF	$ 831,021.87

See Attachment B on page 97, District Rules and Regulations (water related) for additional information regarding the District's Water Rate Structure.

See Attachment D on page 155, District Sample Bills

[7] The District Water Rates are updated annually and can be accessed by water users on the District Website: https://wwd.ca.gov/water-management/water-rates/ . The data provided in the Fixed and Volumetric Charges tables reflect the 2021-2022 water rates.

5. **Describe the Contractor's Record Management System**

District field staff performs meter readings on all active turnouts to record the meter totalizer, time, and day. Meter reading data is inputted in to an electronic notepad application, which transfers the data into the District's billing software, Water Management Information System (WMIS). Office staff analyzes the meter readings and compares it to total consumption data to identify potential errors. Field staff submits meter readings twice a month and kept on file by Customer Accounting in the District's Fresno office. Agricultural water bills are mailed monthly, and the majority of Municipal & Industrial (M&I) water bills are mailed on a yearly basis to water users.

H. Water Shortage Allocation Policies

1. **2021 Water Shortage Policies and Shortage Response Plan**
   -Specifying how reduced water supplies are allocated.

The District is responsible for conserving the available water supply, protecting the integrity of water supply facilities, and implementing a contingency plan in times of drought, supply reductions, failure of water distribution systems, and/or emergencies. The District has developed a Water Shortage Contingency Plan (WSCP) in accordance with California Water Code Section 10632. Section 10632 states that water agencies must develop an urban water shortage contingency plan in the event of drought, water supply reductions, failure of a water distribution system, other emergencies, or regulatory statutes, rules, regulations or policies reducing water supplies by state and federal agencies with jurisdiction over the District. The contingency plan must demonstrate the ability of an agency to meet demands under a supply shortage of up to 50 percent. Emphasis is placed on protection of public health, sanitation, fire protection, and the public welfare.

See Attachment E on page 157, the District's Water Shortage Contingency Plan

2. **2021 Policies that Address Wasteful Use of Water and Enforcement Methods**

Article 2, Section 2.6 I. states the following: "The authorized using, taking, or wasting or water is prohibited and may subject the water user to civil or criminal prosecution."

The District administers conservation and outreach programs by providing monthly Water User Notices to inform water users about preventative measures to avoid wasteful use of water. Water User Notices are available to water users on the District website: https://wwd.ca.gov/news-and-reports/notices/.

See Attachment B on page 97, District Rules and Regulations (water related)

I. Evaluate Policies of Regulatory Agencies affecting the Contractor and identify Policies that inhibit good Water Management

1. Discuss possible modifications to policies and solutions for improved water management.

The District works with state, local, and federal regulatory agencies to promote and implement best water management practices. Additional changes the District implemented, incorporate the policies and legislation are identified below:

1. Agricultural Water Management Measurement Regulation.
2. California Urban Water Conservation Council
3. USBR Agricultural Annual Updates
4. Sustainable Groundwater Management Act
5. Groundwater Sustainability Plan
6. State Water Resources Control Board Irrigated Lands Regulatory Program
7. Mitigated Negative Declaration for Aquifer Storage and Recovery
8. Monitoring and Reporting Program R5-2020-0809; Westlands Water District; Agricultural Aquifer Storage and Recovery Project; Fresno and Kings Counties
9. USBR San Luis Canal Non-Project Water Pump-in Program, Water Quality Monitoring Plan
10. DWR Water Quality Policy and Implementation Process for Acceptance of Non-Project Water into the State Water Project

The District works in conjunction with multiple agencies including DWR, Reclamation, San Luis & Delta Mendota Water Authority, and Power and Water Resources Pooling Authority (PWRPA) on projects which enhance efficiency and improve water management.

Section II

Inventory of Water Resources

Westlands Water District

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**

See Section V on page 82, Agriculture Water Inventory Tables – Table 1, Surface Water Supply.

2. **Amount of Water Delivered to the District by each of the District Sources for the last ten years**

See Section V on page 88, Agriculture Water Inventory Tables – Table 8, Annual Quantities Delivered Under Each Right and/or Contract

B. Groundwater Supply

1. **Groundwater extracted by the District and Delivered by month**

See Section V on page 83, Agriculture Water Inventory Tables – Table 2, Groundwater Supply

2. **Groundwater Basin(s) that underlies the Service Area**

Name	Size (Square Miles)	Usable Capacity (AF)	Sustainable Yield (AF/Y)
5-022.09 San Joaquin Valley - Westside Subbasin	973.44	-	305,000

A discussion of estimated groundwater storage capacity in the San Joaquin Valley Groundwater Basin is included in California's Groundwater Bulletin 118 by DWR (1/20/2006).

See Attachment L on page 287, San Joaquin Ground Valley Groundwater Basin (DWR).

3. **Map of District-Operated Wells and Managed Groundwater Recharge Areas**

The District does not currently operate wells and/or manage groundwater recharge areas; however, the District is in the process of constructing facilities to operate and/or manage recharge areas.

4. Description of Conjunctive Use of Surface and Groundwater

The District is in the process of constructing multiple projects that optimize conjunctive use of surface water and groundwater throughout the District including the Pasajero Groundwater Recharge Project, the Broadview Aquifer Storage and Recovery (Broadview ASR) Project, the Storage Treatment Aquifer Recharge (STAR) ASR, the Distribution Integration Program (DIP), the Canal Integration Program (CIP), and the Westside Subbasin Groundwater Allocation Program.

The District's Pasajero Groundwater Recharge Program allow the conjunctive use of surface water supplies to be recharged and restored. The Pasajero Groundwater Recharge Project includes fifteen dry wells up to a total depth of 300 feet below surface and two recharge basins. The combined long-term average annual water supply benefit from the basins and dry wells is estimated to be 3,020 to 3,775 AF per year.

The Broadview ASR Project includes one ASR well that could store up to 1,200 AF per year. The STAR ASR Project consists of up to 8 ASR wells and provides up to 10,800 AF per year of aquifer storage. All the aforementioned projects will aid in improving groundwater management and drought resiliency.

The District's DIP provides conveyance through District facilities of groundwater pumped into the District's distribution system. This program allows water users to use the District's water distribution system to convey groundwater to other points of use within the District. This program allows for the improved use of groundwater resources. Conjunctive use of surface and groundwater improves overall water supply reliability by making more efficient use of water that is available. In wet periods, use of surface water is encouraged to preserve groundwater supplies. In droughts, greater flexibility in the use of groundwater is facilitated to extract the maximum benefit from this resource. The District conveys and delivers credit water through its distribution system to locations which will assist the pumper meet their overall water requirements. The District coordinates all water quality testing associated with this program. Water quality compliance analysis is required bimonthly, and a Triennial Analysis is required every three years. Testing groundwater wells ensures water quality standards occurs prior to injection into the distribution system for blending surface and groundwater.

The District's CIP allows water users to pump groundwater into the SLC and receive surface water credits with losses. During years when the District receives 20 percent or less of its contract water allocation from the CVP, qualified participating water users may pump groundwater from wells throughout the District to the SLC, using existing District and privately-owned pipelines. The groundwater will be pumped into the SLC at existing licensed water integration locations. Such water would be conveyed using the SLC for withdrawal and use on other land within the District.

The District also provides a low-cost energy program for wells that are in the Groundwater Management Program (GWMP) by integrating local groundwater resources into the District's overall water supply through the GWMP's groundwater management and conjunctive use planning procedures. Through GWMP, the District will be able to improve overall supply reliability while also minimizing total water supply costs.

Lastly, as part of the Sustainable Groundwater Management Act (SGMA), the District, developed the Amended and Clarified Westside Subbasin Groundwater Sustainability Plan (GSP) and the Groundwater Allocation Program and Use of Groundwater within the Westside Subbasin to sustainably manage the Westside Subbasin. The Project provides flexibility to water users to meet their individual needs and annual variations in the availability of surface water from the CVP is a critical aspect of conjunctive use of groundwater and surface water.

5. **Groundwater Management Plan**

See Attachment F on page 160, Groundwater Management Plan

The main objective of the District's Groundwater Management Plan (GMP) is to preserve and enhance the long-term sustainability of the District's groundwater resources. The District's GMP outlined a comprehensive groundwater monitoring program which is described in the Westside Subbasin Groundwater Sustainability Plan (GSP).

The Westside Subbasin GSP is available to view on the SGMA website:
https://sgma.water.ca.gov/portal/service/gspdocument/download/8785

6. **Groundwater Banking Plan**

The District currently manages the Groundwater Recharge Credit Program and the Aquifer Storage and Recovery (ASR) Program that allow water users to develop "groundwater credits" for future use. The programs are intended to promote conjunctive use in the Westside Subbasin and to inform the implementation of the Westside Subbasin Groundwater Sustainability Plan (GSP). Recharge Project types that are eligible to receive groundwater credits include percolation ponds/basins, over (flood) irrigation recharge, dry well injection, and Aquifer Storage and Recovery (ASR) wells.

Applications for the Groundwater Recharge Credit Program and ASR Program are available on the District's website: https://wwd.ca.gov/water-management/groundwater-management-program/sustainable-groundwater-management-act/

See Attachment B on page 97, District Rules & Regulations (water related)

See Attachment G on page 193, Groundwater Banking Plan

District water users have also made investments in Kern Water Bank (KWB) and Semitropic Water Storage District (SWSD) groundwater banks and water transfers into and out of KWB and SWSD which are facilitated by the District. District water users may bank their District CVP allocations in SWSD and KWB. Additionally, as a contracting party under water service contracts with USBR, the District seeks USBR approval. This is done on an as needed bases when CVP allocations are high enough to justify the banking activity.

C. Other Water Supplies

1. **'Other' Water Used as part of the Water Supply – describe supply**

See Section V on page 88, Agriculture Water Inventory Tables – Table 8, Annual Quantities Delivered Under Each Right and/or Contract

D. Source Water Quality Monitoring Practices

1. **Potable Water Quality (Urban)**

The water furnished by the District is not in a potable state and does not warrant the quality or potability of water to furnish. By taking delivery of water from the District, the water user assumes responsibility for the non-potable water which is furnished by the District.

See Attachment H on page 257, District Annual Potable Water Quality Report

2. **Agricultural Water Quality Concerns**

[ ] No [x] Yes (if yes, describe)

Water quality concerns, within the District, include Total Dissolved Solids (TDS), Selenium, Boron, and Nitrates particularly in areas impacted by shallow groundwater levels where high concentrations affect crop root zones.

3. **Description of the Agricultural Water Quality Testing Program and the role of each participant, including the District, in the program.**

Surface water quality analysis in the SLC is performed by DWR. Water quality samples are collected upstream of the District at O'Neill Forebay Outlet (Check 13). The water quality results are available on DWR's California Data Exchange Center and Water Data Library.

The District monitors wells pumping groundwater into the SLC under the District's Canal Integration Program (CIP). The CIP wells must be tested for Title 22 Drinking Water

Standards every three years. Furthermore, when the CIP is operating, CIP wells must sample for arsenic, boron, bromide, chloride chromium, hexavalent chromium, manganese, nitrate, selenium, sodium, electrical conductivity (EC), sulfate, TDS, total organic carbon, gross alpha, and 1,2,3-trichloropropane monthly; Perfluorooctanic and Perfluorooctanesulfonic acid sampling is required once a year. Monitoring of non-CVP water by way of Lateral 7 Inlet Canal is similar to the above except Title 22 Drinking Water Standards must be sampled every year when the CIP is operating. Lastly, weekly field measurements of EC and turbidity are sampled at the Lateral 7 Inlet Canal, and at Lincoln Avenue and Manning Avenue of the SLC.
Monthly water quality analysis is required under the District's DIP on groundwater wells pumping into the District's distribution system. A Triennial Analysis shall be performed on the well water and the results approved by the District's Resources Division.

On the biannual groundwater survey (March/April and November/December) EC measurements are collected by the District on any groundwater well pumping within the District.

The District manages the Westlands Water Quality Coalition (Coalition) which provides growers within the District regulatory coverage under the Irrigated Lands Regulatory Program (ILRP). The Coalition manages the Groundwater Quality Trend Monitoring program, which was created to document groundwater quality and to develop long-term groundwater quality information that can be used to evaluate the impacts of irrigated agricultural practices at the regional scale. The program samples wells annually for field conditions: pH, Specific Conductivity (SC), temperature, turbidity, and dissolved oxygen. Wells are also sampled annually for nitrate + nitrite, and every five years for boron, calcium, magnesium, potassium, sodium, chloride, sulfate, alkalinity (CaCO3), bicarbonate, carbonate, hydroxide, and TDS.

4. 2021 Quality Monitoring Programs for Surface Water by Source (Agricultural)
Station Name: CA Aqueduct, Check 13, O'Neil Outlet 2021-2022 - Constituents of Concern (COC)[8]

Analyses Performed	Frequency	Concentration Range	Average	Units
Arsenic	Monthly	2 - 3.68	2.68	ug/L
Boron	Monthly	0.13 - 0.20	0.17	mg/L
Bromide	Monthly	0.20 - 0.29	0.25	mg/L
Chloride	Monthly	62 - 98	83.3	mg/L
Manganese	Monthly	9.74 - 63.2	33.2	ug/L
Nitrate	Monthly	0.1 - 5.4	2	mg/L
Selenium	Monthly	1 - 1.53	1.3	ug/L

[8] Water Quality Data for CA Aqueduct, Check 13 is from March 2021 through February 2022.

Analyses Performed	Frequency	Concentration Range	Average	Units
Sodium	Monthly	54.6 - 72.5	64.5	mg/L
Specific Conductivity	Monthly	502 - 619	571	uS/cm
Sulfate	Monthly	25.9 - 43.3	36.9	mg/L
TDS	Monthly	281 - 345	311	mg/L

5. 2021 Quality Monitoring Programs for Groundwater by Source (Agricultural)

Distribution Integration Program (DIP)

Analyses Performed	Frequency	Concentration Range	Average[9]	Units
Arsenic	Quarterly	2.0 - 10	2.7	ug/L
Boron	Quarterly	0.1 - 2.1	1.2	mg/L
Chloride	Quarterly	1.0 – 600	44	mg/L
E.C.	Quarterly	1.0 – 2,200	960	µmho/cm
Manganese	Quarterly	0.01 - 0.5	0.38	mg/L
Nitrate	Quarterly	0.23– 45	ND	mg/L
Selenium	Quarterly	2.0 – 50	ND	ug/L
Sulfate	Quarterly	1.0 - 600	320	mg/L
TDS	Quarterly	5.0 – 1,500	660	mg/L

Canal Integration Program (CIP)

Analyses Performed[10]	Frequency	Concentration Range	Average[11]	Units
Arsenic	Weekly/Monthly	Non-detect - 5	0.292	mg/L
Boron	Weekly/Monthly	0.28 – 0.7	0.774	mg/L
Bromide	Weekly/Monthly	Non-detect - 0.66	0.43	mg/L
Chloride	Weekly/Monthly	36 - 210	156	mg/L
Chromium, total	Weekly/Monthly	Non-detect - 11	1.56	mg/L
Hexavalent Chromium	Weekly/Monthly	Non-detect	Non-detect	mg/L
Manganese	Weekly/Monthly	11 - 194	48	mg/L
Nitrate as NO3	Weekly/Monthly	Non-detect – 0.1	0	mg/L
Selenium	Weekly/Monthly	0 - 4	0.33	mg/L
Sodium	Weekly/Monthly	98 - 230	170	mg/L

[9] Water quality data for the Distribution Integration Program is for the 2020-2021 water year.
[10] Constituents of concerns for the pump-ins at milepost 115.43L (Lateral 7 reverse flow) and milepost 133.81L of the SLC. All organic chemicals (volatile organic chemicals and non-volatile synthetic organic chemicals) not listed above, chlorpyrifos, and diazinon resulted in a non-detected during the water quality analysis. Title 22 Drinking Water Standards are tested annually for Later 7 pump-in and every 3 years for direct pump-ins when the CIP is operating.
[11] Water quality data for the Canal Integration Program is for the 2022-2023 water year.

Analyses Performed	Frequency	Concentration Range	Average	Units
Specific Conductivity	Weekly/Monthly	650 - 1750	1172	µS/cm
Sulfate	Weekly/Monthly	94 - 648	138	mg/L
Total Dissolved Solids	Weekly/Monthly	340 – 1290	520	mg/L
Total Organic Carbon	Weekly/Monthly	Non-detect – 3.9	1.9	mg/L
Gross Alpha	Monthly	0.287 – 3.02	0.77	pCi/L
1,2,3-TCP	Weekly/Monthly	Non-detect – 0.50	0.11	ug/L
Molybdenum	Annually/Every 3 years	Non-detect – 29	3.5	ug/L
Perfluorooctanic Acid	Annually	Non-detect	Non-detect	ng/L
Perfluorooctanesulfonic Acid	Annually	Non-detect	Non-detect	ng/L

Groundwater Quality Trend Monitoring (WWQC)

Analyses Performed	Frequency	Concentration Range	Average	Units
Alkalinity as CaCO3	Annually or as available	0 - 102	63.2	mg/L
Bicarbonate	Every 5 years	0 - 102	63.2	mg/L
Boron	Every 5 years	0 - 0.9	0.68	mg/L
Calcium	Every 5 years	0 - 290	156	mg/L
Carbonate	Every 5 years	0 - 0	0	mg/L
Chloride	Every 5 years	0 - 280	140.8	mg/L
Hydroxide	Annually or as available	0 - 0	0	mg/L
Magnesium	Every 5 years	0.007 - 250	109.601	mg/L
Nitrate + Nitrite as N	Annual	0 - 390	49.0055	mg/L
Oxidation-Reduction Potential	Annually or as available	-119.8 - 197.3	48.7471	mV
Oxygen, Dissolved	Annual	0.07 - 8.73	2.59235	mg/L
pH	Annual	7.4 - 8.03	7.67235	none
Potassium	Every 5 years	0 - 4.8	2.6	mg/L
Sodium	Every 5 years	0 - 310	220	mg/L
Specific Conductivity	Annual	933 - 14051	4425.88	uS/cm
Sulfate	Every 5 years	0 - 1800	942	mg/L
Temperature	Annual	20.2 - 28.5	23.1882	Deg C
Total Dissolved Solids	Every 5 years	0 - 3200	1780	mg/L

Analyses Performed	Frequency	Concentration Range	Average	Units
Turbidity	Annually or as available	1.77 - 5.94	4.24333	NTU

E. Water Uses within the District

1. Agricultural

See Section V on page 86, Agriculture Water Inventory Tables – Table 5, Crop Water Needs

2. Types of Irrigation Systems used for each crop in 2021

Crop Name	Total Acres[12]	Level Basin	Furrow	Sprinkler	Low Volume	Multiple Methods
Alfalfa Hay	2,698	164	-	352	2,182	-
Alfalfa Seed	99	-	99	-	-	-
Almonds	107,386	236	291	6,983	99,634	242
Apples	-	-	-	-	-	-
Apricots	234	-	-	-	234	-
Artichokes	-	-	-	-	-	-
Asparagus	7	-	-	-	7	-
Barley	301	38	-	156	107	-
Beans-Dry	-	-	-	-	-	-
Beans-Garbanzo	3,248	-	1	474	1,118	1,655
Beans-Green	-	-	-	-	-	-
Beans-Jojoba	61	-	-	-	61	-
Blueberries	25	-	-	-	25	-
Broccoli	384	-	-	313	-	71
Cabbage	110	-	-	-	110	-
Cantaloupes	8,117	-	232	-	3,559	4,326
Carrots	231	-	-	231	-	-
Cauliflower	-	-	-	-	-	-
Celery	-	-	-	-	-	-
Cherries	342	-	-	-	342	-
Corn Field	383	-	4	-	-	379
Corn-Sweet	3,833	-	-	-	910	2,923
Cotton (Acala-Upland)	3,889	316	964	-	611	1,998

[12] All values listed are in whole acres.

Crop Name	Total Acres	Level Basin	Furrow	Sprinkler	Low Volume	Multiple Methods
Cotton (Pima)	5,306	-	794	-	2,008	2,504
Cucumbers	-	-	-	-	-	-
Eucalyptus	-	-	-	-	-	-
Flowers	-	-	-	-	-	-
Garlic	14,408	437	-	512	4,059	9,400
Grain Hay	-	-	-	-	-	-
Grains Sorghums	238	228	-	10	-	-
Grapefruit	50	-	50	-	-	-
Grapes-Raisin	2,120	-	-	-	2,120	-
Grapes-Table	716	-	-	-	716	-
Grapes-Wine	14,762	-	28	-	14,734	-
Hemp	393	-	-	-	393	-
Honeydews	1,489	-	-	-	483	1,006
Lemons	358	-	-	-	358	-
Lettuce Spring	3,502	-	-	202	-	3,300
Lettuce Fall	4,043	-	-	-	189	3,854
Melons-Mixed	-	-	-	-	-	-
Mustard	152	-	-	152	-	-
Nectarines	319	-	-	-	319	-
Nursery	33	-	-	-	33	-
Oats	670	-	-	505	165	-
Onions-Dehy.	4,909	-	-	3,183	1,224	502
Onions-Fresh	5,461	-	154	-	1,470	3,837
Oranges	1,608	-	-	19	1,589	-
Parsley	1,124	-	-	806	318	-
Pasture	260	-	-	260	-	-
Peaches	1,095	-	-	-	1,095	-
Peas-Green/ Blackeye	-	-	-	-	-	-
Peppers-Misc.	-	-	-	-	-	-
Pistachios	92,171	450	588	152	90,788	193
Plums	404	-	-	-	404	-
Pluots	-	-	-	-	-	-
Pomegranates	2,453	-	1,142	-	1,311	-
Prunes	148	-	-	-	148	-
Pumpkins	21	-	-	-	21	-
Safflower	45	-	-	45	-	-

Crop Name	Total Acres	Level Basin	Furrow	Sprinkler	Low Volume	Multiple Methods
Seed Crop-Misc.	182	-	17	-	30	135
Spinach	448	-	-	448	-	-
Squash	66	-	-	-	66	-
Stevia	-	-	-	-	-	-
Sugar Beets	5	-	5	-	-	-
Tangerines	2,090	-	19	-	2,071	-
Tomatoes-Fresh	3,414	428	-	-	2,831	155
Tomatoes-Processing	49,258	-	8	635	33,505	15,110
Walnuts	513	-	-	-	513	-
Watermelons	2,843	-	-	-	1,242	1,601
Wheat	9,443	142	533	3,756	1,554	3,458
Totals	**357,868**	**2,439**	**4,929**	**19,194**	**274,657**	**56,649**

3. Urban Use by Customer Type in 2021-2022

Customer Type	Number of Connections	Acre-Feet
Single-family	-	-
Multi-family	-	-
Commercial	4	265
Industrial	57	973
Institutional	12	2,517
Landscape Irrigation	-	-
Wholesale	-	-
Recycled	-	-
Incidental Ag	167	919
Unaccounted for	-	-
Total	**240**	**4,674**

4. Urban Wastewater Collection/Treatment Systems serving the Service Area

Treatment Plant	Treatment Level	Gallons per Day	Disposal to/Uses
El Porvenir (CSA 30)	Level 2	18,500	Domestic Water/Wastewater
Cantua Creek (CSA 32)	Level 2	45,000	Domestic Water/Wastewater
O'Neill Community (CSA 49)	Level 1	25,000	Domestic Water
	Total	**88,500**	
Total Discharged to Ocean and/or Saline Sink		-	

5. Groundwater Recharge in 2021

Recharge Area	Method of Recharge	Acre-feet	Method of Retrieval
None			
	Total		

There are no direct groundwater recharge facilities within the District boundaries.

See Section V on page 87, Agriculture Water Inventory Tables – Table 6, 2021-2022 District System Water Budget

6. a. Transfers and Exchanges into the Service Area in 2021-2022

From Whom	To Whom	Acre-Feet	Use
Arvin-Edison WSD	Westlands WD	2,595	Agricultural
Byron Bethany ID	Westlands WD	841	Agricultural
Central California ID	Westlands WD	5,171	Agricultural
Contra Costa WD	Westlands WD	2,000	Agricultural
Del Puerto ID	Westlands WD	500	Agricultural
Delano-Earlimart ID	Westlands WD	1,040	Agricultural
Eagle Field WD	Westlands WD	200	Agricultural
Empire West Side ID	Westlands WD	58	Agricultural
Firebaugh Canal WD	Westlands WD	4,716	Agricultural
Kern County Water Agency / Semitropic WSD	Westlands WD	21,282	Agricultural
Kings County	Westlands WD	5,000	Agricultural
Lindsay-Strathmore ID	Westlands WD	17	Agricultural
Mendota Pool Group	Westlands WD	17,844	Agricultural
Panoche WD	Westlands WD	1,269	Agricultural
Patterson ID	Westlands WD	1,618	Agricultural
Placer County Water Agency	Westlands WD	1,453	Agricultural
San Luis WD	Westlands WD	750	Agricultural
Tulare Lake Basin WSD	Westlands WD	1,121	Agricultural
Widren WD	Westlands WD	950	Agricultural
Yuba County Water Agency	Westlands WD	15,192	Agricultural
	Total	**83,617**	

See Section V on page 82, Agriculture Water Inventory Tables – Table 1, Surface Water Supply

6. b. Transfers and Exchanges out of the Service Area in 2021

From Whom	To Whom	Acre-feet	Use
Westlands WD	City of Coalinga	523	M&I
	Total	**523**	

See Section V on page 87, Agriculture Water Inventory Tables – Table 6, 2021-2022 District System Water Budget

7. Wheeling or Other Transactions in and out of the District Boundaries

From Whom	To Whom	Acre-Feet	Use
Westlands WD	Ca. Dept. of Fish and Wildlife	214	Wildlife Refuge
Westlands WD	City of Coalinga	4,106	M&I
Westlands WD	City of Huron	914	M&I
	Total	**5,234**	

See Section V on page 87, Agriculture Water Inventory Tables – Table 6, 2021-2022 District System Water Budget

8. Other Uses of Water

Other Uses	Acre-feet
Not Applicable	

F. Outflow from the District (Agricultural)

1. Surface and Subsurface Drain/Outflow

The District does not provide or allow surface and subsurface drain and/or outflow.

Outflow Point	Location Description	AF	Type of Measurement	Accuracy (%)	% Of Outflow	Acres Drained
Not Applicable						

Outflow Point	Where the Outflow Goes (Drain, River, or Other Location)	Type Reuse
Not Applicable		

2. **Description of the outflow (surface and subsurface) Water Quality Testing Program and the role of each participant in the program**

The District does not provide or allow surface or subsurface outflow.

3. **Outflow (Surface Drainage and Spill) Quality Testing Program**

Analyses Performed	Frequency	Concentration Range	Average	Reuse Limitation
Not Applicable				

Outflow (Subsurface Drainage) Quality Testing Program

Analyses Performed	Frequency	Concentration Range	Average	Reuse Limitation
Not Applicable				

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.**

On January 9, 2014, the Regional Water Quality Control Board (RWQCB) adopted new regulatory requirements (Western Tulare Lake Basin General Order (GO) R5-2014-0001) that applies to irrigated lands within the Water District.

The GO outlines specific instructions for all landowners whose lands are being used for irrigated agricultural purposes. One of the requirements is for landowners to enroll their lands in the ILRP. The RWQCB requires that landowners must enroll either directly with the RWQCB or enroll with a third-party coalition.
The Coalition has been approved by the RWQCB to serve as a third-party coalition for administering the terms and conditions of the ILRP as described in the GO. The Coalition has been formed to represent landowners and operators irrigating agricultural lands (Members) under the GO.

In 2005, the District purchased a parcel identified as the Bullard Avenue Airstrip (BAA) located towards the northern boundary of the District. Initially the parcel was used for flight operations that were conducted on a single dirt runway owned by aerial crop-dusting organizations up to 2003. Pesticides were mixed and loaded into aircraft along the airstrip for application to nearby agricultural properties which in turn resulted in pesticide container rinse wash to be discharged into the ground along the runway.

After the closure of the BAA in 2003, a series of environmental site assessment investigations were conducted, and BAA was identified as having issues related to the

soil and groundwater contamination of pesticides, herbicides, metals, and petroleum hydrocarbons. A workplan to conduct annual site assessments was approved by RWQCB in August 2004. The District continues to timely follow the reporting requirements outlined under the site assessment workplan.

The District has submitted a report of waste discharge to implement an agricultural aquifer storage and recovery (Ag-ASR) Project through the Westlands Groundwater Sustainability Agency (GSA) in the Westside Subbasin in Fresno County. Pursuant to California Water Code section 13267, the Monitoring and Reporting Program (MRP) R5-2020-0809 was issued to the District on March 18, 2020. The District continues to timely follow reporting requirements under the MRP.

5. **Drainage Problem Areas**

See Attachment K on page 279, Drainage Problem Area Report

G. Water Accounting – Inventory

See Section V on page 81, Agricultural Water Inventory Tables – Tables 1-8

Section III

Best Management Practices for Agricultural Contractors

Westlands Water District

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):** 2,655
    b. **Number of Delivery Points serving more than one farm:** 0
    c. **Number of Measured Delivery Points (meters and measurement devices):** 2,655
    d. **Percentage of water delivered to the Contractor that was measured at a Delivery Point:** 100%
    e. **Percentage of water that was measured at Delivery Point:** 100%
    f. **Total number of Delivery Points not Billed by Quantity:** 0%
    g. **Delivery Point Measurement Device Table**

Measurement Type	Number	Accuracy[13] (+/-%)	Reading Frequency (Days)[14]	Calibration Frequency (Months)	Maintenance Frequency (Months)
Orifices	-	-	-	-	-
Propeller meters	2,477	±2%	30	60	60
Weirs	-	-	-	-	-
Flumes	-	-	-	-	-
Venturi	156	±1%	30	60	60
Metered Gates	-	-	-	-	-
Turbine Meters	151	±0.5%	30	60	60
MAG Meters	27	±0.5%	30	60	60
Total	**2,811**				

[13] Documentation verifying the accuracy of measurement devices are included as Attachment C, Measurement Device Documentation on page 125.
[14] All meters are read monthly, and all active meters are read on a bi-monthly basis.

2. **Designate a Water Conservation Coordinator to develop and implement the Plan and develop Annual Updates**

Name: Kori Peterson
Title: Associate Resources Analyst
Address: 3130 North Fresno Street, Fresno, California 93703
Telephone: (559) 241-6231
E-mail: kpeterson@wwd.ca.gov

See Attachment M on page 294, Associate Resources Analyst Class Description for the minimum qualifications and job description of an Associate Resources Analyst.

3. **Provide or support the availability of Water Management Services to the Water Users**

See Attachment I on page 258, Notices of District Education Programs and Services Available to Customers.

4. **On-farm Irrigation and Drainage System Evaluations using a Mobile Lab Type Assessment**

	Total in District	Surveyed in 2020-2021	Surveyed in 2021-2022	Projected for 2022-2023	Projected in 2023-2024
Irrigated Acres	357,868	0	0	4,800	4,800
Number of Farms	700	0	0	30	30

The District offers On-farm Irrigation and Drainage System Evaluations Program using a Mobile Lab service. The District offers a 25% or $500 rebate for water users who participate in the Irrigation Evaluations Program. Additionally, water users also have the option to use the Irrigation and Training Research Center (ITRC) at California State Polytechnic University, San Luis Obispo (Cal Poly) for on-farm irrigation evaluations. The District did not perform any On-farm Irrigation and Drainage System Evaluations in 2020-2021 or 2021-2022 water years but anticipates increase water user interest in the upcoming years.

a. **Timely Field and Crop-Specific Water Delivery Information to the Water User**

The District provides water users with documented monthly statements which details water use by turnout. Statements are provided by the tenth day after the end of the month when water was delivered or within 24 hours after specific delivery requests. Throughout the water year, meters are read at the end of each month or on a biweekly basis as necessary, by District field staff. The District provides water use statements via email or water users can view their water use statements and history by accessing their water user account through the District's secure access website.

b. Real-Time and Normal Irrigation Scheduling and Crop ET Information

The District provides public access to the *Irrigation Guide* where crop water use data is available for water users for over 50 crops to better help water users estimate crop water use. The Irrigation Guide provides data for three zones of the District boundary: Northern, Central, and Southern.

The *Irrigation Guide* is available to water users through the District website: https://wwd.ca.gov/water-management/irrigation-guide/

The District also maintains California Irrigation Management Information System (CIMIS) Weather Station – Westlands which is located west of Tranquillity at the District's Tranquillity Field Office. This weather station is designed to provide water users with more precise information on crop ET and weather data.

Also available to water users are satellite images illustrating distinct colors or photosynthesis activity using the Normalized Difference Vegetative Index (NDVI). The crop canopy reflection in red and near-infrared zones of the electromagnetic spectrum depends on its green phytomass. NDVI is widely used to quantify the vegetation condition. NDVI can also describe the vegetation density, allowing water users to evaluate plant germination, growth, and productivity. One to two images are made available each month to all District water users by accessing their water user account through the District's secure access website.

c. Surface, Ground, and Drainage Water Quantity and Quality Data provided to the Water Users

Surface water quality analysis in the SLC is performed by California DWR. Water quality samples are collected upstream of the District at O'Neill Forebay Outlet (Check 13). The water quality results are available on DWR's California Data Exchange Center and Water Data Library. Surface water by way of the District's Lateral 7 is analyzed by the District at the Lateral 7 Inlet Canal. Public water systems within the District perform their own water quality analysis as required by the California Department of Public Health.

Monthly water quality analysis is required under the District's DIP on groundwater wells pumping into the distribution system. Along with DIP, the District monitors wells enrolled in the CIP. Water quality analysis for DIP and CIP are provided to the agencies overseeing the projects. During the District's bi- annual groundwater survey (June and November/December) EC measurements are taken if a groundwater well is found pumping.

d. Agricultural Water Management Education Programs and Materials for Farmers, Staff, and the Public

Program	Co-Funders (If Any)	Yearly Targets
See "e. Other" below		

e. Other

The District is in regular communication with water users and the public at large. Notices are produced for water users and landowners as needed, which consist of District water supply information, legislative updates, District-sponsored programs, and community items. Every other week and as needed the District sends information to water users regarding current water supply conditions and weather forecasting. Additionally, following every regular board meeting, and as needed, the District hosts water user calls to both inform participants and answer questions about District policies, activities and programs. The District also hosts board workshops on key issues which affect the District and staff meets one on one with landowners, water users, and interested parties on issues affecting their operations.

The District also continuously engages with the public through participating in events, providing District tours and presenting to various audiences. In 2021-2022 staff participated in over a dozen events as health restrictions eased and in-person events picked up including presentations, tours, and additional public engagements.

For communication with the public at large, the District engages with local, state, national, and international media outlets and updates its webpage and social media pages with current topical information, resources, and educational material relevant to the District**.** Educational materials and resources can be found on the District website.

See Attachment I on page 258, Notices of District Education Programs and Services.

5. Pricing Structure – based at least in part on quantity delivered. Adopt a water pricing structure based on the measured quantity delivered.

The District currently prices water by volume. All deliveries are billed by volume and supplemental water is priced at market rate.

See Attachment B on page 97, District Rules and Regulations (water related) for the current year water rate schedule.

6. **Evaluate and improve efficiencies of District Pumps.**

Describe the program to evaluate and improve the efficiencies of the Contractor's pumps.

	Total in District	Surveyed in 2020-2021	Surveyed in 2021-2022	Projected for 2022-2023
Wells	340	11	5	9
Lift Pumps	510	77	52	140

District pumps range in size from 15 to 900 HP and are monitored on a biennial testing program. Overhauls are scheduled when pumps test out at less than 60% efficient.

B. Exemptible BMPs for Agricultural Contractors

See Planner, Chapter 2, Addendum B for examples of Exemptible Conditions

1. **Facilitate Alternative Land Use**

Drainage Characteristic	Acreage	Potential Alternate Uses
High Water Table (<5 feet)	18,516	Dry Farm, Grazing, Solar Power
Poor Drainage	90,500	Dry Farm, Grazing, Solar Power
Groundwater Selenium Concentration > 50 ppb	-	-
Poor Productivity	46,000	Solar Power

Describe how the Contractor encourages Customers to participate in these programs

The District implemented a land use modification program allowing landowners the opportunity to temporarily, although long term to convert a portion of their lands to non-irrigable uses. This program encourages alternative land use and allows landowners to receive the benefit of a water allocation that can be used on their remaining cropland. The District also makes available its drainage impaired lands to solar contractors for development of the land. Additionally, the District offers a land acquisition program which allows landowners to sell their land to the District which is then permanently fallowed to reduce current and future water demands and to support implementation of the Westside Subbasin Groundwater Sustainability Plan (GSP). The result of the land acquisition program is intended to support efficient use of water, preserve water supplies, and address drought impacts through water conservation. It also assists the District with its efforts to avoid undesirable results and to support sustainable management of the Westside Subbasin by 2040.

2. **Facilitate Use of Available Recycled Urban Wastewater**

Sources of Recycled Urban Wastewater	AF/Y Available	AF/Y Currently Used in District
None		

3. **Facilitate the Financing of Capital Improvements for On-farm Irrigation Systems**

The District offers low interest loans to water users for the lease-purchase of irrigation system equipment through the Expanded Irrigation System Improvement and Recharge Program (EISIP). EISIP funds up to $130,000 towards the purchase of irrigation system equipment, or recharge project equipment including micro-irrigation systems, tailwater reuse systems, linear move, center pivot systems, portable aluminum irrigation equipment, filtration systems, monitoring devices, and sublateral recharge and drywall. Additionally, the District also offers low interest loans with a cost share subsidy to water users for the lease-purchase of irrigation system equipment through the Expanded Irrigation System Improvement Program/Power and Water Resources Pooling Authority (PWRPA) Public Purpose Program (P3) Grant (EISIP P3). EISIP P3 funds up to $130,000 with a 35% cost share subsidy towards the purchase of irrigation system equipment for micro-irrigation systems, portable aluminum irrigation equipment, or linear move and center pivot systems.

4. **Incentive Pricing**

Describe incentive rate structure and other programs and their purposes

The District does not have a formal incentive price program. The District has a de facto incentive pricing structure because supplemental water must be purchased to meet minimum crop requirements in all water years and allocation scenarios. Supplemental water is purchased at market price which is typically higher in cost than CVP contract water.

5. **a. Line or Pipe Ditches and Canals**

Canal/Lateral (Reach)	Types of Improvement	Number of Miles in Reach	Estimated Seepage (AF/Y)	Accomplished/ Planned Date
None				

The District delivery system consists of 1,034 miles of underground pipeline with over 2,650 metered turnouts, which radiates from the San Luis Aqueduct and Coalinga Canal. In addition, the District has one unlined canal (Inlet Canal) from the Mendota Pool that is 7.4 miles. Lining the Inlet Canal is not a priority currently due to operational frequency, low seepage losses and cost.

5. b. Construct/Line Regulatory Reservoirs

Reservoir Name	Location	Describe Improved Operational Flexibility and AF Savings
None		

The District delivery system was designed and constructed with regulatory reservoirs/tanks to maintain a consistent pressure within each lateral.

6. Increase Flexibility in Water Ordering by and delivery to Water Users

See Attachment J on page 276, Contractor's 'Agricultural Water Order' Form

7. Construct and Operate District Spill and Tailwater Recovery System

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.

The District operates spill recovery and overflow situated at Mile Post 12.52 on the Coalinga Canal into the Los Gatos Creek and provides emergency overflow protection. The District does not allow the outflow of surface water from the District and all water users are responsible in controlling tail water on their farms. Any water user found in violation of these regulations will have their service discontinued.

See Attachment B, Section 2.6 G, H & I on page 97, of the District Rules and Regulations (water related).

8. Plan to Measure Outflow

The District does not allow the outflow of tailwater and/or drain water from the District boundary. Since outflow does not occur, the District does not have a plan to measure the outflow of tailwater and/or drain water. Article 2, Section 2.6 G states the following, "Each water user shall take reasonable steps to reuse or control tail water. The failure to do so shall constitute a waste of water."

See Attachment B on page 97, District Rules and Regulations (water related).

a. **Total Number of Outflow (surface) Locations/Points:** 0
b. **Total Number of Outflow (subsurface) Locations/Points:** 0
c. **Total Number of Measured Outflow Points:** 0
d. **Percent of Total Outflow (volume) measured during Report Year:** 0%
e. **Identify locations, prioritize, and determine best measurement methods/costs – submit funding proposal (Estimated Cost in $1,000s)**

Location and Priority	Current Year	Year 2	Year 3	Year 4	Year 5
Not Applicable					

9. Optimize Conjunctive Use of Surface and Groundwater

Describe the potential for increasing conjunctive use of surface and groundwater

Conjunctive use is the coordinated use of surface water and groundwater supplies to best maximize utility of both and to ensure sustainable access in the future. When the District receives a reduced surface water allocation, water users then rely more heavily on groundwater. During wet years and when the District receives ample surface water through its CVP allocation and other available supplies, the District diverts the available surplus water to recharged projects throughout the District. The aforementioned strategy allows the District to optimize groundwater supplies when the District receives a reduced surface water allocation and water users rely more heavily on groundwater.

The District is in the process of constructing multiple projects that optimize conjunctive use of surface water and groundwater throughout the District including the Pasajero Groundwater Recharge Project, the Broadview Aquifer Storage and Recovery (Broadview ASR) Project, the Storage Treatment Aquifer Recharge (STAR) ASR, the Distribution Integration Program (DIP), the Canal Integration Program (CIP), and the Westside Subbasin Groundwater Allocation Program.

The District's Pasajero Groundwater Recharge Project allow the conjunctive use of surface water supplies to be recharged and stored. The Pasajero Groundwater Recharge Project includes fifteen dry wells up to a total depth of 300 feet below surface and two recharge basins. The combined long-term average annual water supply benefit from the basins and dry wells is estimated to be 3,020 to 3,775 AF per year.

The Broadview ASR Project includes one ASR well that could store up to 1,200 AF per year. The STAR ASR Project consists of up to 8 ASR wells and provides up to 10,800 AF per year of aquifer storage. All the aforementioned projects will aid in improving groundwater management and drought resiliency.

The District's DIP allows water users to pump groundwater into a lateral with the approval of all water users on that lateral. Additionally, wells enrolled in the DIP must meet the minimum water quality requirement standards. The DIP also allows growers to move water throughout the District and enhances operational flexibility.

The District's CIP allows water users to pump groundwater into the SLC and receive surface water credits with losses. During years when the District receives 20 percent or less of its contract water allocation from the CVP, qualified participating water users may pump groundwater from wells throughout the District to the SLC, using existing District and privately-owned pipelines. The groundwater will be pumped into the SLC at existing licensed water integration locations. Such water would be conveyed using the SLC for withdrawal and use on other land within the District.

The District's Groundwater Allocation Program provides flexibility to water users to meet their individual needs and annual variations in the availability of surface water from the CVP is a critical aspect of conjunctive use of groundwater and surface water. The Program directly contributes to achieving measurable objectives relating to water levels and groundwater storage by promoting groundwater pumping distributions in the Subbasin that minimizes the occurrence of large amounts of groundwater extraction that have undesirable results. Groundwater allocations are also expected to substantially minimize and prevent undesirable results of chronic lowering of groundwater levels, significant and unreasonable reduction in groundwater storage and significant and unreasonable land subsidence.

Lastly, the District also provides a low-cost energy program for wells that are in the Groundwater Management Program (GWMP) by integrating local groundwater resources into the District's overall water supply through the GWMP's groundwater management and conjunctive use planning procedures. Through the GWMP, the District will be able to improve overall supply reliability while also minimizing total water supply costs.

10. Automate Distribution and/or Drainage System Structures

Identify locations where automation would increase delivery flexibility and reduce spill and losses. Describe the program to achieve these benefits and estimate the annual water savings.

The District's distribution delivery system is fully automated through closed underground pipeline that increase delivery flexibility and reduce spill and losses. Improving this system is shown in the outlined budget table in Section III C1, on page 70.

11. Facilitate or promote Water Customer Pump Testing and Evaluation

See Attachment I on page 258, Notices of District Education Programs and Services Available to Customers.

12. Mapping

GIS Maps[15]	2021	2022	2023	2024	2025
Layer 1 – Distribution System	$10	$10	$10	$10	$10
Layer 2 – Drainage System	$0	$0	$0	$0	$0
Layer 3 – Groundwater Information	$15	$15	$15	$15	$15
Layer 4 – Soils Map	$0	$0	$0	$0	$0
Suggested Layers:					
Layer 5 – Natural & Cultural Resources	$0	$0	$0	$0	$0
Layer 6 – Problem Areas	$0	$0	$0	$0	$0

[15] Estimated Costs are listed in $1,000s. The District has an inventory of geographic information system (GIS) data which is updated regularly including GIS maps, distribution systems, groundwater, and other maps.

C. Provide a 5-year Budget for Implementing BMPs[16]

1. Amount Actually Spent During 2021-2022

Year 1 BMP #	BMP Name	Budgeted Expenditure	Staff Hours
A1	Measurement	$463,055	3,984
A2	Conservation Staff	$80,000	1,000
A3	On-farm Evaluation/Water Delivery Info	$0	0
	Irrigation Scheduling	$0	0
	Water Quality	$4,180	24
	Agricultural Education Program	$51,730	80
A4	Quantity Pricing	$0	0
A5	Contractor's Pumps	$672,972	1,747
B1	Alternative Land Use	$964,469	1,000
B2	Urban Recycled Water Use	$0	0
B3	Financing of On-farm Improvements	$805,655	36
B4	Incentive Pricing	$25,000	400
B5	Line or Pipe Canals/Install Reservoirs	$0	0
B6	Increase Delivery Flexibility	$0	0
B7	District Spill/Tailwater Recovery Systems	$0	0
B8	Measure Outflow	$0	0
B9	Optimize Conjunctive Use	$295,400	692
B10	Automate Canal Structures	$4,000	20
B11	Customer Pump Testing	$0	0
B12	Mapping	$25,000	350
	Total	**$3,391,461**	**9,333**

[16] The Budgeted Expenditures does not include staff time.

2. Projected Budget Summary for 2022-2023

Year 2 BMP #	BMP Name	Budgeted Expenditure	Staff Hours
A1	Measurement	$400,000	4,000
A2	Conservation Staff	$80,000	1,500
A3	On-farm Evaluation/Water Delivery Info	$15,000	60
	Irrigation Scheduling	$0	0
	Water Quality	$26,000	760
	Agricultural Education Program	$72,700	150
A4	Quantity Pricing	$0	0
A5	Contractor's Pumps	$240,000	3,500
B1	Alternative Land Use	$1,049,135	1,200
B2	Urban Recycled Water Use	$0	0
B3	Financing of On-farm Improvements	$5,200,000	240
B4	Incentive Pricing	$25,000	400
B5	Line or Pipe Canals/Install Reservoirs	$0	0
B6	Increase Delivery Flexibility	$0	0
B7	District Spill/Tailwater Recovery Systems	$0	0
B8	Measure Outflow	$0	0
B9	Optimize Conjunctive Use	$530,300	1,040
B10	Automate Canal Structures	$4,000	20
B11	Customer Pump Testing	$0	0
B12	Mapping	$25,000	350
	Total	**$7,667,135**	**13,220**

3. Projected Budget Summary for 2023-2024

Year 3 BMP #	BMP Name	Budgeted Expenditure	Staff Hours
A1	Measurement	$400,000	4,000
A2	Conservation Staff	$80,000	1,000
A3	On-farm Evaluation/Water Delivery Info	$15,000	60
	Irrigation Scheduling	$0	0
	Water Quality	$35,000	960
	Agricultural Education Program	$76,900	200
A4	Quantity Pricing	$0	0
A5	Contractor's Pumps	$340,000	2,400
B1	Alternative Land Use	$5,010,000	1,500
B2	Urban Recycled Water Use	$0	0
B3	Financing of On-farm Improvements	$5,200,000	240
B4	Incentive Pricing	$25,000	400
B5	Line or Pipe Canals/Install Reservoirs	$0	0
B6	Increase Delivery Flexibility	$0	0
B7	District Spill/Tailwater Recovery Systems	$0	0
B8	Measure Outflow	$0	0
B9	Optimize Conjunctive Use	$13,600,000	1,080
B10	Automate Canal Structures	$4,000	20
B11	Customer Pump Testing	$0	0
B12	Mapping	$25,000	350
	Total	**$24,810,900**	**12,210**

4. Projected Budget Summary for 2024-2025

Year 4	BMP Name	Budgeted Expenditure	Staff Hours
A1	Measurement	$300,000	4,000
A2	Conservation Staff	$80,000	1,000
A3	On-farm Evaluation/Water Delivery Info	$15,000	60
	Irrigation Scheduling	$0	0
	Water Quality	$35,000	960
	Agricultural Education Program	$84,700	200
A4	Quantity Pricing	$0	0
A5	Contractor's Pumps	$181,000	2,200
B1	Alternative Land Use	$3,710,000	1,300
B2	Urban Recycled Water Use	$0	0
B3	Financing of On-farm Improvements	$5,200,000	240
B4	Incentive Pricing	$25,000	400
B5	Line or Pipe Canals/Install Reservoirs	$0	0
B6	Increase Delivery Flexibility	$0	0
B7	District Spill/Tailwater Recovery Systems	$0	0
B8	Measure Outflow	$0	0
B9	Optimize Conjunctive Use	$300,000	260
B10	Automate Canal Structures	$4,000	20
B11	Customer Pump Testing	$0	0
B12	Mapping	$25,000	350
	Total	**$9,959,700**	**10,990**

5. Projected Budget Summary for 2025-2026

Year 5 BMP #	BMP Name	Budgeted Expenditure	Staff Hours
A1	Measurement	$300,000	4,000
A2	Conservation Staff	$80,000	1,000
A3	On-farm Evaluation/Water Delivery Info	$15,000	60
	Irrigation Scheduling	$0	0
	Water Quality	$35,000	960
	Agricultural Education Program	$93,200	200
A4	Quantity Pricing	$0	0
A5	Contractor's Pumps	$200,000	2,200
B1	Alternative Land Use	$1,110,000	1,500
B2	Urban Recycled Water Use	$0	0
B3	Financing of On-farm Improvements	$5,200,000	240
B4	Incentive Pricing	$25,000	400
B5	Line or Pipe Canals/Install Reservoirs	$0	0
B6	Increase Delivery Flexibility	$0	0
B7	District Spill/Tailwater Recovery Systems	$0	0
B8	Measure Outflow	$0	0
B9	Optimize Conjunctive Use	$1,000,000	3,000
B10	Automate Canal Structures	$4,000	20
B11	Customer Pump Testing	$0	0
B12	Mapping	$25,000	350
	Total	**$8,087,200**	**13,930**

Section IV

Best Management Practices for Urban Contractors

Westlands Water District

Section IV – Best Management Practices for Urban Contractors

A. BMP Compliance Methodology

Describe the methodology selected for BMP compliance: Traditional, Flexible, or GPCD. Provide a description of how water savings are being achieved through the selected methodology.
This section is not applicable as the District is not an Urban Contractor.

B. Foundational BMPs

1. **Operations Programs**
   1.1 - Operations Practices

A.1 - Conservation Coordinator

Contact Name: Russ Freeman, P.E.
Title: Deputy General Manager of Resources
Telephone: 559-241-6241
E-mail: rfreeman@wwd.ca.gov

A.2 – Water Waste Prevention

Article 19 Section 19.5 A states the following, “The unauthorized use or taking of water for M&I Use, or the waste or unreasonable use of water, are prohibited. Water made available for M&I Use may only be used at the point of delivery and for the purpose(s) identified in the M&I Water Application. Except as provided in in Section 19.5 B of this Article, the transfer of M&I waster is prohibited.”

See Attachment B on page 97, District’s Rules and Regulations (water related)

A.3 – Wholesale Agency Assistance Programs

The District does not have any Wholesale Agency Assistance Programs.

1.2 - Water Loss Control

Urban and Agricultural Water is distributed through 1,034 miles of buried pipe, varying in diameter from 10 to 96 inches. The District’s Delivery System is monitored for leaks by field operators and reported by water users.

1.3 - Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections

M&I water users are billed based on the volume of water that is consumed. Each connection has a meter to determine amount of water used.

1.4 - Retail Conservation Pricing

Customer Class	Water Rate Type	Conserving Rate?
Institutional	Uniform	Yes
Commercial	Uniform	Yes
Industrial	Uniform	Yes

2. **Education Programs**
   - **2.1 - Public Information Programs**
   - **2.2 - School Education Programs**

C. Programmatic BMPs

Programmatic BMP is not applicable because the District is not an urban contractor and does not provide potable water.

1. **Residential**
   - **A.1 – Residential Assistance Program**
   - **A.2 – Landscape Water Survey**
   - **A.3 – High-efficiency Clothes Washers (HECWs)**
   - **A.4 – WaterSense Specification (WSS) Toilets**
   - **A.5 – WaterSense Specifications for Residential Development**

2. **Commercial, Industrial, and Institutional (CII)**

3. **Landscape**

D. Provide a 5-year Budget for Expenditures and Staff Effort for BMPs

The District is not an Urban Contractor and therefore does not budget for implementing urban best management practices.

1. Amount Actually Spent During 2021-2022

2021-2022 BMP #	BMP Name	Budgeted Expenditure (not including staff time)	Staff Hours
1	Utility Operations		
1.1	Operation Practices	$ -	-
1.2	Water Loss Control	$ -	-
1.3	Metering	$ -	-
1.4	Retail Conservation Pricing	$ -	-
2	Educational Programs		
2.1	Public Information Programs	$ -	-
2.2	School Educational Programs	$ -	-
3	Residential	$ -	-
4	CII	$ -	-
5	Landscape	$ -	-
	Total	**$ -**	**-**

2. Projected Budget Summary for 2022-2023

2022-2023 BMP #	BMP Name	Budgeted Expenditure (not including staff time)	Staff Hours
1	Utility Operations		
1.1	Operation Practices	$ -	-
1.2	Water Loss Control	$ -	-
1.3	Metering	$ -	-
1.4	Retail Conservation Pricing	$ -	-
2	Educational Programs		
2.1	Public Information Programs	$ -	-
2.2	School Educational Programs	$ -	-
3	Residential	$ -	-
4	CII	$ -	-
5	Landscape	$ -	-
	Total	**$ -**	**-**

3. Projected Budget Summary for 2023-2024

2023-2024 BMP #	BMP Name	Budgeted Expenditure (not including staff time)	Staff Hours
1	Utility Operations		
1.1	Operation Practices	$ -	-
1.2	Water Loss Control	$ -	-
1.3	Metering	$ -	-
1.4	Retail Conservation Pricing	$ -	-
2	Educational Programs		
2.1	Public Information Programs	$ -	-
2.2	School Educational Programs	$ -	-
3	Residential	$ -	-
4	CII	$ -	-
5	Landscape	$ -	-
	Total	**$ -**	**-**

4. Projected Budget Summary for 2024-2025

2024-2025 BMP #	BMP Name	Budgeted Expenditure (not including staff time)	Staff Hours
1	Utility Operations		
1.1	Operation Practices	$ -	-
1.2	Water Loss Control	$ -	-
1.3	Metering	$ -	-
1.4	Retail Conservation Pricing	$ -	-
2	Educational Programs		
2.1	Public Information Programs	$ -	-
2.2	School Educational Programs	$ -	-
3	Residential	$ -	-
4	CII	$ -	-
5	Landscape	$ -	-
	Total	**$ -**	**0**

5. **Projected Budget Summary for 2025-2026**

2025-2026 BMP #	BMP Name	Budgeted Expenditure (not including staff time)	Staff Hours
1	Utility Operations		
1.1	Operation Practices	$ -	-
1.2	Water Loss Control	$ -	-
1.3	Metering	$ -	-
1.4	Retail Conservation Pricing	$ -	-
2	Educational Programs		
2.1	Public Information Programs	$ -	-
2.2	School Educational Programs	$ -	-
3	Residential	$ -	-
4	CII	$ -	-
5	Landscape	$ -	-
	Total	**$ -**	**0**

Section V

Agriculture Water Inventory Tables

Westlands Water District

Section V – Agriculture Water Inventory Tables[14]

Table 1 – Surface Water Supply

2021-2022	Federal Ag Water	Federal Non-Ag Water	State Water	Local Water	Other Water	Transfers Into District	Upslope Drain Water	Total Acre-Feet
Method								
March-21	9,765	85	-	-	-	-	-	9,850
April-21	11,594	112	-	110	-	6,493	-	18,309
May-21	25,642	131	-	116	-	6,583	-	32,472
June-21	30,864	411	-	193	-	6,724	-	38,192
July-21	13,502	628	6,162	307	-	13,254	-	33,853
August-21	4,410	634	17	286	-	11,084	-	16,431
September-21	-	725	-	114	-	11,130	-	11,969
October-21	-	561	-	76	-	8,890	-	9,527
November-21	-	263	-	121	-	2,410	-	2,794
December-21	-	154	-	-	-	1,066	-	1,220
January-22	-	257	-	-	-	2,497	-	2,754
February-22	-	190	-	-	-	7,307	-	7,497
Total	**95,777**	**4,151**	**6,179**	**1,323**	**-**	**77,438**	**-**	**184,868**

[14] Values of all Water Inventory Tables are listed in acre-feet, unless otherwise noted.

Table 2 – Groundwater Supply

2021-2022	District Groundwater	Private Agric Groundwater[15]
Method		
March-21	11,719	23,973
April-21	20,720	41,781
May-21	24,566	49,920
June-21	29,771	77,771
July-21	27,843	72,682
August-21	21,117	54,964
September-21	15,512	47,350
October-21	10,256	31,195
November-21	4,701	14,457
December-21	2,678	5,721
January-22	4,479	9,568
February-22	11,656	24,899
Total	**185,018**	**454,231**

Table 3 – Total Water Supply

2021-2022	Surface Water Total	District Groundwater	Recycled M&I Wastewater	Total Acre-Feet
Method				
March-21	9,850	11,719	-	21,569
April-21	18,309	20,720	-	39,029
May-21	32,472	24,566	-	57,038
June-21	38,192	29,771	-	67,963
July-21	33,853	27,843	-	61,696
August-21	16,431	21,117	-	37,548
September-21	11,969	15,512	-	27,481
October-21	9,527	10,256	-	19,783
November-21	2,794	4,701	-	7,495
December-21	1,220	2,678	-	3,898
January-22	2,754	4,479	-	7,233
February-22	7,497	11,656	-	19,153
Total	**184,868**	**185,018**	**-**	**369,886**

[15] Values for Private Agric Groundwater are estimated.

Table 4a – Distribution System

2021-2022	Precipitation (inches)	Precipitation (feet)	Precipitation (acres)	AF/Year
March-21	0.76	0.063	-	-
April-21	0.11	0.009	-	-
May-21	0.01	0.001	-	-
June-21	0.00	0.000	-	-
July-21	0.02	0.002	-	-
August-21	0.01	0.001	-	-
September-21	0.00	0.000	-	-
October-21	0.62	0.052	-	-
November-21	0.11	0.009	-	-
December-21	1.87	0.156	-	-
January-22	0.12	0.010	-	-
February-22	0.07	0.006	-	-
Total	**3.70**	**0.308**	**-**	**-**

2021-2022	Evaporation (inches)	Evaporation (feet)	Evaporation (acres)	AF/Year
March-21	4.51	0.376	-	-
April-21	6.71	0.559	-	-
May-21	9.36	0.780	-	-
June-21	9.49	0.791	-	-
July-21	9.78	0.815	-	-
August-21	8.51	0.709	-	-
September-21	6.77	0.564	-	-
October-21	4.42	0.368	-	-
November-21	1.99	0.166	-	-
December-21	0.94	0.078	-	-
January-22	1.77	0.148	-	-
February-22	3.13	0.261	-	-
Total	**67.38**	**5.615**	**-**	**-**

Table 4b – Agricultural Distribution System Losses

2021-2022	Length (feet)	Width (feet)	Surface Area (sq. ft)	Precipitation	Evaporation	Spillage	Seepage	Total AF
7-1 Inlet	39,072	25	976,800	-	-	-	1	-1
31 Reg. Reservoirs	45	45	2,025	-	-	-	-	-
12R Tank	-	-	-	-	-	1.31	-	-1.31
13RB Tank	-	-	-	-	-	8.40	-	-8.40
16RC Tank	-	-	-	-	-	0.34	-	-0.34
17R Tank	-	-	-	-	-	1.80	-	-1.80
Total				**-**	**-**	**11.85**	**1**	**-12.85**

Table 5 – Crop Water Needs

2021 Crop Name	Area (acres)	Crop ET (AF/Ac)	Leaching Requirement (AF/Ac)	Cultural Practices (AF/Ac)	Effective Precipitation (AF/Ac)	Appl. Crop Water User
Alfalfa - Hay	2,698	3.50	0.19	0.00	0.17	9,065
Alfalfa - Seed	99	2.39	0.13	0.00	0.22	228
Almonds	107,386	2.96	0.22	0.00	0.09	331,428
Barley	301	1.15	0.01	0.00	0.12	336
Beans	3,309	0.79	0.05	0.00	0.13	2,614
Cantaloupes	8,117	0.89	0.04	0.00	0.02	9,318
Cotton	9,195	2.00	0.03	0.00	0.01	17,894
Garlic	14,408	1.28	0.11	0.10	0.19	21,942
Grapes	17,598	2.35	0.18	0.00	0.09	40,701
Lettuce - Spring	3,502	0.36	0.01	0.09	0.20	1,245
Lettuce - Fall	4,043	0.42	0.04	0.13	0.00	3,186
Onions	10,370	2.44	0.23	0.10	0.17	35,841
Pistachios	92,171	2.63	0.20	0.00	0.06	254,734
Safflower	45	1.81	0.03	0.00	0.13	74
Sugar Beets	5	2.86	0.04	0.00	0.48	14
Tomatoes - Fresh	3,414	1.37	0.06	0.00	0.05	4,991
Tomatoes - Processing	49,258	1.35	0.06	0.14	0.05	74,328
Wheat	9,443	1.54	0.03	0.00	0.19	17,683
Field Crops - Misc.	1,965	2.00	0.06	0.00	0.00	4,726
Truck Crops - Misc.	10,894	1.50	0.08	0.00	0.10	18,000
Trees/Vines - Misc.	9,647	2.50	0.14	0.00	0.05	27,894
Total	**357,868**					**876,242**

Total Irrigated Acres[17]: 357,868

[17] The Total Irrigated Acres includes non-bearing, not harvested and double cropped acres.

Table 6 – 2021-2022 District System Water Budget

Type of Water	Location of Information		
Water Supply	Table 3		369,886
Riparian ET		minus	-
Groundwater Recharge	(Distribution & Drain) Intentional - Ponds, Injection	minus	-
Seepage	Table 4b	minus	1
Evaporation - Precipitation	Table 4b	minus	-
Spillage	Table 4b	minus	12
Transfers Out of District		minus	523
Water Available for Sale to Customers		**Subtotal**	369,350
Actual Agricultural Water Sales	From District Sales Records	minus	361,972
Private Groundwater	Table 2	plus	454,231
Crop Water Needs	Table 5	minus	876,242
Drain water Outflow	(Tail and Tile, Not Recycled)	minus	-
Percolation from Agricultural Land	(Calculated)	minus	(60,039)
M&I Actual Water Sales	From District Sales Records	minus	4,151
Unaccounted for Water	(Calculated)	**Total**	**3,227**

Table 7 – Influence on Groundwater and Saline Sink

2021-2022	
Agric Land Deep Perc + Seepage + Recharge - Groundwater Pumping = District Influence on Groundwater Storage	(245,056)
Estimated Actual Change in Groundwater Storage, including Natural Recharge	-
Irrigated Acres (from Table 5)	357,868
Irrigated Acres over a Perched Water Table	237,837
Irrigated Acres Draining to a Saline Sink	92,600
Portion of Percolation from Agriculture Seeping to a Perched Water Table	(39,902)
Portion of Percolation from Agriculture Seeping to a Saline Sink	(15,535)
Portion of On-Farm Drain Water flowing to a Perched Water Table/Saline Sink	-
Portion of Distribution System Seep/Leaks/Spills to Perched Water Table/Saline Sink	-
Total (AF) Flowing to a Perched Water Table and Saline Sink	(55,437)

Table 8 – Annual Water Quantities Delivered Under Each Right and/or Contract

Year	Federal Ag Water	Federal Non-Ag Water	State Water	Local Water	Other Water	Transfers Into District	Upslope Drain Water	Total Acre-Feet
2012	403,967	2,446	4,263	2,612	-	228,710	-	641,998
2013	185,693	2,308	20,495	2,812	-	222,725	-	434,033
2014	96,169	2,404	1,337	7,372	-	95,013	-	202,295
2015	78,991	3,438	19,475	2,216	-	70,340	-	174,460
2016	6,033	3,171	52,819	18,237	-	191,473	-	271,733
2017	890,721	2,264	2,100	19,603	16,950	157,936	-	1,089,574
2018	546,320	2,449	2,511	-	-	114,911	-	666,191
2019	754,331	2,291	1,949	5,794	38,000	119,433	-	921,798
2020	257,078	2,462	12,341	303	-	133,268	-	405,452
2021	95,777	4,151	6,179	1,323	-	77,438	-	184,868
Total	3,315,080	27,384	123,469	60,272	54,950	1,411,247	-	4,350,404
Average	**331,508**	**2,738**	**12,347**	**6,027**	**5,495**	**141,125**	**-**	**499,240**

Section VI

Urban Water Inventory Tables

Westlands Water District

Section VI – Urban Water Inventory Tables

The District is not an Urban Contractor and therefore these tables are not applicable.

Section VII

Delta Reliance Reduction

Westlands Water District

Section VII – Demonstration of Reduced Reliance on the Delta

As an agricultural water supplier, the District anticipates participating and receiving water from proposed projects that are considered "covered actions", such as multi-year water transfers, conveyance facility, or new diversion that involves transferring water through, exporting water from, or using water in the Sacramento-San Joaquin Delta (Delta).

Except for very wet years when flood operations occur on the San Joaquin and Kings Rivers, all surface water delivered to the District is exported from the Delta. The exported water is diverted under permits held by the U.S. Bureau of Reclamation (Reclamation) and the Department of Water Resources (DWR), as Central Valley Project (CVP) water and State Water Project (SWP) water, respectively. Additionally, some exported water, subject to monthly requirements identified by ESA/CESA, through the Delta are transferred through a petition to the SWRCB or a NEPA/CEQA complaint pre-1914 water right conveyed by the projects. The District holds repayment contracts for up to 1,196,948 acre-feet (AF) of CVP water and an agreement with the County of Kings for the Delivery of up to 5,000 AF of SWP Table A water to Lemoore Naval Air Station which Reclamation factors into its annual CVP reservoir and Delta export operations plan. As part of the water rights permits held by the CVP and SWP, the Projects are required to meet numerous requirements intended to protect the environment and to maintain adequate water quality for urban Delta diverters. The annual amount of water delivered to the District under its contracts is often reduced because of CVP's and SWP's obligations to meet environmental requirements before meeting the contractual commitments.

Table 1 entitled, "District Agricultural Supplier Water Supplies (1983-2022)", depicts the District's water supplies that are conveyed through the Delta and other local water supplies.

Table 1 – District Agricultural Supplier Water Supplies (1983-2022)

	Delta Water Supplies					
Water Year	Net CVP	Water User Acquired	Supplemental District Supply	Groundwater	Other Water Supplies[18]	Total Acre-Feet
1983	1,175,702	-	-	31,000	33,490	1,240,192
1984	1,369,791	-	3,000	73,000	29,771	1,475,562
1985	1,306,266	-	1,500	228,000	20,227	1,555,993
1986	1,135,870	-	-	145,000	7,395	1,288,265
1987	1,489,123	-	12,069	159,000	4,662	1,664,854

[18] Includes District Transfers from Mendota Pool, Kings River Water Association, and Tranquillity Irrigation District which are all south of the Delta.

	Delta Water Supplies					
Water Year	Net CVP	Water User Acquired	Supplemental District Supply	Groundwater	Other Water Supplies	Total Acre-Feet
1988	1,174,410	-	47,376	160,000	80,959	1,462,745
1989	1,035,369	20,530	99,549	175,000	-	1,330,448
1990	625,196	18,502	(2,223)	300,000	7,319	948,794
1991	229,666	22,943	77,399	600,000	44,709	974,717
1992	208,668	42,623	100,861	600,000	45,094	997,246
1993	682,833	152,520	82,511	225,000	11,509	1,154,373
1994	458,281	56,541	108,083	325,000	41,970	989,875
1995	1,021,719	57,840	121,747	150,000	25,780	1,377,086
1996	994,935	92,953	172,609	50,000	18,644	1,329,141
1997	968,408	94,908	261,085	30,000	20,967	1,375,368
1998	945,115	54,205	162,684	15,000	22,111	1,199,115
1999	805,404	178,632	111,144	60,000	11,067	1,166,247
2000	695,693	198,294	133,314	225,000	11,790	1,264,091
2001	611,267	75,592	135,039	215,000	6,906	1,043,804
2002	776,526	106,043	64,040	205,000	12,655	1,164,264
2003	863,150	107,958	32,518	160,000	-	1,163,626
2004	800,704	96,872	44,407	210,000	276	1,152,259
2005	996,147	20,776	98,347	75,000	1,036	1,191,306
2006	1,076,461	45,936	38,079	25,000	4,599	1,190,075
2007	647,864	87,554	61,466	310,000	-	1,106,884
2008	347,222	85,421	102,862	460,000	14,024	1,009,529
2009	202,991	68,070	70,149	480,000	2,657	823,867
2010	590,059	41,296	79,242	140,000	1,393	851,990
2011	576,910	60,380	191,686	45,000	14,925	888,901
2012	405,451	111,154	123,636	355,000	5,425	1,000,666
2013	88,488	101,413	130,867	638,000	19,028	1,077,796
2014	98,573	59,714	26,382	655,000	24,748	864,417
2015	82,429	51,134	34,600	660,000	6,738	834,901
2016	9,204	72,154	174,374	612,000	34,023	901,755
2017	911,307	(50,009)	174,490	54,000	19,603	1,109,391
2018	580,050	42,338	54,923	328,000	949	1,006,260
2019	87,317	37,985	53,433	89,000	5,794	273,529
2020	259,540	66,436	78,780	493,000	303	898,059
2021	99,928	63,822	20,595	636,000	1,323	821,668
2022	4,000	42,000	103,598	630,000	2,651	782,249

Recent water delivery information from 2012 through 2021 is available within the Plan's Water Inventory Tables, Table 8 – Annual Water Quantities Delivered Under Each Right and/or Contract.

Table 8 – Annual Water Quantities Delivered Under Each Right and/or Contract

Year	Federal Ag Water (AF)	Federal Non-Ag Water (AF)	State Water (AF)	Local Water (AF)	Other Water (AF)	Transfers Into District (AF)	Upslope Drain Water	Total Acre-Feet
2012	403,967	2,446	4,263	2,612	-	228,710	-	641,998
2013	185,693	2,308	20,495	2,812	-	222,725	-	434,033
2014	96,169	2,404	1,337	7,372	-	95,013	-	202,295
2015	78,991	3,438	19,475	2,216	-	70,340	-	174,460
2016	6,033	3,171	52,819	18,237	-	191,473	-	271,733
2017	890,721	2,264	2,100	19,603	16,950	157,936	-	1,089,574
2018	546,320	2,449	2,511	-	-	114,911	-	666,191
2019	754,331	2,291	1,949	5,794	38,000	119,433	-	921,798
2020	257,078	2,462	12,341	303	-	133,268	-	405,452
2021	95,777	4,151	6,179	1,323	-	77,438	-	184,868
Total	3,315,080	27,384	123,469	60,272	54,950	1,411,247	-	4,350,404
Average	**331,508**	**2,738**	**12,347**	**6,027**	**5,495**	**141,125**	**-**	**499,240**

Table 2 – District Comparison of Historic Average Annual Delta Supplies verses Projected Average Annual Delta Supplies

Value	Baseline Delta Supplies (1983-1998)	2015 Conditions Delta Supplies	2020 Conditions Delta Supplies	2030 Climate Conditions Delta Supplies	2070 Climate Conditions Delta Supplies
Average Annual Supplies (AF)	1,042,698	749,374	695,076	621,000	368,000
Percent of Baseline Supplies	N/A	72%	67%	60%	35%
Percent Reduction in Supplies	N/A	28%	33%	40%	65%

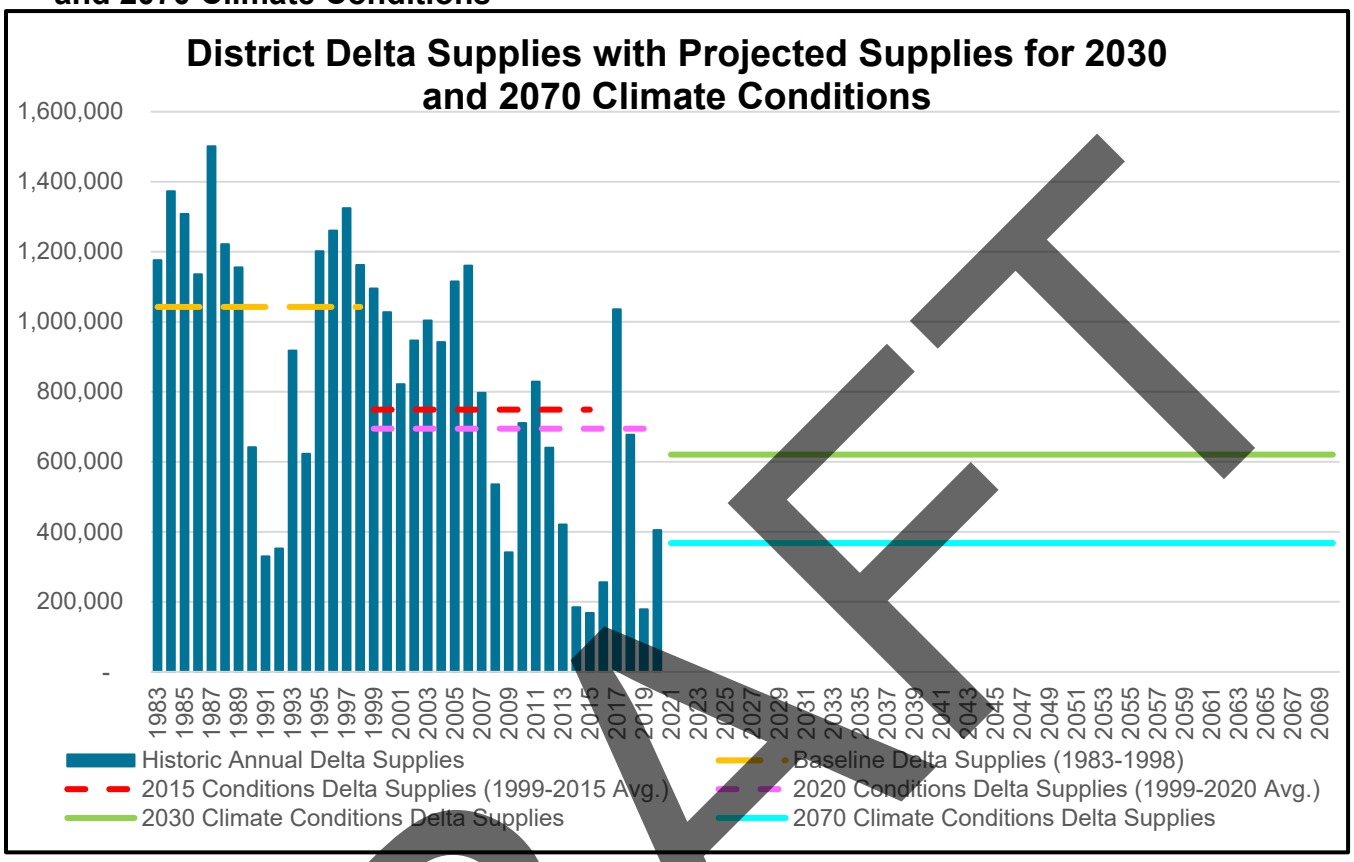
Table 2 and the Chart entitled "District Comparison of Historic Average Annual Delta Supplies verses Projected Average Annual Delta Supplies" (see Chart 1) tables and graphs the historic baseline and projected average annual Delta supplies. The District selected a baseline period of 1983-1998 prior to the implementation of the District's land acquisition program(s). The 2015 Conditions and 2020 Conditions averages are based

on the Delta Water Supplies available from 2008-2015 and 2008-2020, respectively. The 2030 and 2070 Conditions are based on CALSIM II climate change model runs based on an assumed amount of sea level raise and modified precipitation and runoff patterns. The climate change conditions result in lower long-term water supply.

The District's expected long-term average water allocation under its contracts has decreased from 92% in 1978 to 60% in 2020. The projected reduced average allocations for 2030 and 2070 were determined using the widely accepted operations model called 'CALSIM II' developed by DWR and Reclamation. Climate change simulations for 2030 and 2070 conditions were obtained from modeling performed by DWR in 2016 for its Water Storage Investment Project. The results of the modeling studies were modified to reflect the 2019 Biological Opinion and the 2018 Amended Coordinated Operations Agreement. The District's average water supply has been reduced by 28% over the past 42 years due to increasing regulatory constraints related to State and Federal Endangered Species and Clean Water Acts. The regulatory impacts to water supply demonstrates that the District's reliance on Delta water has already been significantly reduced.

The reduction in delivered contract water to the District has increased the need to purchase transfer water to meet the needs of the District. During most years, the purchased transfer water originates from sellers north of the Delta (or sellers south of Delta with CVP contracts) and therefore must be diverted through the Delta. More details regarding the District's water transfers can be referenced in Section I of the Plan, on page 39. Reclamation is allowed to divert the transfer water from the Delta only after meeting all its environmental requirements. As part of meeting its environmental requirements, Reclamation redirects a portion of the transfer water to offset the effects of conveying and diverting the water from the Delta.

Chart 1 – District's Annual Delta Supplies and Projected Delta Supplies for 2030 and 2070 Climate Conditions



Evaluation and Implementation of Locally Cost Effective and Technically Feasible Programs and Projects

Conjunctive Use – The District has implemented programs and projects that optimize conjunctive use of surface water and groundwater, support alternative land uses, and recharge the District's groundwater which in turn reduces the District's reliance on the Delta. These programs include the Pasajero Groundwater Recharge Project which will have the capability to store up to 10,800 AF per year. The Broadview Aquifer Storage and Recovery (Broadview ASR) Project includes one ASR well that could store up to 1,200 AF per year and the Storage Treatment Aquifer Recharge (STAR) ASR Project which will consist of up to 8 ASR wells and provide up to 10,800 AF per year of aquifer storage. More details regarding how the District optimizes conjunctive use and the District's GW recharge projects can be referenced in Section II of the Plan, on page 46, 47, 67, and 68.

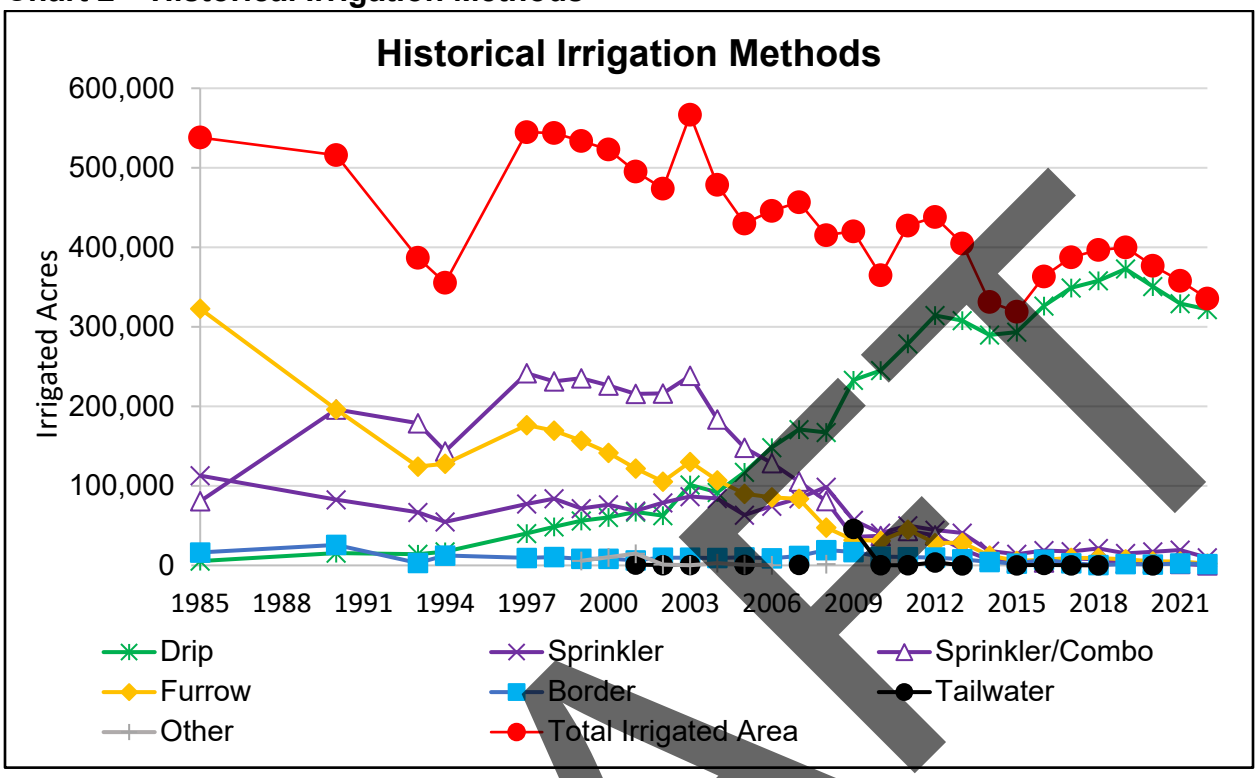
The District also implemented the Groundwater Allocation Program (Program) which provides flexibility to water users to meet their needs and annual variation in the availability of surface water from the CVP. The Program promotes the equal distribution of groundwater pumping and minimizes the potential of concentrated groundwater

pumping in the Subbasin, which directly contributes to achieving measurable objectives related to groundwater levels and storage and avoiding undesirable results. This Program is expected to substantially minimize and prevent undesirable results of chronic lowering in groundwater levels, and unreasonable reduction in groundwater storage and land subsidence. More details regarding the District's Groundwater Allocation Program can be referenced in Section II of the Plan, on page 47, 64, and 68.

Additionally, the District's Distribution Integration Program (DIP) allows water users to use the District's water distribution system to convey groundwater to other points of use within the District which allows for the improved use of groundwater resources already available within the District boundaries. The District conveys and delivers credit water through its distribution system to locations which assists the water users to meet their overall water requirements. The District also periodically operates (when the CVP south of Delta allocation is 20% or less) the Canal Integration Program (CIP) which allows water users to pump suitable quality groundwater into the San Luis Canal (SLC) and receive surface water credits, adjusted for conveyance losses and mitigation.

Efficient Irrigation – The District also offers low interest loans to water users for the lease-to-purchase of irrigation system equipment through the Expanded Irrigation System Improvement and Recharge Program (EISIP). Through the EISIP funding, water users can purchase irrigation equipment or recharge project equipment including micro-irrigation systems, tailwater reuse systems, linear move or center pivot systems, portable aluminum irrigation equipment, filtration systems, monitoring devices, and sublateral recharge and drywall. The EISIP encourages water users to transition irrigation methods to more water efficient methods as mentioned above. Since the implementation of EISIP in 1999, the District has funded over 500 irrigation system improvement loans. The District estimates 219,750 AF of water savings annually compared to 1985 due to the increase in water efficient irrigation methods. The Chart entitled "Historical Irrigation Methods" (see Chart 2) shows a steady increase in drip irrigation from 1985 to 2022.

Chart 2 – Historical Irrigation Methods



Alternative Land Use – The District has implemented a land use modification program which allows landowners to temporarily, although long-term, convert a portion of their lands to non-irrigable uses, such as solar generation. This program allows landowners to still receive the benefit of an agricultural water allocation on the converted land that can be used to supplement the water supply on their remaining cropland. Additionally, since 1999 the District has acquired and retired approximately 96,565 acres from irrigation of which 11,879 acres have been sold or leased for utility scale solar development, and another 27,900 acres are under option agreements with solar developers. The water supply from these acquisitions is reallocated to remaining privately owned land to further reduce demand for additional water from external sources (Approximately 240,000 acre-feet of demand reduction).

Local/South of Delta Water Supply – Projects the District are working on implementing include, expanding the District's distribution system at Lateral 6, the Los Vaqueros Enlargement Project, B.F. Sisk Dam Raise Project, and continued efforts to meet SGMA requirements. The Los Vaqueros Enlargement Project and B.F. Sisk Dam Raise Project will improve flexibility with the District's surface supply, enabling more water to be stored during periods of surplus (with less potential for adverse environmental impact) thereby reducing its reliance on ground water and CVP contract water that would be exported from the Delta.

Improvements at the District's Lateral 6 would increase conveyance capacity for delivering water from the Mendota Pool to the San Luis Canal. The maximum conveyance

out of the Mendota Pool is limited by either pump station capacity, channel capacity, or cumulative demands on Lateral 6. Lateral 6 currently has a limited capacity of 33 cubic feet per second (cfs) and at the completion of this project, the District will see an increase in capacity to approximately 213 cfs. This project would allow the District to maximize diversions during the limited window when Kings River flood flows and Friant 215 water are available. Together, these programs along with the water conservation programs already implemented, are bringing the District closer to balancing irrigation demand with less reliance on Delta water supply.

Section VIII

District Attachments

Westlands Water District

Attachment A

District Maps

The District Maps for Attachment A are located throughout the Water Management Plan. Reference the table below for the map locations.

Attachment B

District Rules and Regulations (water related)

The District's Rules and Regulations are available on the District's website:

Article 1: https://wwd.ca.gov/wp-content/uploads/2023/09/article-1-rr-adopted-2023-09.pdf

Article 2 & Article 19: https://wwd.ca.gov/about-westlands/additional-information/rules-and-regulations/

Attachment C

Measurement Device Documentation

The District's meter measurements are provided below, followed by the manufacturer's data sheets.

Test Date	Location	Serial Number	WWD Number	Beginning Error	Exit Error
3/1/2021	33-2.5S-0.01	993331	7083965	-0.3	1.0
3/1/2021	P24-0.4	892847	7083573	-1.3	1.2
3/10/2021	P24-0.01N	20032684	7084234	1.8	1.8
3/10/2021	14-5.5-4.0	20051564	7084384	-4.2	0.4
3/11/2021	3-2.2	20160442	7085091	2.3	-0.2
3/11/2021	33-4.0N	891652	7083462	2.5	0.4
3/11/2021	P24S-1.1	20051547	7084367	-0.8	-0.8
3/11/2021	29-1.0-9.4S	20121493	7084820	-0.2	-0.2
3/11/2021	16-3.5	945076	7083690	0.2	0.2
3/11/2021	13R-4.0-2.5	993293	7083947	-0.5	-0.5
3/12/2021	18-1.0S	20082926	7084654	-1.0	-1.0
3/12/2021	P29-0.5-1.0	20072713	7084571	-0.7	-0.7
3/16/2021	22-1.3	20111876	7084802	1.4	1.4
3/16/2021	21-1.8-0.01	20130946	7084880	0.2	0.2
3/16/2021	P16-0.67	20042871	7084277	1.7	1.7
3/16/2021	20-1.3	20152449	7085066	2.7	-0.1
3/18/2021	P16-0.68	20160434	7085083	1.6	1.6
3/18/2021	14-5.5-5.0	83-10-926	7024669	1.7	1.7
3/23/2021	29-10.5-1.0-0.1	20111859	7084785	-1.8	-1.8
3/23/2021	28-2.0-4.5S	20130944	7084878	1.2	1.2
4/8/2021	30-3.9S	20152423	7085040	4.6	0.9
4/8/2021	25R-0.9S	20151296	7085020	1.1	1.1
4/8/2021	27R-3.5-0.01	20170152	7085136	-0.1	-0.1
4/8/2021	P-28-E-0.3	20060719	7084451	1.8	1.8
4/9/2021	P30-0.4	20152420	7085037	2.7	-0.8
4/13/2021	21-3.5	20140888	7084936	2.8	0.6
4/13/2021	P1-1.0-0.5E	20152430	7085047	1.7	1.7
4/15/2021	32-6.0S	20170963	7085181	-0.4	-0.4
4/15/2021	4-2.5-0.5	7025001	7025001	3.1	1.0
4/15/2021	17-11.5	934791	7083669	0.4	0.4
4/21/2021	P32-S-1.5N	20170950	7085168	0.1	0.1
4/26/2021	3-1.7-0.01	20051557	7084377	2.6	0.2
4/26/2021	R-6.0E 1.5	20142319	7084988	0.6	0.6
4/26/2021	4-7.0	20151306	7085030	-0.2	-0.2
4/26/2021	5-3.0	20013516	7084119	5.6	0.2
4/2/2021	P26N-0.1	20181877	7085369	-0.3	-0.3
4/30/2021	35-8.0N	891638	7083448	4.7	1.0
5/4/2021	30-5.3	20072672	7084604	3.3	1.2
5/24/2021	14-3.5-4.0-0.01	20042894	7084300	-0.5	-0.5
5/24/2021	12R-4.8	993357	7083991	2.6	0.2
5/24/2021	29-1.0-2.0S	20051544	7084364	0.7	0.7
5/24/2021	2R-6.0W-0.5	20181876	7085368	1.2	1.2
5/24/2021	2R-6.0E-0.01	20171796	7085217	-1.2	-1.2
5/24/2021	28-2.0-1.0	891653	7083463	2.4	-0.9
5/24/2021	14-5.5	20051579	7084399	6.6	1.7

Test Date	Location	Serial Number	WWD Number	Beginning Error	Exit Error
5/26/2021	14-5.5B	20052445	7084309	-0.8	-0.8
5/26/2021	2R-4.0-0.99S	20050404	7084315	1.2	1.2
5/26/2021	PV2-3.5-0.01	871092	7083072	-0.6	-0.6
6/1/2021	12R-4.8B	20022636	7084167	0.1	0.1
6/1/2021	18R-2.7	20102437	7084724	2.8	0.9
6/1/2021	27-5.0-6.5-1.0-0.5N	20051556	7084376	-2.8	0.5
6/4/2021	20-11.8	986587	7025133	3.6	1.9
6/4/2021	P27N-0.7-0.01	20062143	7084486	1.8	1.8
6/7/2021	4-6.5-2.0	20141645	7084980	0.0	0.0
6/7/2021	4-6.5-1.5	20151942	7085240	0.1	0.1
6/10/2021	7R-2.5N	973917	7083815	-1.3	0.5
6/10/2021	12-2.0	20042868	7084274	1.2	1.2
6/10/2021	P13-1.5	20060727	7084459	-1.4	-1.4
6/14/2021	2R-5.5-0.5	20051528	7084348	0.7	0.7
6/14/2021	27-6.0-3.5	20032653	7084203	4.0	1.4
6/15/2021	36-1.5N	20152424	7085041	2.1	-0.3
6/15/2021	28R-1.0-0.75	20152448	7085065	2.3	0.3
6/16/2021	29-1.0-6.0N	20180693	7085272	2.4	-0.6
6/16/2021	28-2.0-1.0	891653	7083463	0.6	0.6
6/16/2021	30-9.3-0.1	20152434	7085051	-0.1	-0.1
6/16/2021	PV8-3.8-1.0	883609	7083347	0.8	0.8
6/16/2021	4-5.0	885030	7083431	0.1	0.1
6/16/2021	31-6.5S	993305	7083959	0.3	0.3
6/25/2021	35-3.0-0.5	20151273	7084997	0.1	0.1
6/25/2021	P16-1.2B	892151	7083527	-8.4	0.8
6/25/2021	29-1.0-7.0N	20151297	7085021	3.6	0.2
7/7/2021	21R-0.9	972314	7083800	1.8	1.8
7/7/2021	27-5.0-1.0	885299	7033444	1.2	1.2
7/15/2021	P26N-2.0B	20023577	7084170	1.8	1.8
7/16/2021	4-7.5-1.5	20032692	7084193	1.9	1.9
7/16/2021	3R-1.75-W	20181534	7084301	0.2	0.2
7/16/2021	28-2.0-4.5N	20032669	7024219	1.6	1.6
7/16/2021	17R1.2-0.5	883612	7083350	-4.5	0.4
7/19/2021	3-1.7-0.5	892834	7083560	3.4	0.4
7/20/2021	14-2.0	20160447	7085053	2.1	0.6
7/21/2021	7R-5.5-0.5	962898	7024969	-1.9	-1.9
7/21/2021	6-11.5	934881	7083673	-2.7	-0.3
7/21/2021	P16-0.2-0.01	20082910	7084644	3.9	1.6
7/22/2021	4-5.0	885030	7083431	0.1	0.1
7/22/2021	32-4.5N	20152431	7085048	1.0	1.0
7/25/2021	4-6.6	883610	7083348	2.6	1.5
8/3/2021	PV6-3.0	20011221	7084051	10.0	1.2
8/3/2021	27R-3.0	20171786	7085207	4.1	0.7
8/3/2021	5-0.7	20151283	7085007	0.5	0.5
8/4/2021	7R-3.0S	7712451	7024328	-0.9	-0.9

Test Date	Location	Serial Number	WWD Number	Beginning Error	Exit Error
8/4/2021	3-8.7-0.01	972308	7083794	1.5	1.5
8/5/2021	7R-4.60	994331	7083994	-6.4	1.5
8/9/2021	37-0.3-2.0	20062184	7084527	1.9	1.9
8/9/2021	28R-1.0W-2.0-0.02	891645	7083455	-1.0	-1.0
8/10/2021	19-13.5	20170157	7085141	2.3	-1.2
8/10/2021	P16-1.2	20171121	7085186	-0.1	-0.1
8/10/2021	16-6.0	20170116	7085144	0.2	0.2
8/10/2021	7R-3.5-0.5	20050423	7084332	1.8	1.8
8/10/2021	7R-6.5-1.0	20062187	7084530	0.4	0.4
8/10/2021	3-0.7-2.5	20072677	7084609	1.8	1.8
8/11/2021	PV2-4.0	20072786	7084591	-1.4	0.9
8/11/2021	16R-3.7	20152453	7085070	3.4	1.4
8/11/2021	2-0.5-1.5-0.5	871108	7083088	0.0	0.0
8/11/2021	7R-1.0N-0.5	892832	7083550	3.3	1.1
8/12/2021	37-2.3N	952234	7083709	1.5	1.5
8/16/2021	32-1.5S	20140866	7084938	-1.1	1.5
8/16/2021	P32S-0.5	972313	7083799	-1.8	0.8
8/17/2021	31-5.0N	20151275	7081999	0.0	0.0
8/19/2021	PV8-1.8-0.8	20011202	7084033	0.9	0.9
8/19/2021	16-7.0	20170163	7085147	1.0	1.0
8/23/2021	14-2.0	20160447	7085096	-0.3	-0.3
8/23/2021	27-5.5	20170170	7085154	3.6	0.7
8/23/2021	16R-3.2	883631	7083369	0.0	0.0
8/23/2021	20-10.8	20170162	7085146	5.3	0.0
8/24/2021	28-4.0-7.0-0.5	20170949	7085167	-0.5	-0.5
8/24/2021	29-1.0-4.0N	20180705	7085284	0.5	0.5
8/24/2021	29-3.0S	20171794	7085215	0.1	0.1
8/19/2021	28-4.0-2.0N	20190540	7085422	1.7	1.7
8/24/2021	7-4.5S-0.5	20171124	7085189	0.2	0.2
8/25/2021	Pv3-4.5B	20132624	7084919	-0.1	-0.1
8/25/2021	28-4.0-6.5B	891164	7083484	1.2	1.2
8/25/2021	14-0.5	20072703	7084561	4.8	0.5
9/3/2021	17R-4.9-1.5S	20200606	7085691	0.0	0.0
9/13/2021	29-7.0S	20111824	7084749	2.5	0.3
9/13/2021	P28E-0.03	20170136	7085120	-0.7	-0.7
9/14/2021	14-0.02	993251	7083905	-1.0	-1.0
9/14/2021	P21-0.1	7910625	7024451	-3.0	-1.2
9/16/2021	30-6.3N	20181898	7085396	-0.7	-0.7
9/16/2021	19-1.5	892860	7083586	0.9	0.9
9/17/2021	34-4.5S	20151285	7085009	1.0	1.0
9/20/2021	6-3.5-N-0.5	20082947	7084675	4.5	0.8
9/23/2021	PV8-6.3	20111871	7084797	3.2	1.1
9/23/2021	7R-4.5-0.2-0.35	20061585	7084472	-0.9	0.7
9/23/2021	1-1.5-0.1	20152437	7085054	0.2	0.2
9/23/2021	1-1.0-0.5	20152455	7085073	-0.3	-0.3

Test Date	Location	Serial Number	WWD Number	Beginning Error	Exit Error
9/27/2021	17R-4.3-0.2N	20082959	7084687	0.7	0.7
9/27/2021	2-0.5-2.0	20062170	7084513	0.8	0.8
9/27/2022	27-5.0-8.0-1.0	20051531	7084351	0.2	0.2
9/27/2021	1P-1.0-0.5-N	20121508	7084835	-1.0	-1.0
9/27/2021	30-1.3-7.8-0.5	20160440	7085089	0.9	0.9
9/28/2021	P1-0.8	80121506	7084833	0.1	0.1
9/28/2022	21R-4.4	20160441	7085090	1.1	1.1
9/29/2021	P27S-1.6	885293	7033438	3.8	0.3
9/30/2021	30-1.3-1.0	20082951	7084679	0.8	0.8
10/6/2021	30-1.3-0.01	20171791	7085212	-1.6	-1.6
10/12/2021	28-3.0-4.5-0.5	20160429	7085078	2.5	-0.2
10/12/2021	29-1.0-6.5N	20131085	7084905	2.0	1.1
10/13/2021	2R-6.0-E-0.5	20151277	7085001	-0.1	-0.1
10/13/2021	7-3.0S	20160451	7085100	-0.9	-0.9
10/13/2021	1R-3.5-0.5	20181838	7085329	0.2	0.2
10/13/2021	30-2.8N	20190572	7085483	-0.1	-0.1
10/14/2021	27-5.0-7.5-0.01	972312	7083798	2.2	1.3
10/18/2021	37-2.8N	20051527	7084347	4.1	1.0
10/18/2021	37-1.8S	20140890	7084968	0.7	0.7
10/18/2021	2R-5.0-0.5	885033	7083434	11.3	-0.2
10/19/2021	37-1.3N	20082945	7084673	3.0	1.1
10/19/2021	35-5.0N	20151274	7084998	-0.8	-0.8
10/20/2021	36-1.5-0.3	20151293	7085017	1.1	1.1
10/20/2021	33-5.5N	20072787	7084592	-7.9	0.3
10/21/2021	30-1.3-3.5N	20152451	7085068	2.2	0.3
10/21/2021	31-2.0N	20072768	7084573	1.7	1.7
10/21/2021	31-1.0	871088	7083068	1.6	1.6
10/22/2021	3-2.7-1.5B	20040847	7083263	-1.3	-1.3
10/22/2021	7R-4.6	8412417	7024761	-1.6	-1.6
10/22/2021	2R-3.0-1.0	202422	7025162	14.1	-1.8
10/28/2021	28-2.0-1.5	20170956	7085174	2.8	-0.4
10/29/2021	2R-0.5	20050413	7084324	-3.0	-0.4
10/29/2021	2R-3.0-0.01	20051521	7084341	-3.2	0.9
10/29/2021	22R-1.1	873564	7083261	-1.4	-1.4
11/1/2021	7R-4.5-0.2-0.01	20111860	7084786	0.9	0.9
11/1/2021	25R-2.4S	20131081	7084901	1.2	1.2
11/3/2021	27R-0.5	20032686	7084236	2.3	0.8
11/3/2021	2R-3.0-0.5	20191315	7085501	1.2	1.2
11/9/2021	28-2.0-2.0-0.01	20042869	7084275	1.8	1.8
11/9/2021	29-1.0-6.5S	20130941	7084875	1.3	1.3
11/9/2021	28-2.0-2.0-0.05	952247	7083722	3.1	0.5
11/9/2021	2R-1.0-0.01	20180685	7085264	-0.2	-0.2
11/10/2021	P29-1.5	20042880	7084286	4.4	0.5
11/10/2021	31-1.5-8.0S	20072791	7084596	1.1	1.1
11/10/2021	27R-3.5-0.2	20171801	7085222	1.4	1.4

Test Date	Location	Serial Number	WWD Number	Beginning Error	Exit Error
11/12/2021	P32E-0.1-0.5	20060709	7084441	-0.6	-0.6
11/12/2021	18R-3.6B	201051	7084009	4.8	1.7
11/12/2021	28-P-E-1.2B	20021036	7084155	-1.3	-1.3
11/16/2021	21R-0.4-1.5	20013541	7084134	0.5	0.5
11/17/2021	31-1.5-2.5N	20140910	7084964	2.2	0.3
11/17/2021	33-3.0-0.2	20051590	7084410	4.1	1.6
11/17/2021	24R-1.9NB	20151769	7085076	5.1	1.6
11/17/2021	33-2.0-2.0S	20062171	7084514	2.5	1.2
11/17/2021	33-2.0-4.5N	993238	7083892	0.0	0.0
11/17/2021	28-7.0	AG190808	7113044	-1.9	-1.9
11/18/2021	13-8.2	20011192	7084697	2.2	0.4
11/23/2021	37-0.3-4.5	20082939	7084667	1.0	1.0
11/23/2021	37-0.3-2.5	20032674	7084224	0.4	0.4
11/23/2021	PV2-2.0-2.0	20111853	7084779	0.1	0.1
12/13/2021	20.7.3-0.01	20170150	7085134	-6.6	-0.2
12/13/2021	13R-4.5	20102453	7084740	-2.5	1.1
12/13/2021	13-1.7-0.01	892858	7083584	1.1	1.1
12/13/2021	13R-4.0-2.25	972320	7083806	1.4	1.4
12/13/2021	20-4.8	20170171	7085155	1.5	1.5
12/13/2021	20-9.3B	20170887	7085163	-10.5	-0.1
12/13/2021	20-6.8	20180679	7085258	-3.0	0.3
12/14/2021	6-9.5-S-0.5N	986551	7025097	-1.2	-1.2
12/14/2021	16R-5.2-0.5N-0.01	20121511	7084838	-0.7	-0.7
12/20/2021	25R-1.9S	20190543	7085425	-1.6	-1.6
12/20/2021	2R-4.0-0.5	20140872	7084944	-1.4	-1.4
1/4/2022	22R-1.6C	20063190	7084627	1.9	1.9
1/4/2022	13R-1.5	20102438	7084725	-0.2	-0.2
1/4/2022	6-1.25	883605	7083343	-1.8	-1.8
1/5/022	22R-4.6-2.0B	20063188	7084689	-0.4	-0.4
1/5/2022	13-2.7-0.25	20032684	7084233	0.3	0.3
1/5/2022	27R-1.5-0.01	20121491	7084818	-2.7	0.7
1/6/2022	P32E-0.5	20042867	7084273	0.4	0.4
1/6/2022	P30-2.3-0.01	20072778	7084583	0.1	0.1
1/6/2022	14.57R-1.01	20121755	7084855	-9.3	-1.1
1/7/2022	PV8-6.3B	891188	7083508	1.6	1.6
1/7/2022	13R-3.0S-0.5	20062140	7084435	1.0	1.0
1/7/2022	2R-6.0E-2.0	20152429	7085046	-1.5	-1.5
1/7/2022	32-2.5-NB	20014825	7084150	-7.6	-1.7
1/14/2022	P13W-0.6-0.5	993265	7083919	1.8	1.8
1/14/2022	3-1.7-1.5	20170958	7085176	-0.9	-0.9
1/14/2022	13R-3.05-0.8	20072689	7084621	-6.3	-0.4
1/14/2022	3-2.7-0.01	986520	7025066	1.5	1.5

Irrigation & Agriculture

Model WMR - Water Meter

The ample space around the core of the in-line helical axial turbine allows foreign matter to pass through the meter without clogging.

- **Applications**
  For main supply lines, agriculture and industry
- **Available Sizes**
  2" (50mm)
- **Standards**
  EEC (based on ISO 4064:1993)

Features:

- Minimum head loss
- High accuracy
- Hermetically sealed register with glass
- Optional electrical output: EV (volume
  EF (rate of flow) or DIALOG
- Not sensitive to dirt

Technical Specifications

Maximum Working Pressure	16 bar
Maximum Liquid Temperature	55°C
Body	Iron, polyester coated
Connection	2" BSP coupling

WMR type dial

Irrigation & Agriculture

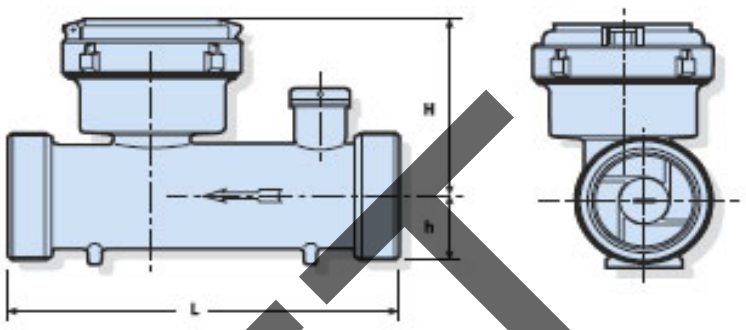
Model WMR - Water Meter

ARAD

Water Works

Dimensions

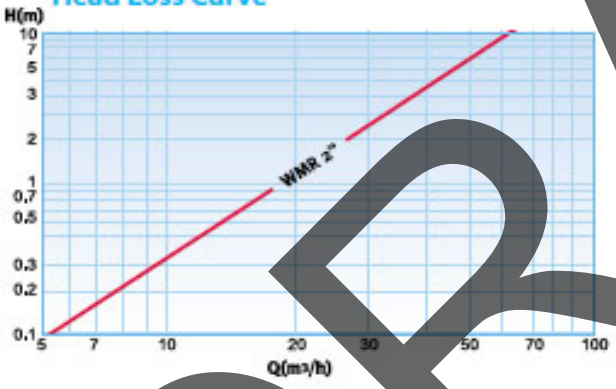
Model		WMR
Nominal size	(mm)	50
	(inch)	2
L – Length without couplings (mm)		200
H – Height (mm)		98
h – Height (mm)		40
Weight (kg)		2.3
Weight with couplings (kg)		3.7



Performance data:

Model WMR Nominal size (mm)	Model WMR Nominal size (inch)	Qmax Maximum flowrate (m3/h)	Qn ISO 4064 (m3/h)	Qn Nominal Flowrate (m3/h)	Qt Transitional Flowrate (m3/h)	Qmin Minimum Flowrate (m3/h)	Starting Flow (m3/h)	Maximum register capacity (m3)	Smallest readable unit (liter)	Accuracy between Qmax & Qt	Accuracy between Qt & Qmin
50	2	40	15	20	2	0.45	0.15	10^6	1	±2%	±5%

Head Loss Curve



Installation Requirements

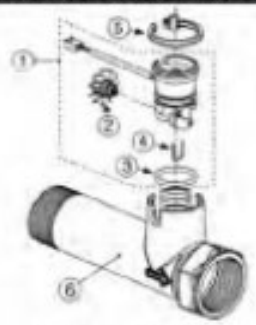
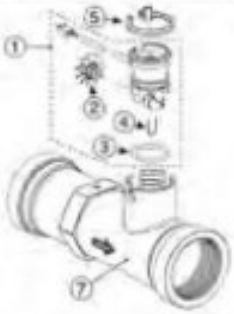
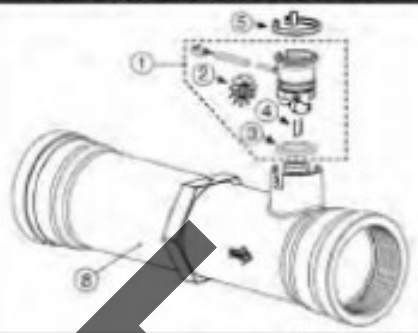
- The water meter may be installed in any position. For non-horizontal position the flow shall be upwards.
- The meter shall be full of water while operating.
- Prior to installation of a meter the pipeline shall be thoroughly flushed.
- Straight pipe section of the same diameter D as the meter, having lengths of 10D and 5D shall be installed upstream and downstream of the meter respectively.

ARAD | Arad Ltd.
Dalia 19239, Israel, Tel: 972-4-9897911, Fax: 972-4-9897960 | www.arad.co.il | ARADGROUP Integrated Metering Technologies

Inline Flow Meters
NPT or BSPT

V3040-15 or V3040BSPT-15 **1.5" Meter**	V3050 or V305[illegible]BSPT **2" Meter**	V3075 or V3075BSPT **3" Meter**
		
• 1.5" Inline meter suited for commercial/ industrial applications • Lead Free Brass construction • Service flow range 0.5 to 60 gpm • Meter accuracy ±5% • Reliable and proven turbine design • 15-foot cable included • 1½" male x female pipe NPT or BSPT connections	• 2" Inline meter suited for commercial/ industrial applications • Stainless Steel construction • Service flow range 1.5 to 150 gpm • Meter accuracy ±5% • Reliable and proven turbine design • 15-foot cable included • 2" female x female pipe connection or 2½" groove lock coupling	• 3" Inline meter suited for commercial/ industrial applications • Stainless Steel construction • Service flow range 3.5 to 350 gpm • Meter accuracy ±5% • Reliable and proven turbine design • 15-foot cable included • 3" female x female pipe connection or 3½" groove lock coupling

Inline Flow Meters NPT or BSPT

WS1.5 Meter Assembly Order No: V3040-15 or V3040BSPT-15	WS2 Meter Assembly Order No: V3050 or V3050BSPT	WS3 Meter Assembly Order No: V3075 or V3075BSPT
		

Drawing No.	Order No.	Description	Quantity
		Common Parts	
1	V3221	WS Remote Meter Asy 15 Ft Cord (includes V3118-03, V3501 and V3105)	1
2	V3118-03	WS1.5/2 Turbine Asy	1
3	V3105	O-Ring 215	1
4	V3501	WS1.5/2 Turbine Clip	1
5	V3632	WS1.5/2/3 Meter Retaining Clip	1
		WS1.5 Meter Assembly Parts	
6	V3401-01	WS1.5 Meter Housing NPT	1
	V3401BSPT-01	WS1.5 Meter Housing BSPT	
Not Shown	V3437	WS1.5 Flow Straightener (located inside meter housing)	1
		WS2 Meter Assembly Parts	
7	V3222-01	WS2 Meter NPT Housing	1
	V3222BSPT-01	WS2 Meter BSPT Housing	
Not Shown	V3488	WS2 Flow Straightener (located inside meter housing)	1
		WS3 Meter Assembly Parts	
8	V3601-01	WS3 Meter NPT Housing	1
	V3601BSPT-01	WS3 Meter BSPT Housing	
Not Shown	V3602	WS3 Flow Straightener (located inside meter housing)	1

Installation

Installation of the V3040-15 WS1.5 Meter NPT Assembly can be accomplished using 1.5" NPT pipe and fittings.
For V3040BSPT-15 WS1.5 Meter BSPT use 1.5" BSPT pipe and fittings.

Installation of the V3050 WS2 Meter NPT Assembly can be accomplished with 2" NPT pipe or by using a 2½" groove lock coupling.
For V3050BSPT WS2 Meter BSPT Assembly use 2" BSPT pipe or 2½" groove lock coupling.

Installation of the V3075 WS3 Meter NPT Assembly can be accomplished with 3" NPT pipe or by using a 3½" groove lock coupling.
For V3075BSPT WS3 Meter BSPT Assembly use 3" BSPT pipe or 3½" groove lock coupling.

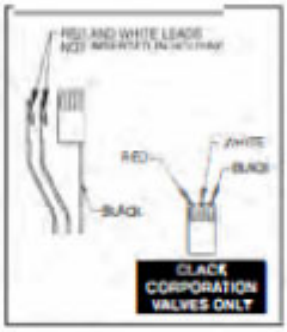
WHEN INSTALLING THE METER, MAKE SURE THE ARROW ON THE METER BODY IS GOING THE SAME DIRECTION AS THE WATER FLOW.
THE METER ASSEMBLIES MUST BE INSTALLED IN A HORIZONTAL POSITION.

THIS WATER METER SHOULD NOT BE USED AS THE PRIMARY MONITORING DEVICE FOR CRITICAL HEALTH EFFECT APPLICATIONS.

OPERATING PRESSURES: 20 PSI MINIMUM / 125 PSI MAXIMUM - OPERATING TEMPERATURES: 40°F MINIMUM / 110°F MAXIMUM

The 22 gauge wire crimp terminals are Molex Series 41572 or 40445. The housing connector is Molex Series 2695 White Housing, P/N 22-01-3037.
The housing connector diagram shows the proper installation of the RED, WHITE and BLACK wires for CLACK CORPORATION CONTROL VALVES. When connecting to other manufacturer's control valves please contact your original equipment manufacturer for proper wiring instructions.

Wiring:
- The meter must be supplied with a DC voltage between 4 and 24 volts.
- The RED wire is positive.
- The BLACK wire is negative.
- The WHITE wire is the meter output.



Calibration Instructions for WS1.5 Meters:
- For WS1.5" valves select 1.5 if valve software records in gallons and 38 if valve software records in cubic meters.
- The calibration factor for the Meter Assembly is 37 pulses per gallon when used on applications other than WS1.5" valves.
- The meter flow range is 0.5-60 gpm + 5% (output signal 0.4 Hz to 47.5 Hz). NOTE: Not all flow monitors will register accurately at either the low or high flow range of this meter. Contact your flow monitor manufacturer for limitations.
- Pressure drop at 75 gpm is 2.7 PSI.

Calibration Instructions for WS2 Meters:
- For WS2 valves select 2.0 if valve software records in gallons and 5.0 if valve software records in cubic meters.
- For WS2L valves select 2.0L if valve software records in gallons and 5.0L if valve software records in cubic meters.
- The calibration factor for the WS2 Meter Assembly is 20 pulses per gallon when used on applications other than WS2 or WS2L valves.
- The meter flow range is 1.5-150 gpm + 5% (output signal 0.4 Hz to 47.5 Hz). NOTE: Not all flow monitors will register accurately at either the low or high flow range of this meter. Contact your flow monitor manufacturer for limitations.
- Pressure drop at 150 gpm is 3.6 PSI.

Calibration Instructions for WS3 Meters:
- For WS2H valves select 8 pulses if valve software records in gallons and 2.1 if valve software records in liters.
- The calibration factor for the WS3 Meter Assembly is 8 pulses per gallon when used on applications other than WS2H valves.
- The meter flow range is 3.5-350 gpm + 5% (output signal 0.46 Hz to 46.6 Hz). NOTE: Not all flow monitors will register accurately at either the low or high flow range of this meter. Contact your flow monitor manufacturer for limitations.
- Pressure drop at 350 gpm is 7.3 PSI.

SPARLING INSTRUMENTS, INC.

PRODUCT DATA SHEET

SERIES 100 METERS AND ACCESSORIES

Series 190 Totalizers, Indicators and Transmitters for Mechanical Drive Propeller Flowmeters FT190, FT191, FT193

PDS-190
Issue Date: Feb. 1995
Supercedes: Nov. 1993

DESCRIPTION

The Series 190, 191 and 193 are used in combination with and mounted on Sparling propeller flowmeters to provide mechanical totalization (registration), mechanical indication and a variety of pulse and/or 4-20 mA outputs.

FT190—(Formerly Model 245)
Provides mechanical totalization (registration), mechanical rate indication.

FT191—(Formerly Model 249)
Provides mechanical totalization (registration).

FT193
Provides mechanical totalization and both a true two-wire 4-20 mA output and a true two-wire scaled electronic pulse output.

TABLE 1
READOUT AND OUTPUT CAPABILITIES

Type	Mechanical Totalization	Mechanical Rate Indication	Outputs	4-20 mA (Two Wire) ①	Scaled Electronic Pulse Rate	Approx. Shipping Weight
FT190 (FORMERLY MODEL 245)	YES	YES	NO	NO	NO	20 lbs.
FT191 (FORMERLY MODEL 249)	YES	NO	NO	NO	NO	15 lbs.
FT193	YES	NO	YES	Standard	Standard	20 lbs.

① Full scale flow rate for 100% signal output must occur at full scale flow rate shown in Table 4 or greater flow rate
② Available in optional "P", "B" and "E" switch outputs.

Sparling Instruments, Inc.
4097 N. Temple City Blvd. • El Monte, CA 91731-1089 USA
Phone (626) 444-0571 • Fax (626) 444-2314

ISO 9001 DNV

SPECIFICATIONS:

MECHANICAL RATE INDICATOR

Scale Length ..... 6 inches
Accuracy ..... 5% full scale
Available Scales ..... See Table 4

MECHANICAL TOTALIZER

Number of digits 6
Accuracy ..... ±2% actual flow
Units of registration ..... See table 2
Test Hand ..... One full rotation per least significant digit of totalizer.

4-20 mA OUTPUT (FT193 ONLY):

True two-wire requiring external power supply
External Power Supply ..... 18 to 30 Vdc
Output Load Capability ..... See power supply vs. output load curve
Reverse polarity protection ..... 35 Vdc (max.)
Accuracy ..... 0.5% of full scale

SCALED ELECTRONIC PULSE RATE (FT193 ONLY)

Two-wire isolated solid state switch (photocoupled)
External power supply ..... 10 Vdc to 30 Vdc
Pulse amplitude ..... 0 Vdc (off) to external supply voltage minus 3 Vdc (on)
Output load ..... 4 watts maximum
Pulse on time 100ms
Pulse output registration ..... Equal to mechanical totalizer least significant digit
Accuracy ..... 2% actual flow

ALL OUTPUT CONNECTIONS:

Pigtail leads through 1/2 NPT grommeted or potted sealed conduit connection.

MATERIAL OF CONSTRUCTION:

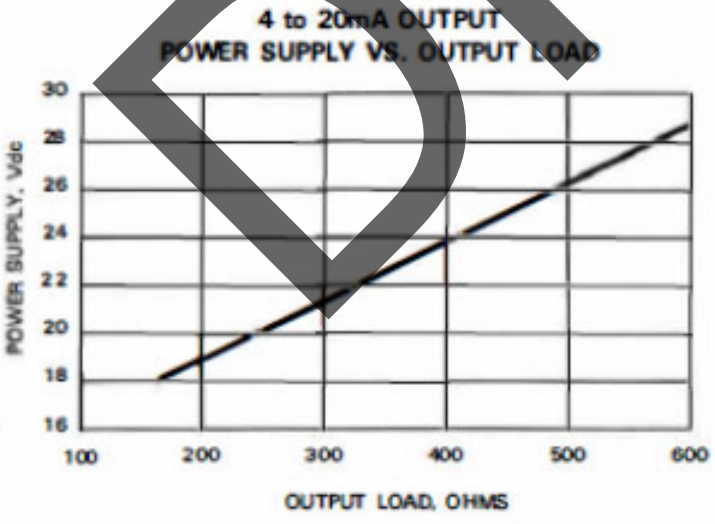
Painted Die Cast Aluminum

ENCLOSURE RATING ..... NEMA 3R

ELECTRICAL RATING ..... General Purpose

AMBIENT TEMPERATURE LIMITS:

+30F (-1C) to +130F (+55C)—FT193



SERIES 190 PROPELLER FLOWMETER TRANSMITTERS
MODEL NUMBER SCHEDULE

Table 1 - Base Model Number	
FT190 -	Mechanical Flow Totalizer and Indicator
FT191 -	Mechanical Flow Totalizer
FT193 -	Mechanical Flow Totalizer with 4-20 mA and Scaled Pulse Output

Table 2 - Outputs	
000 -	No Outputs (FT190 and F191 Only)
111 -	4-20 mA and Scaled Pulse Rate (FT 193 Only)

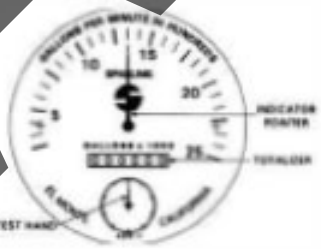
Table 3 - Mounting	
2	For Mounting on Meterhead on Same Order
3	Replacement for Existing Meterheads

FT19__-___-__

ORDERING INFORMATION

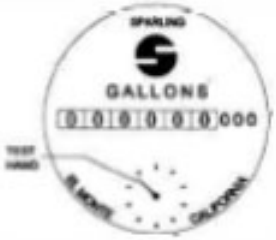
1. Construct model number by selecting one code for each category.
2. If ordered with new meter-head, state base model number and size of meter-head. If replacement for existing meterhead, state serial number of existing meterhead.
3. Provide following information from Tables 2 & 3.
   a. Mechanical indicator scale and units.
   b. Mechanical totalizer registration and units.

FT190 (Formerly 245)
Indicator/Totalizer

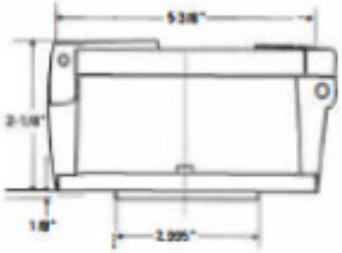


No Outputs

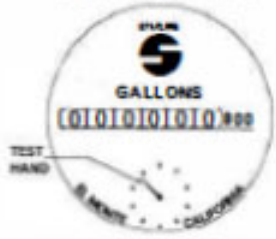
FT191 (Formerly 249)
Totalizer

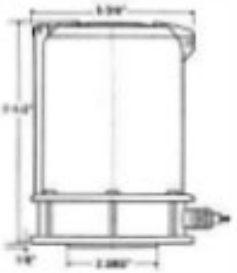


No Outputs



FT193
Transmitter/Totalizer





WATERFLUX 3070

IP68 Compact & remote
Battery powered electromagnetic water meter

- Battery power or optional mains power & battery backup with the FlexPower
- Easy installation without straight inlet or outlet lengths
- Integrated pressure and temperature sensor

Measurements

Measuring units	**Volume**
	Default setting: m^3
	Selectable: liter, gallon, imperial gallons, cubic feet, acre inch, acre feet
	Flow rate
	Default setting: m^3 / hr
	Selectable: liter/sec, gallon/min, imperial gallon/min, cubic feet/hour, acre inch/day, acre feet/day
Measurement interval Battery power	Default setting: 15s
	Selectable: 5s, 10s, 15s, 20s
Measurement interval FlexPower	Default setting: 5s
Empty pipe detection	Optional: display shows - EP - in case of empty pipe detection
Low flow cut off	Measurements below this value are neglected
	Default setting: 10 mm/s
	Selectable: 0 mm/s, 5 mm/s, 10 mm/s

Measuring accuracy

Reference conditions	Medium: water
	Temperature: +10...30°C / +50...86°F
	Operating pressure: 1 bar / 14,5 psi
	Inlet section: 3 DN / Outlet section: 1 DN
Maximum measuring error	DN25...300: down to 0.2% of the measured value ± 1 mm/s DN350...600: down to 0.4% of the measured value ± 1 mm/s
	The maximum measuring error depends on the installation conditions.
	For detailed information refer to *Measurement accuracy* on page 26.
Repeatability	DN 25...300: ±0.1% (v >0.5 m/s / 1.5 ft/s) DN350...600: ±0.2% (v >0.5 m/s / 1.5 ft/s)
Calibration / Verification	**Standard:**
	2 Point calibration by a direct volume comparison.
	Optional: for DN25...600
	Verification to Measurement Instrument Directive (MID), Annex MI-001. Standard: Verification at Ratio (Q3/Q1) = 80 Optional: Verification at Ratio (Q3/Q1) > 80
MID Annex III (MI-001) (Directive 2014/32/EU)	**EC-Type examination certificate to MID Annex III (MI-001)**
	Diameter: DN25...600
	Minimum straight inlet flow: 0 DN
	Minimum straight outlet flow: 0 DN
	Forward and reverse (bi-directional) flow
	Orientation: any
	Ratio (Q3/Q1): up to630
	Liquid temperature range: +0.1°C / 50°C
	Maximum operating pressure: ≤ DN200: 16 bar, ≥ DN250: 10 bar
	For detailed information refer to *Legal metrology* on page 20.

2.3 Measurement accuracy

Each water meter is standard wet calibrated under reference conditions by direct volume comparison. The performance of the water meter is defined and documented in an individual water meter calibration certificate.

Reference conditions

- Medium: water
- Temperature: +10...+30°C / +50...+86°F
- Pressure: 1 bar / 14.5 psi
- Inlet section: ≥ 3 DN
- Outlet section: ≥ 1 DN

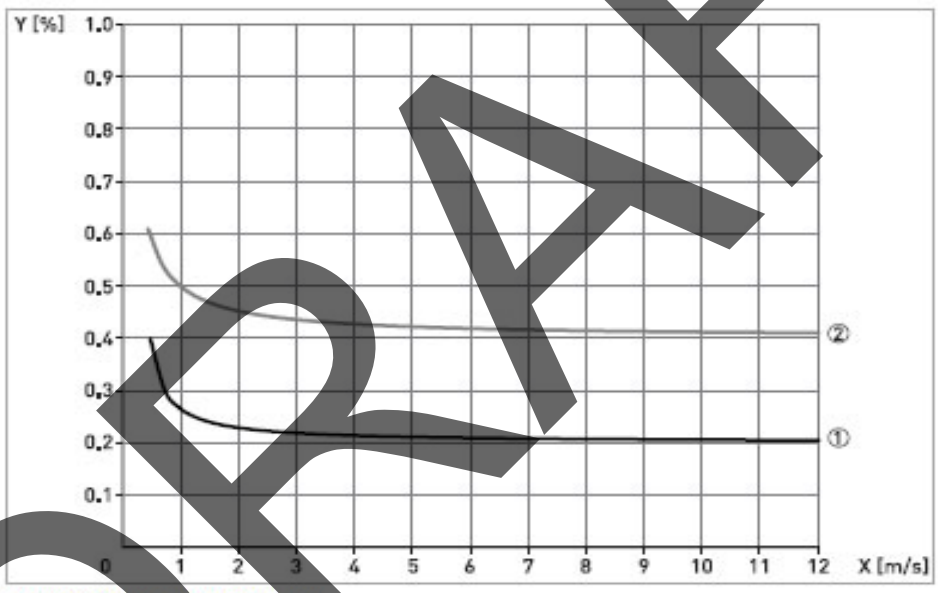


Figure 2-3: Measuring accuracy
X [m/s]: Flow velocity; Y [%]: Maximum measuring error

Accuracy with signal converter IFC 070

	Inlet	Outlet	Accuracy	Curve
DN25...300 / 1...12"	3 DN	1 DN	0.2% + 1 mm/s	①
DN350...600 / 14...24"	3 DN	1 DN	0.4% + 1 mm/s	②

MASTER METER WT TURBINE

2" TO 12"

MORE REVENUE FROM LESS SPACE.

WT provides a cost effective, compact epoxy-coated cast iron body for our ruggedized field proven turbine measuring element. For 2" to 12" high volume applications too cramped to accomodate a standard length turbine meter, the Master Meter WT Turbine Meter delivers superior accuracy in a design that is 20 to 33 percent shorter than most turbines. This shorter laying length enables accurate measurement without replumbing, customer inconvenience, and allows for a spool mounted test port per AWWA M6 Manual.

WT Turbine Meters provide uncompromised accuracy that meet or excede AWWA C-701 Class II Turbine standards inspite of its compact length. The WT's epoxy-coated cast iron main case reduces meter cost while providing tough durability and superior corrosion resistance. Nylon inlet flow conditioners and polypropylene rotors insure enduring high accuracy and long service life for optimal revenue generation for years to come.

FEATURES & BENEFITS:

- Sustained accuracy for maximum revenue over time
- Meets or exceeds AWWA C-701 Class II Turbine; most recent revision
- Ruggedized epoxy-coating for superior corrosion resistance
- Easily adapted for use with AMR/AMI Data Platforms
- Precision engineered for efficient flow patterns with minimal head loss
- Turbine and Chamber Constructed from Non-Hydrolyzing, Wear Resistant Polymer
- Wide Range of Flow for Maximum Accountability of Usage

REGISTER OPTIONS:

- AccuLinx™ 8 Wheel Absolute Encoder *(also available with integrated DIALOG 3G AMR)*
- DIALOG 3G Odometer Interpreter
- DIALOG 3G LCD Interpreter™
- Electrical Output Register
- Rate-of-Flow
- Direct Read

READING OPTIONS:

- FixedLinx™ Meter Data Management Solution - Utilizes the 3G technology backbone with simultaneous Mobile AMR and Fixed Network AMI data collection capabilities
- Mobile Drive-By AMR - 3G
- Proximity/Wand Read - 2G
- Direct Read/Manual

SIZES AVAILABLE: 2" - 12"

Sustained Accuracy | Low Head Loss | AMR/AMI Migratable with 3G | Wide Flow Range

TECHNICAL SPECIFICATIONS:

Description - AWWA Class II Turbine Meter

AWWA Standard - Meets or exceeds the performance required by AWWA Standard C701, most recent revision, for Class II Turbine Meters

Main Case - 2" - 12" constructed of epoxy-coated cast iron, with flanged ends. Bronze register retaining ring and lid are standard

Measuring Chamber - Meter chamber assembly and turbine are constucted of durable, engineering plastics for extended service life

Magnetic Drive - A reliable, direct magnetic drive provides linkage between measurement element and register. No intermediate spur gearing is required; no gearing is exposed to water

Register - Standard direct read, DIALOG® Meter Reading System, AccuLinx, Electrical Output, Interpreter, and Rate-of-Flow are available. A six-wheel odometer is standard. Registration is available in gallons,cubic feet or cubic meters.

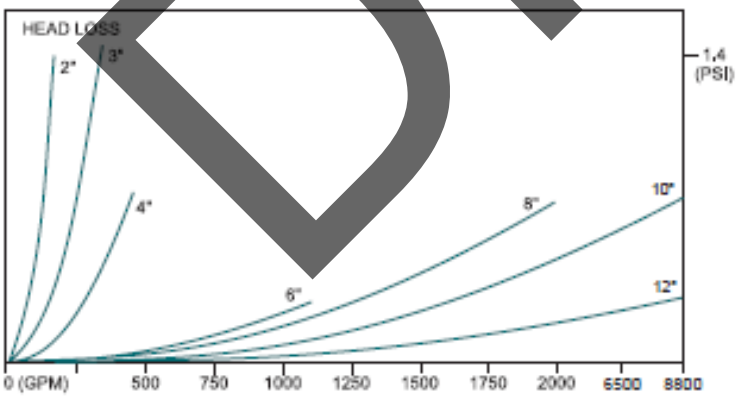
Register Sealing - Direct read, AccuLinx and DIALOG® System registers are permanently sealed, with a tempered glass lens, stainless steel base and wrap-around gasket to prevent intusion of dirt or moisture

Test Circle - Most registers have large center sweep hand with 100 clearly indicated graduations per minimum registration unit, with each tenth marked

Low Flow Detector - Most registers have center-mounted indicator with high sensitivity resulting from direct, geared linkage to the measuring element

WT EPOXY-COATED CAST IRON TURBINES 2" - 12"

METER OPERATING CHARACTERISTIC/DIMENSION	2"	3"	4"	6"	8"	10"	12"
Normal Operating Range [± 1 - 1/2%] (gpm)	4.4–175	6–330	9–1320	35–1150	37–2000	60–6500	180–8800
Continuous Operatin Range (gpm)	4.4–175	6–330	8.5–1000	35–1150	37–2000	60–3300	180–4400
Low Flow [95%] (gpm)	2.5	4.5	6.5	19	30	44	50
Maximum Intermittent Flow (gpm)	285	485	1320	1800	3200	6500	8800
Maximum Working Pressure (psi)	175	175	175	175	175	175	175
Maximum Working Temperature (°F)	120	120	120	120	120	120	120
Length	7.9"	9.1"	9.9"	11.7"	13.7"	18"	20"
Height	8.5"	9.2"	9.9"	12.3"	13.5"	17.5"	18.6"
Height, bottom to center line	2.8"	3.6"	4.3"	5.4"	6.6"	8.1"	9.2"
Width	6.5"	7.9"	8.6"	11.1"	13.4"	16.2"	18.4"
Weight (lbs.)	27	35	43	78	105	167	211
Register Capacity [millions] (U.S. Gallons)	100	100	1000	1000	10000	10000	10000
Register Capacity [millions] (Cubic Feet)	10	10	100	100	1000	1000	1000
Epoxy-Coated Maincase Base Metal	Cast Iron	Cast Iron	Cast Iron	Cast Iron	Cast Iron	Cast Iron	Cast Iron
Flanges/End Connections	Round	Round	Round	Round	Round	Round	Round



Master Meter, Inc. Reading the Future™
101 Regency Parkway, Mansfield, TX 76063
Toll Free: 800-765-6518 • Main Line: 817-842-8000 • FAX: 817-842-8100
MASTERMETER.COM

Mc Mag3000™

SPECIFICATION SHEET
BATTERY POWERED
ELECTROMAGNETIC FLOW METER

DESCRIPTION

McCrometer's award-winning Mc Mag3000™ provides growers and irrigators with a new alternative for flow measurement. With a 5-year expected battery life (3-year battery warranty) and saddle mount design, the Mc Mag3000 delivers the dependability and ease-of-installation McCrometer has provided to the agricultural market for nearly 60 years. The electromagnetic sensor offers accuracy as good as ±1% while being designed to naturally shed debris.

The meter is available to fit a common range of agricultural line sizes, from 4" to 12" diameter pipe.

The innovative design of the Mc Mag3000 saddle mount meter features a multi-point angled sensor that sheds debris, making it ideal for use in surface water, livestock waste lagoons, and other dirty water applications.

Using electromagnetic technology to measure the water flow, the Mc Mag3000's precision sensor corrects for shifting velocity in the pipe by constantly obtaining the mean velocity from its multiple electrodes. The result is a highly accurate (as low as +/- 1%) flow meter.

The meter combines an innovative saddle, precision sensor, and a battery powered integrated electronic converter package with data logging capability to provide accurate flow measurement for full-pipe flow monitoring applications.

The integrated electronic converter is secured with tamper resistant screws to protect against unauthorized access. The meter offers flow rate and total water used and a 5-year expected battery life (3-year battery warranty). The Mc Mag3000 features three 3.6V lithium-thionyl chloride ($Li\text{-}SOCl_2$) D size batteries, with one serving as back-up power. The main power batteries are easily replaced in the field. Pulse and 4-20mA output are available for remote meter reading or SCADA. The Mc Mag3000 is McCrometer CONNECT wireless system compatible, which allows users to access flow data by simply logging on to the Internet. This eliminates costly manual meter reading.

INSTALLATION

The Mc Mag3000 offers hassle-free installation, even in tight spaces. No flanges or costly welding is involved. Users simply cut a 3" diameter hole in the top of their pipe and slide the sensor into the hole, and then cinch the meter onto the pipe using the Factory provided U-straps.

The meter can be mounted in a horizontal or vertical position with a full pipe of water. A minimum of three pipe diameters upstream of a flow disturber and one pipe diameter downstream from the meter are required to ensure optimal accuracy of ±2%. A ±1% accuracy is available with a Factory consultation prior to order.

APPLICATIONS

- Irrigation
- Center Pivot Systems
- Well Monitoring
- Water Distribution
- Chemigation
- Livestock Waste Lagoons
- Surface Water
- Golf Courses and Park Management

McCROMETER
www.mccrometer.com

3255 WEST STETSON AVENUE • HEMET, CALIFORNIA 92545 USA
TEL: 951-652-6811 • 800-220-2279 • FAX: 951-652-3078

Printed In The U.S.A.
Lit. # 30121-41, Rev. 1.8 / 4-2-18

Description and Operating Specifications	
Pipe Sizes	4", 6", 8", 10", 12"
Body Style	Saddle mount
Pressure	150 psi (10.3 bar) working pressure
Accuracy	± 2% with default calibration ± 1% with custom Factory calibration
Conductivity	Minimum conductivity of 50µS/cm, for lower conductive fluid consult Factory.
Empty Pipe Detection	Hardware/Software, conductivity-based (optional)
Electrical connects	Optional shielded cable for 10-32VDC/4-20 mA output Optional shielded cable for pulse out
Pipe Run Requirements	3D Upstream / 1D Downstream
Display and Measurement	
Display	2-Line LCD display (no backlight), 16 characters per line • Non-volatile memory • Anti-reverse totalizer (standard) • Total (to 9 digits of precision) • Flow Rate and Velocity (to 5 digits of precision) • Two alarms: low battery and empty pipe (optional) To preserve battery life, a push-button on the housing activates the display.
Digits	5 Rate, 9 Total
Units	US gallons, US gallons x1000, US gallons x1,000,000, cubic inches, cubic feet, cubic feet x1000, cubic centimeters, cubic decimeters, milliliters, liters, deciliters, hectoliters, kiloliters, megaliters, cubic meters, cubic meters x1000, acre feet, acre inches, imperial gallons, imperial gallons x1000, imperial gallons x1,000,000, standard barrels, oil barrels, and miner inch days. Rate scales: seconds, minutes, hours, and days.
Power	
Battery	Standard: three 3.6V lithium thionyl chloride ($Li\text{-}SOCl_2$) D size batteries. Batteries are field replaceable
DC Power	Linear power supply 10-35VDC 2.4W
Battery Life	Five-year expected battery life (three-year battery warranty)
Environmental	
Operating Temperature	-4° to 140°F (-20° to 60°C) sensor
Storage Temperature	-40° to 149°F (-40° to 65°C) **Note:** During freezing conditions and when meter is not in use, sensor must be removed from pipe and stored in dry conditions. ***NOTE: Damage to the sensor caused by allowing the sensor freeze in the pipe is not covered by the warranty.***
Operating Pressure	150 PSI
Water Impermeability	IP68 (submersible sensor)
Outputs	
Pulse Output	Digital pulse (open collector) output for volumetric and/or alarm • Battery power only: 1 pulse output maximum • DC powered version: 2 pulse outputs available
Analog Output	4-20mA (not galvanically separated from the power supply). DC powered option only.
Options and Accessories	
	• Data Logger - included as standard with five years of data storage at default (12hr) interval. (Cable sold separately) • Epoxy coated carbon steel flanged spool piece • DC power w/battery backup: (Pulse & 4 20mA Out) • Annual verification / calibration • Stainless Steel ID tag
Materials	
Sensor Body	Fusion bonded epoxy coated stainless steel (316)
Electrodes	Stainless steel (316)
Saddle Mount	Stainless steel (304)
Saddle Hardware	Stainless steel (304)
Electronic Housing	IP-67 Certified diecast aluminum, powder coated enclosure w/ tamper resistant seal, 6½" x 6½" x 4⅜" tall
O-Ring	SBR rubber D-ring
Boot Cover	EPDM rubber

McCROMETER
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3255 WEST STETSON AVENUE • HEMET, CALIFORNIA 92545 USA
TEL: 951-652-6811 • 800-220-2279 • FAX: 951-652-3078
Printed In The U.S.A.
Lit. # 30121-41, Rev. 1.8 / 4-2-18

MODEL UM06 AND UM08

ULTRA MAG® ELECTROMAGNETIC FLOW METER

150 PSI FLANGED TUBE METER, SIZES 2" thru 48"

300 PSI FLANGED TUBE METER, SIZES 2" thru 48"

UltraLiner

Ultra Mag And SIGNAL CONVERTER

DESCRIPTION

MODELS UM06 AND UM08 FLANGED TUBE ULTRA MAG® meters are manufactured to the highest standard available for magmeters. They incorporate microprocessor technology to offer very low flows and broad range ability. The flanged end tube design permits use in a wide range of applications with up to 300 PSI working pressure. Flanged ends are:

- Steel AWWA Class "D" flat face flanges (150 PSI) for UM06
- Steel AWWA Class "F" raised face flanges (300 PSI) for UM08 (2", 3", and ≥14")
- Steel ANSI 300 lb. Raised Face Flanges for UM08 (4" - 12")

The fabricated tube is stainless steel with steel or stainless steel flanges and is lined with UltraLiner™, an NSF approved, fusion bonded epoxy material.

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 pipe of liquid for proper operation. Fluid must be grounded to the downstream flange of the sensor either via internal grounding electrodes (4 - 12") or using McCrometer 316 SS Grounding Rings. For best performance, grounding rings are recommended for all sizes. Any 90 or 45 degree elbows, valves, partially opened valves, etc. should not be placed closer than one pipe diameters upstream and zero pipe diameters downstream. All blending and chemical injection should be done early enough so the flow media is thoroughly mixed prior to entering the measurement area.

SIGNAL CONVERTER: The signal converter is the reporting, input and output control device for the sensor. The converter allows the measurements, functional programming, control of the sensor and data recording to be communicated through the display and inputs/outputs. The microprocessor-based signal converter has a curve-fitting algorithm to improve accuracy, dual 4-20mA analog outputs, an optional RS485 communication port, an 8 line graphical backlit LCD display with 3-key touch programming, and a rugged enclosure that meets IP67. In addition to a menu-driven self-diagnostic test mode, the converter continually monitors the microprocessor's functionality. The converter will output rate of flow and total volume. The converter also comes standard with password protection and many more features.

ISOLATED POWER AND SIGNAL: The power and signal between the converter and sensor are isolated and placed in separate cables giving superior resistance to electrical signal noise compared to single cable designs. An added benefit from the dual cable design is a maximum cable length of up to 500ft.

OPTIONAL:

DC powered converter (10-35 VDC, 21 W)
Meter mounted converter
Extended warranty
Hastelloy® electrodes
ANSI or DIN flanges
Quick Connect cable fittings
Special lay lengths, including ISO standard lay lengths
Converter sun shield
Modbus Protocol RS485 converter; HART® Converter; Profibus Converter (No Dual 4-20mA on HART & Profibus); Smart Output™ (Sensus or Itron compatible); Panel mount converter (Not CSA approved); Battery or battery-solar powered converter (Not CSA approved, ±1% accuracy)

SPECIFICATIONS

WARRANTY: 2 Years

ACCURACY TESTS: 5-point wet flow calibration of every complete flow tube with its signal converter. If desired, the tests can be witnessed by the customer. The McCrometer test facilities are traceable to the National Institute of Standards & Technology. Uncertainty relative to flow is ±0.15%

ACCURACY: Plus or minus 0.5% of actual flow (battery powered is ±1% of flow)

IMPORTANT NOTICE ON FLOW METER ACCURACY: The flow meter, the cable and the electronics are factory calibrated for accuracy as a single unit. Changing the cable length with the Splice Kit changes the accuracy of the meter and invalidates the calibration certificate.

REPEATABILITY: ±0.05% or ±.0008ft/s (±0.25mm/s), whichever is greater

HEAD LOSS: None. No obstruction in line and no moving parts

PRESSURE RANGE: 150 PSI maximum working pressure (UM06); 300 PSI maximum working pressure (UM08)

TEMPERATURE RANGE:

Sensor Operating: -10 to 60°C (14 to 140°F)
Sensor Storage: -15 to 60°C (5 to 140° F)
Electronics: Operating and storage temperature: -20° to 60° C (-4° to 140° F)

VELOCITY RANGE: .2 to 32 FPS

BI-DIRECTIONAL FLOW: Forward and reverse flow indication and forward, reverse, net totalization are standard with all meters

CONDUCTIVITY: 5 µs/cm

LINER: UltraLiner NSF approved, fusion bonded epoxy

ELECTRODES: Type 316 stainless steel, others optional

POWER SUPPLY: AC: 100-240VAC/45-66 Hz (20W/25VA), DC: 10-35VDC (21W), battery (four lithium D cell batteries), five-year estimated life, solar (5W panel). AC, DC, battery, or battery & solar must be specified at time of ordering.

OUTPUTS: Dual 4-20mA Outputs (Not available for Profibus, HART, or battery converters): Galvanically isolated and fully programmable for zero and full scale (0-22mA).

Four separate digital programmable outputs: open collector transistor usable for pulse, frequency, or alarm settings.

- Volumetric Pulse
- Flow Rate (Frequency)
- Directional Indication
- High/Low Flow Alarms
- Hardware Alarm
- Empty Pipe
- Range Indication

SENSOR CABLE LENGTHS:

Standard: 25' McCrometer supplied submersible cable with each remote mount unit.
Optional: Up to 500 feet, or 50 feet max for battery powered.
Quick connect: Available in standard cable lengths: 25', 50', 75', 100', 125', 150', 175, 200', and 500'. Custom cable lengths at additional cost.

CONVERTER/SENSOR SEPARATION: ≤ 500 feet; for longer lengths consult factory

EMPTY PIPE SENSING: Zero return when electrodes are uncovered

ALARMS: Programmable alarm outputs

DIGITAL TOTALIZER: Cubic Meter; Cubic Centimeter; Milliliter; Liter; Cubic Decimeter; Decaliter; Hectoliter; Cubic Inches; US Gallons; Imperial Gallons; Cubic Feet; Kilo Cubic Feet; Standard Barrel; Oil Barrel; US Kilogallon; Ten Thousands of Gallons; Imperial Kilogallon; Acre Feet; Megagallon; Imperial Megagallon; Hundred Cubic Feet, Megaliters

IP RATINGS:

Metering Tube: NEMA 6P/IP68 with remote converter
Die cast aluminum converter: IP67
Panel mount converter: IP65

SENSOR SUBMERSIBILITY DEPTH:

With standard strain relief cable: 9 m (30 ft.)
With optional quick connect: 1.8 m (6 ft.)

CERTIFICATIONS:

- CE Certified (Converter only)
- Listed by CSA to 61010-1: Certified by CSA to UL 61010-1 and CSA C22.2 No.61010-1-04
- ISO 9001:2015 certified quality management system

McCROMETER
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WATER SPECIALTIES PROPELLER METER

PROPELLER METERS
ACCURACY AND HEAD LOSS CURVES

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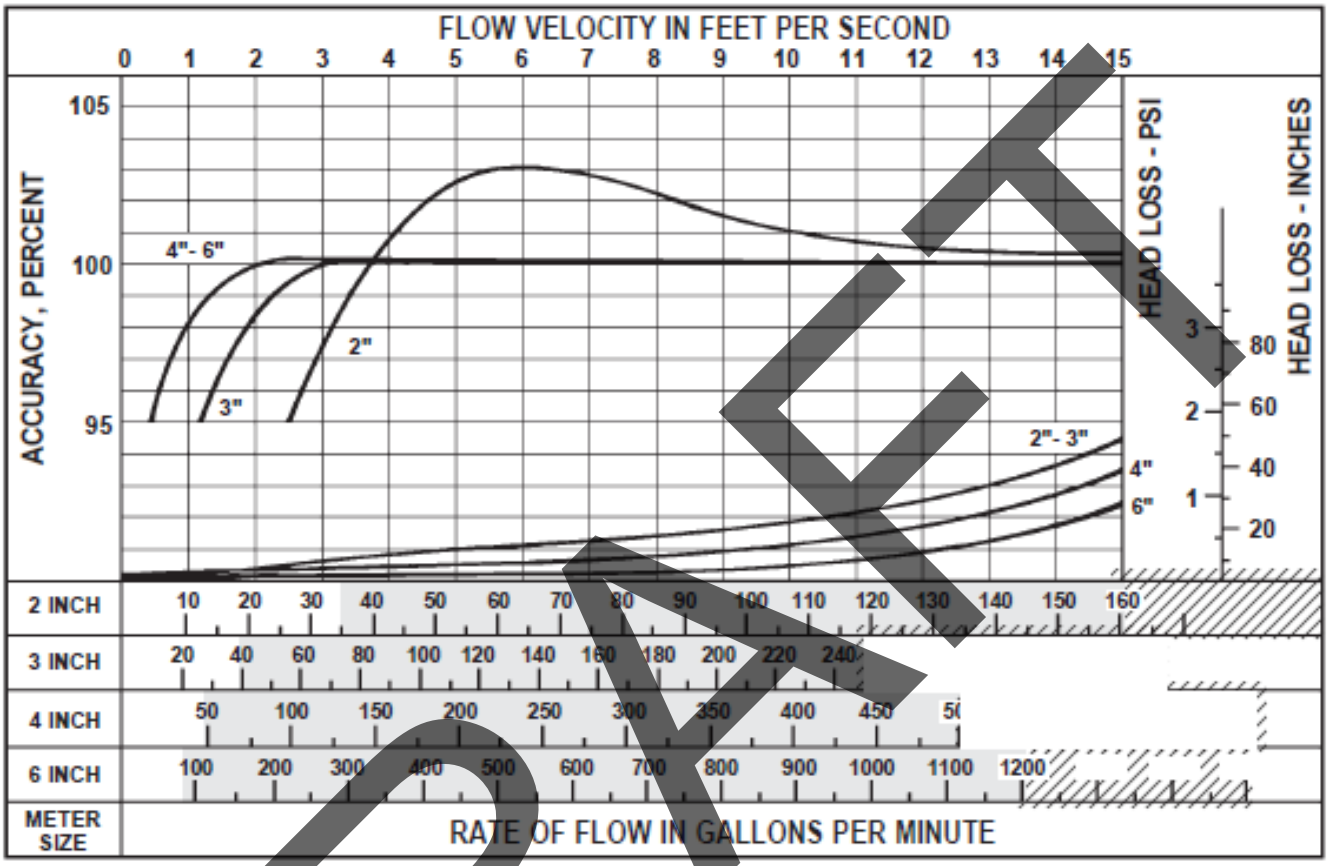
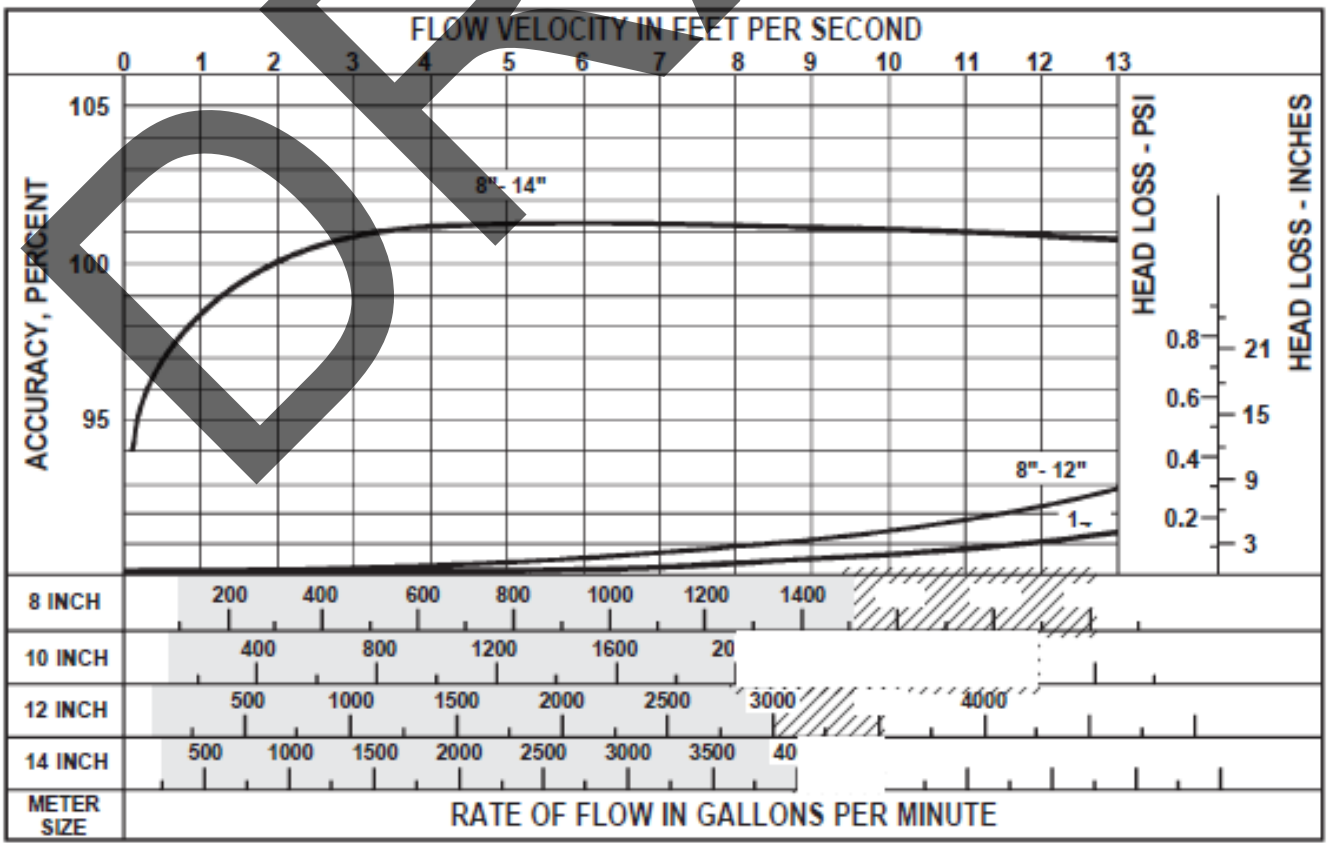
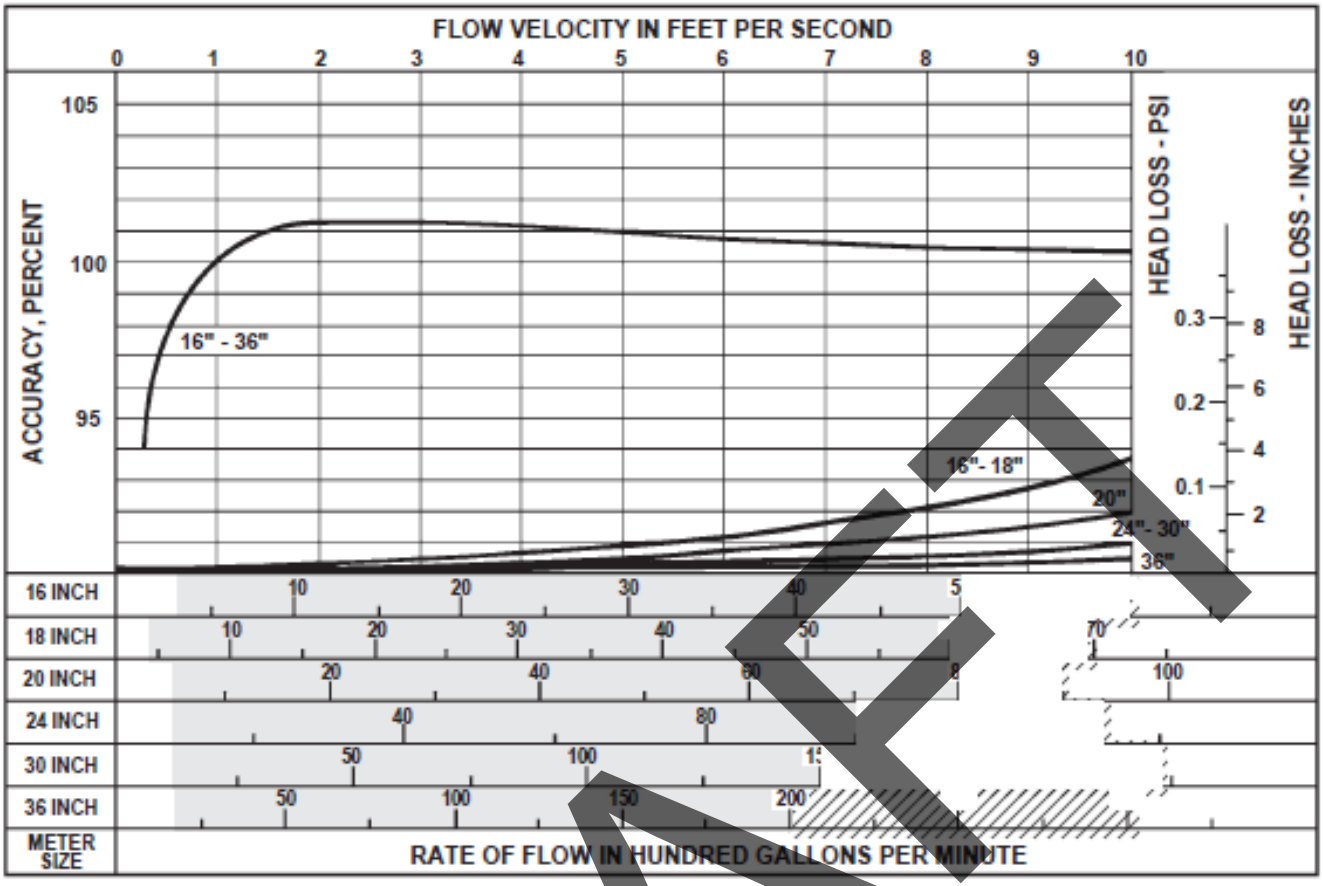
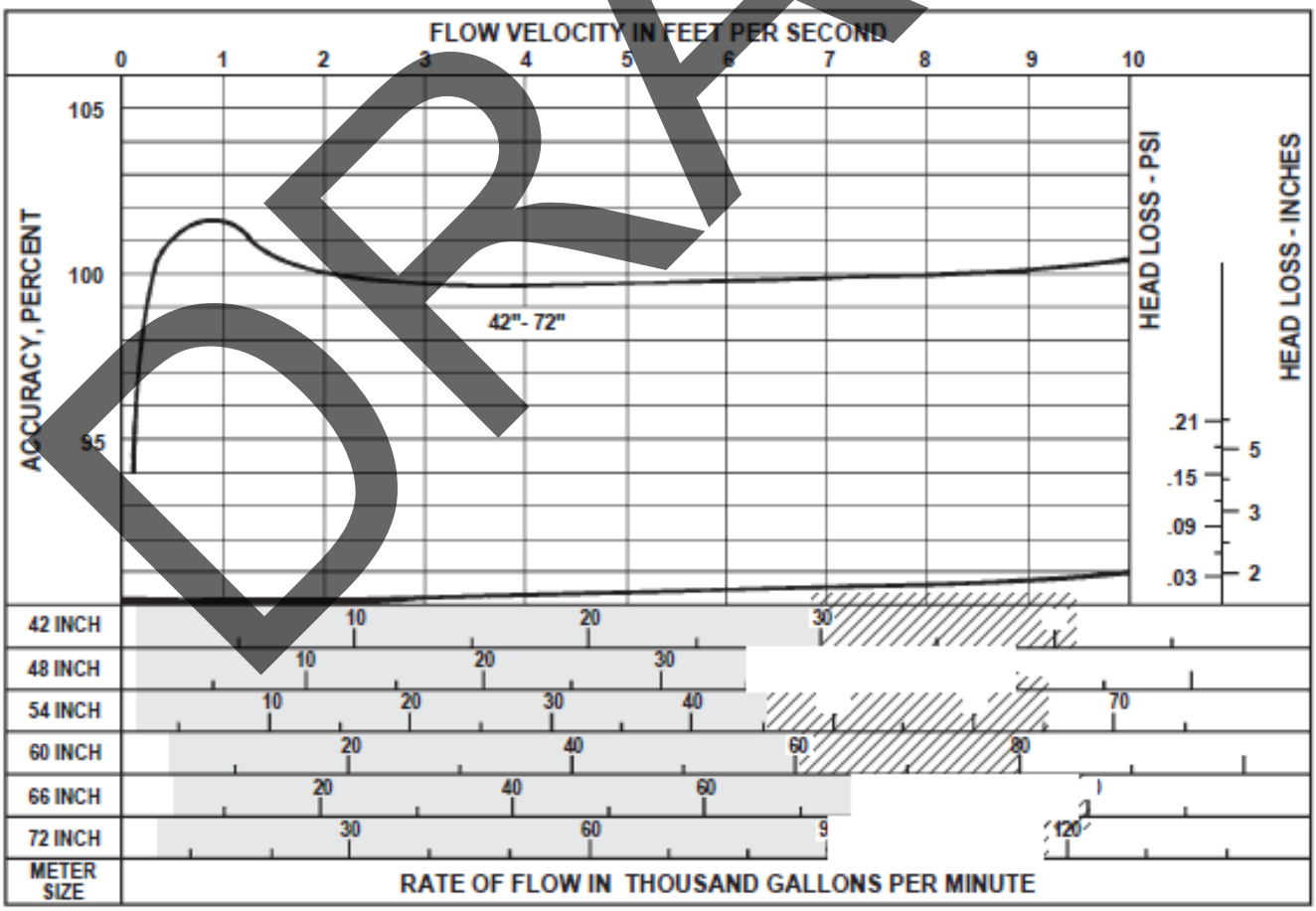
Visit our Website: www.mccrometer.com









MAXIMUM AND MINIMUM FLOWS

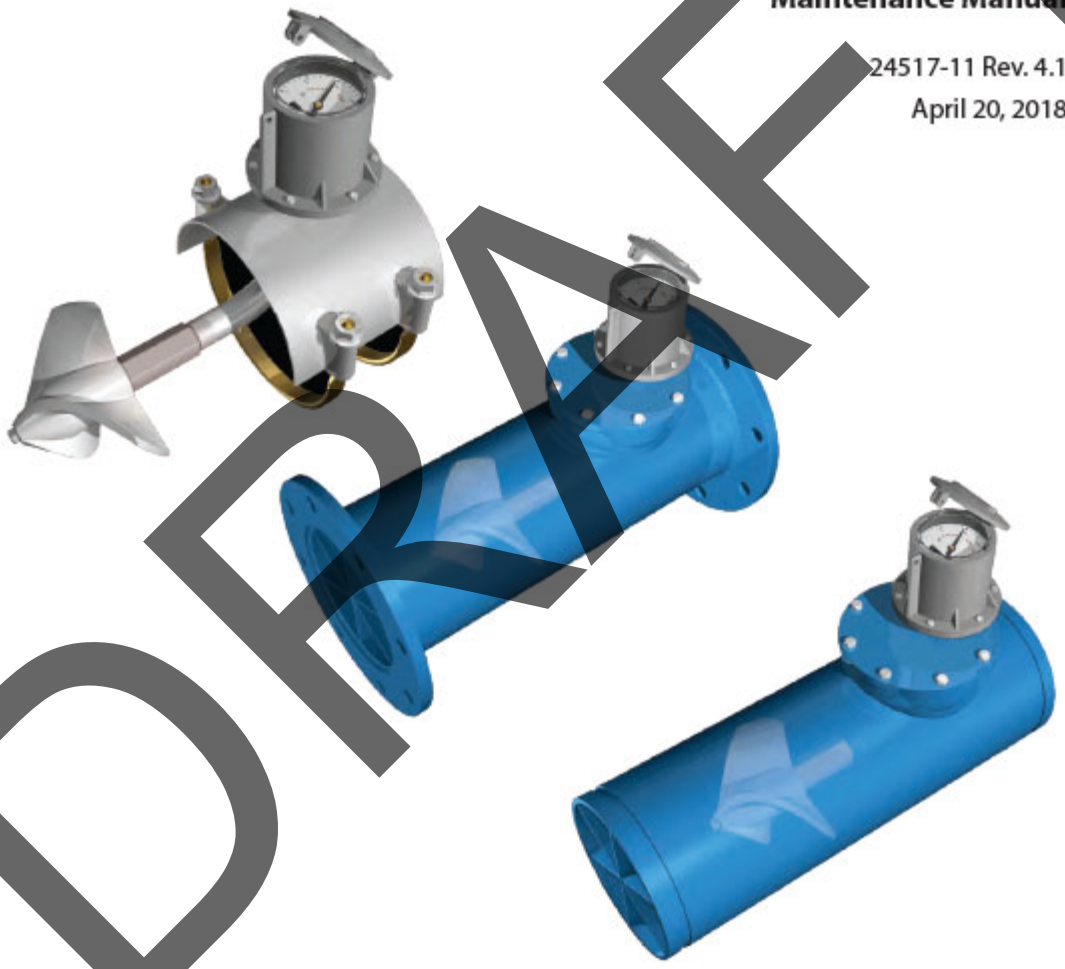
Mc Propeller Meter

Mc Propeller Flowmeters

Installation, Operation And Maintenance Manual

24517-11 Rev. 4.1

April 20, 2018



McCROMETER

2.0 SPECIFICATIONS

The measuring element of a propeller flowmeter consists of a rotating device, called a rotor or propeller. Positioned in the center of the flowstream, the propeller rotates at a rate proportional to the velocity of the fluid through the flowmeter. This rotation can be transmitted mechanically to a register assembly and the fluid's volumetric flowrate and accumulated volume can then be displayed.

2.1 General Specifications

SIZES AVAILABLE	2" to 96"
FLOWRATES AVAILABLE	40 to 75,000 GPM
TURNDOWN	up to 15:1
ACCURACY	±2%
REPEATABILITY	±0.25%
RATED PRESSURE	150 PSI to 300 PSI
RATED TEMPERATURE	160° F to 180° F

DESCRIPTIONS:

TURNDOWN: Propeller meters are specified to work within a certain range of flowrates. Turndown is the ratio of the maximum flowrate to the minimum flowrate of the meter. A typical turndown of an 8" meter is 15:1. (e.g., max. flow = 1500 gpm to min. flow = 100 gpm)

ACCURACY: Accuracy is the relation between the volume shown on the meter's totalizer and the actual volume of fluid which has passed through the meter. McCrometer guarantees that the meter will report within ±2% of the actual flow if it is normally operated between its minimum and maximum rates of flow.

REPEATABILITY: Flowmeter repeatability is the ability of a meter to reproduce a measurement under similar conditions. This is not by itself a measure of accuracy, but rather a component of the meter's total accuracy. McCrometer propeller meters have a repeatability of ±0.25%.

PRESSURE: The pressure rating for standard propeller meters is 150 PSI. This pressure rating refers to the constant line pressure in the pipe. Some models can be rated up to 300 PSI. Higher pressures are available on special request.

TEMPERATURE: The temperature rating for standard propeller meters is 160° F constant temperature. This temperature rating refers to fluid temperature. Most standard models can be upgraded to 180° F constant temperature on special request.

McCROMETER
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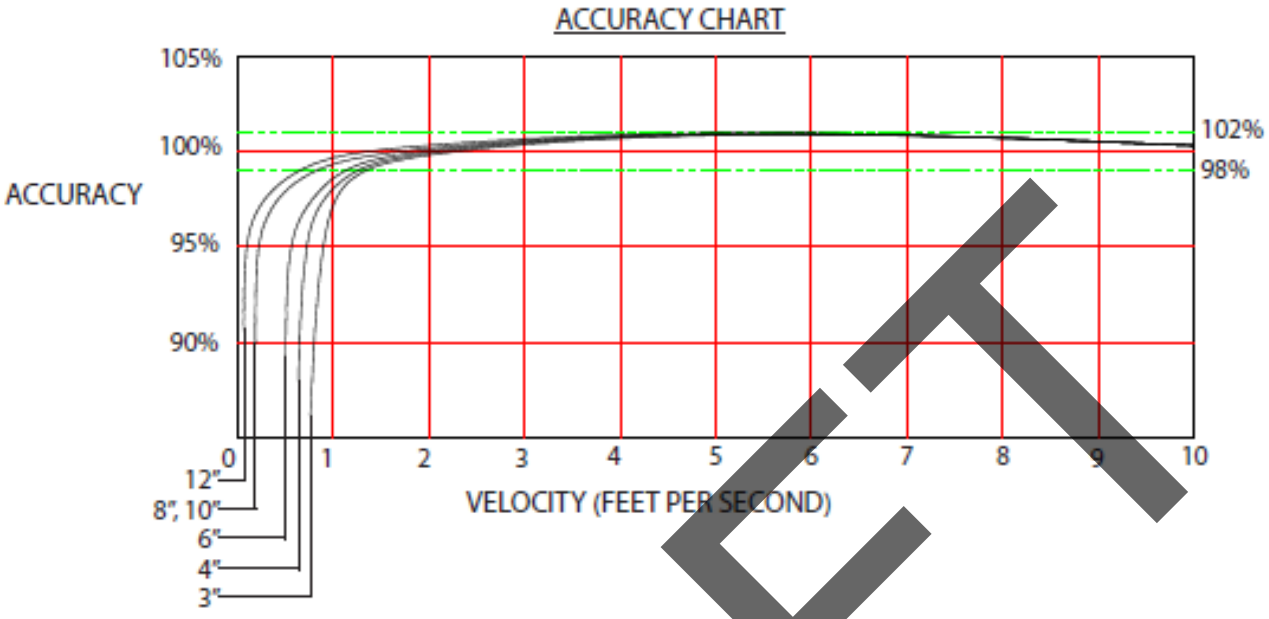
2.4 Accuracy

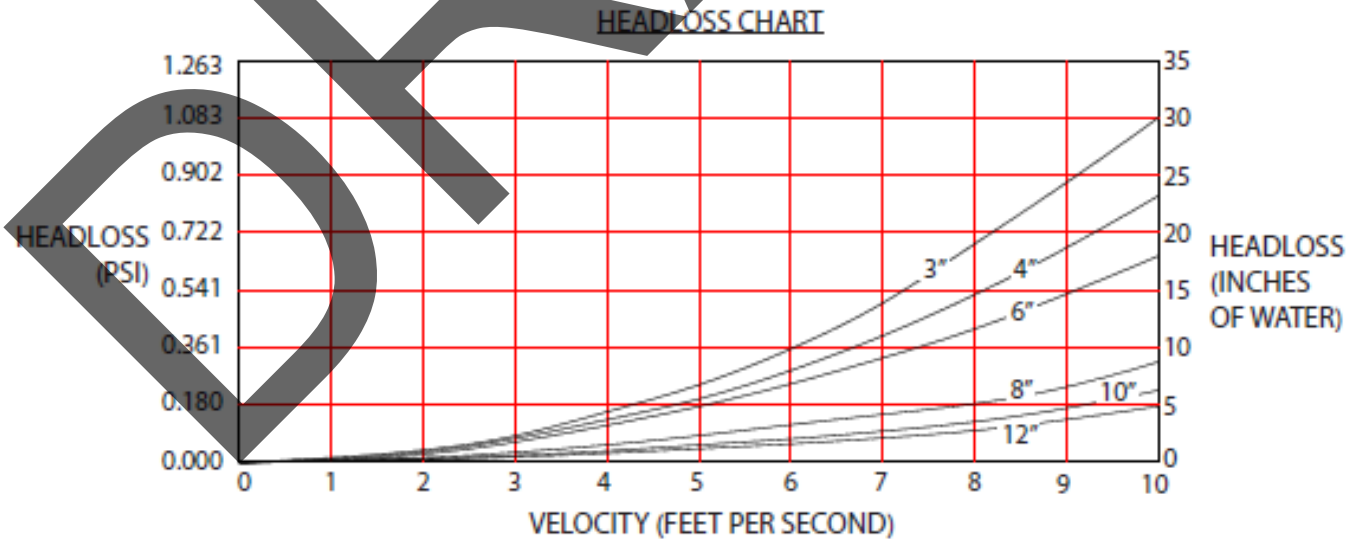


Standard flowrates for McCrometer propeller meters are shown below. Readings are guaranteed accurate within ±2% in these flowrates. Please note that over 80 percent of the meter's flow range, the accuracy is better than ±1%.

Nominal Meter Size	2"	2.5"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
Minimum Flow(U.S.GPM)	40	40	40	50	90	100	125	150	250	275	400	475	700
Maximum Flow(U.S.GPM)	250	250	250	600	1200	1500	1800	2500	3000	4000	5000	6000	8500
Dial Face Range	250	250	250	800	1300	2500	3000	4000	6000	8000	10000	10000	15000

2.5 Headloss

Headloss refers to the fluid pressure lost due to the meter. Propeller meters have very low permanent headloss as seen in the chart below.



Nominal Meter Size	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
Max. Headloss (in. H_20 column)	30	23	17	7	4	3	2	2	2	1	1

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Overview

Benefits

- IP68/NEMA 6P rating with tamper proof
- Flexible power supply - internal or external battery pack or mains power supply with battery back-up possibilities
- No moving parts in a robust construction means less wear and tear
- Up to 8 years maintenance-free operation in typical application
- Connectable to AMR systems
- Adaptor for conduit installation to provide a clean, protected pathway for device cables

Technical specifications

Meter	
Accuracy	± 0.8 % ± 2.5 mm/s ± 0.4 % ± 2.5 mm/s NMI (class 2.5)
Low flow cut-off (default)	1.0 %
Media conductivity	Clean water > 20 µs/cm
Temperature	
Ambient	-20 ... +60 °C (-4 ... +140 °F)
Media	0 ... 70 °C (32 ... 158 °F)
Storage	-40 ... +70 °C (-40 ... +158 °F)
Enclosure rating	
Remote sensor	IP68 to EN 60529/NEMA 6P; 10 m H_2O cont.
Compact version	IP68 to EN 60529/NEMA 6P; 3 m H_2O for six months
Approvals	
Drinking water approvals	• ANSI/NSF 61[1] (cold water) USA • WRAS (BS 6920 cold water) UK
Custody transfer approval	NMI 10 Australia
Sensor material	Carbon steel ASTM A 105, with corrosion resistant two-component epoxy coating (150 µm/300 µm) Corrosivity category C4, according to ISO 12944-2
Conformity	IEC/EN 61326
Flanges	
EN 1092-1 (DIN 2501) PN 10 drilled pattern	DN 50 ... 600 (2" ... 24") (max. pressure 7 bar (101.5 psi))
ANSI 16.5 Class 150 drilled pattern	2" ... 24" (max. pressure 7 bar (101.5 psi))
AS 2091-1 Table D drilled pattern	DN 50 ... 600 (2" ... 24") (max. pressure 7 bar (101.5 psi))
AS 2129	DN 25, DN 40, DN 125 (1", 1½", 5")
AS 4087 PN 16	DN 50 ... DN 1200 (2" ... 48")
Excitation frequency	
Battery-powered	DN 50 ... 600 (2" ... 24"): 1/15 Hz DN 700 ... 1200 (28" ... 48"): 1/60 Hz
Mains-powered	DN 50 ... 600 (2" ... 24"): 3.125 Hz DN 700 ... 1200 (28" ... 48"): 1.5625 Hz
Liner	Ebonite
Electrodes	Stainless steel

[1] Including Annex G

SPARLING INSTRUMENTS, INC.

PRODUCT DATA SHEET

SERIES 100 METERS AND ACCESSORIES

Series 190 Totalizers, Indicators and Transmitters for Mechanical Drive Propeller Flowmeters FT190, FT191, FT193

PDS-190
Issue Date: Feb. 1995
Supercedes: Nov. 1993

DESCRIPTION

The Series 190, 191 and 193 are used in combination with and mounted on Sparling propeller flowmeters to provide mechanical totalization (registration), mechanical indication and a variety of pulse and/or 4-20 mA outputs.

FT190—(Formerly Model 245)
Provides mechanical totalization (registration), mechanical rate indication.

FT191—(Formerly Model 249)
Provides mechanical totalization (registration).

FT193
Provides mechanical totalization and both a true two-wire 4-20 mA output and a true two-wire scaled electronic pulse output.

TABLE 1
READOUT AND OUTPUT CAPABILITIES

Type	Mechanical Totalization	Mechanical Rate Indication	Outputs	4-20 mA (Two Wire) ①	Scaled Electronic Pulse Rate	Approx. Shipping Weight
FT190 (FORMERLY MODEL 245)	YES	YES	NO	NO	NO	20 lbs.
FT191 (FORMERLY MODEL 249)	YES	NO	NO	NO	NO	15 lbs.
FT193	YES	NO	YES	Standard	Standard	20 lbs.

① Full scale flow rate for 100% signal output must occur at full scale flow rate shown in Table 4 or greater flow rate
② Available in optional "P", "B" and "E" switch outputs.

Sparling Instruments, Inc.
4097 N. Temple City Blvd. • El Monte, CA 91731-1089 USA
Phone (626) 444-0571 • Fax (626) 444-2314

ISO 9001 DNV

SPECIFICATIONS:

MECHANICAL RATE INDICATOR

Scale Length	6 inches
Accuracy	5% full scale
Available Scales	See Table 4

MECHANICAL TOTALIZER

Number of digits	6
Accuracy	±2% actual flow
Units of registration	See table 2
Test Hand	One full rotation per least significant digit of totalizer.

4-20 mA OUTPUT (FT193 ONLY):

True two-wire requiring external power supply

External Power Supply	18 to 30 Vdc
Output Load Capability	See power supply vs. output load curve
Reverse polarity protection	35 Vdc (max.)
Accuracy	0.5% of full scale

SCALED ELECTRONIC PULSE RATE (FT193 ONLY)

Two-wire isolated solid state switch (photocoupled)

External power supply	10 Vdc to 30 Vdc
Pulse amplitude	0 Vdc (off) to external supply voltage minus 3 Vdc (on)
Output load	4 watts maximum
Pulse on time	100ms
Pulse output registration	Equal to mechanical totalizer least significant digit
Accuracy	2% actual flow

ALL OUTPUT CONNECTIONS:

Pigtail leads through 1/2 NPT grommeted or potted sealed conduit connection.

MATERIAL OF CONSTRUCTION:

Painted Die Cast Aluminum

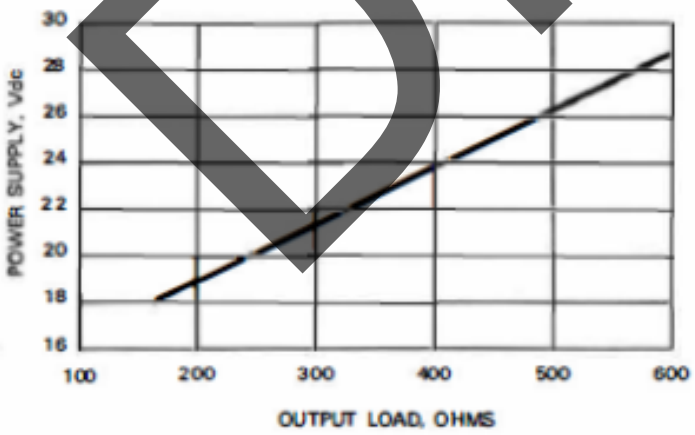
ENCLOSURE RATING ..... NEMA 3R

ELECTRICAL RATING ..... General Purpose

AMBIENT TEMPERATURE LIMITS:

+30F (-1C) to +130F (+55C) – FT193

4 to 20mA OUTPUT
POWER SUPPLY VS. OUTPUT LOAD



SERIES 190 PROPELLER FLOWMETER TRANSMITTERS
MODEL NUMBER SCHEDULE

Table 1 - Base Model Number

FT190 -	Mechanical Flow Totalizer and Indicator
FT191 -	Mechanical Flow Totalizer
FT193 -	Mechanical Flow Totalizer with 4-20 mA and Scaled Pulse Output

Table 2 - Outputs

000 -	No Outputs (FT190 and F191 Only)
111 -	4-20 mA and Scaled Pulse Rate (FT 193 Only)

Table 3 - Mounting

2	For Mounting on Meterhead on Same Order
3	Replacement for Existing Meterheads

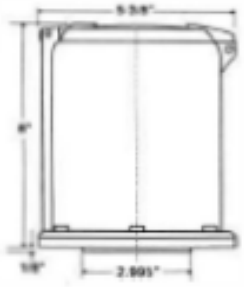
FT19__-___-__

ORDERING INFORMATION

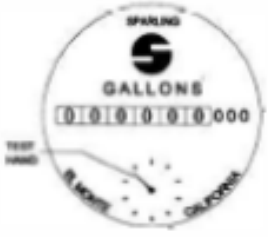
1. Construct model number by selecting one code for each category.
2. If ordered with new meter-head, state base model number and size of meter-head. If replacement for existing meterhead, state serial number of existing meterhead.
3. Provide following information from Tables 2 & 3.
   a. Mechanical indicator scale and units.
   b. Mechanical totalizer registration and units.

FT190 (Formerly 245)
Indicator/Totalizer

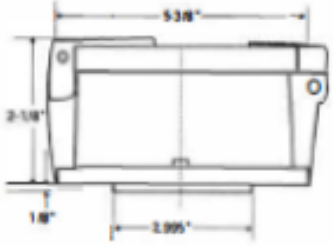
No Outputs



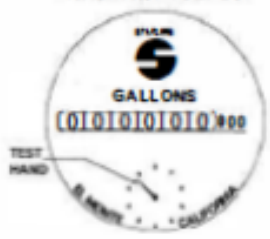
FT191 (Formerly 249)
Totalizer

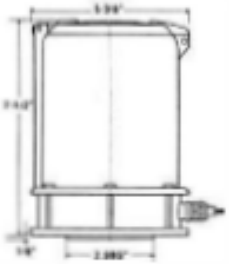


No Outputs



FT193
Transmitter/Totalizer





WaterMaster optimized full-bore meter (FEV) / full-bore meters (FEF, FEW) flow performance – m^3/h

			Standard Calibration – 0.4 % Class 2			High Accuracy Calibration – 0.2 % Class 1		
DN	Q4	Q3	$Q_{0.4\%}$	Q2	Q1	$Q_{0.2\%}$	Q2	Q1
10	3.1	2.5	0.167	0.013	0.008	0.31	0.02	0.012
15	7.88	6.3	0.42	0.032	0.02	0.79	0.05	0.03
20	12.5	10	0.67	0.05	0.032	1.25	0.08	0.05
25	20	16	1.1	0.08	0.05	2	0.13	0.08
32	31.25	25	1.67	0.13	0.08	3	0.20	0.13
40*	50	40	4.2	0.2	0.13	6	0.32	0.2
50*	79	63	4.2	0.32	0.20	7.9	0.5	0.32
65*	125	100	6.7	0.5	0.32	12.5	0.8	0.5
80*	200	160	10.7	0.81	0.51	16	1.3	0.8
100*	313	250	16.7	1.3	0.79	25	2	1.25
125*	313	250	16.7	1.3	0.79	25	2	1.25
150*	788	630	42	3.2	2.0	63	5	3.2
200*	1,250	1,000	67	5.1	3.2	100	8	5
250	2,000	1,600	107	8.1	5.1	160	13	8
300	3,125	2,500	167	12.7	7.9	250	20	12.5
350	5,000	4,000	267	20.3	12.7	400	32	20
400	5,000	4,000	267	20.3	12.7	400	32	20
450	7,875	6,300	420	32	20	630	50	32
500	7,875	6,300	420	32	20	630	50	32
600	12,500	10,000	667	51	32	1000	80	50
700	20,000	16,000	1600	102	64	1600	160	100
750	20,000	16,000	1600	102	64	1600	160	100
30 in (750)	20,000	16,000	1600	102	64	1600	160	100
800	20,000	16,000	1600	102	64	1600	160	100
900	31,250	25,000	2500	160	100	2500	250	156
1000	31,250	25,000	2500	160	100	2500	250	156
42 in	31,250	25,000	2500	160	100	2500	250	156
1100	31,250	25,000	2500	160	100	2500	250	156
1200	50,000	40,000	4000	256	160	4000	400	250
1350	78,750	63,000	6300	403	252	6300	630	394
1400	78,750	63,000	6300	403	252	6300	630	394
1500	78,750	63,000	6300	403	252	6300	630	394
60 in (1500)	78,750	63,000	6300	403	252	6300	630	394
1600	78,750	63,000	6300	403	252	6300	630	394
1650	78,750	63,000	6300	403	252	6300	630	394
1800	125,000	100,000	10000	640	400	10000	1000	625
1950	125,000	100,000	10000	640	400	10000	1000	625
2000	125,000	100,000	10000	640	400	10000	1000	625
2200	200,000	160,000	16000	1024	640	16000	1600	1000
2400	200,000	160,000	16000	1024	640	16000	1600	1000

* OIML R49 Certificate of Conformance to Class 1 and Class 2, with OIML R49 and MID versions available.

Note. OIML R49–1 allow Class 1 only for meters with $Q_3 \geq 100$ m^3/h. Meters outside this range have been tested and conform to Class 1.

WaterMaster optimized full-bore meter (FEV) / full-bore meters (FEF, FEW) flow performance – gal/min

			Standard Calibration 0.4 % Class 2			High Accuracy Calibration 0.2 % Class 1		
NPS/NB (DN)	Q4	Q3	$Q_{0.4\%}$	Q2	Q1	$Q_{0.2\%}$	Q2	Q1
3/8 (10)	13.8	11	0.73	0.06	0.035	1.38	0.09	0.053
1/2 (15)	34.7	27.7	1.85	0.14	0.09	3.48	0.22	0.14
3/4 (20)	55	44	2.94	0.22	0.14	5.5	0.35	0.22
1 (25)	88	70.4	4.7	0.35	0.22	8.8	0.57	0.35
1 1/4 (32)	137.6	110	7.3	0.57	0.35	13.2	0.88	0.57
1 1/2 (40)	220	176	18.5	0.89	0.56	26.4	1.41	0.88
2 (50)	347	277	18.5	1.41	0.88	34.7	2.22	1.39
2 1/2 (65)	550	440	29.4	2.24	1.40	55.0	3.52	2.20
3 (80)	881	704	47.0	3.58	2.24	70.4	5.64	3.52
4 (100)	1,376	1,101	73.4	5.59	3.49	110	8.81	5.50
5 (125)	1,376	1,101	73.4	5.59	3.49	110	8.81	5.50
6 (150)	3,467	2,774	185	14.1	8.81	277	22.2	13.9
8 (200)	5,504	4,403	294	22.4	14.0	440	35.2	22.0
10 (250)	8,806	7,045	470	35.8	22.4	704	56.4	35.2
12 (300)	13,759	11,007	734	55.9	34.9	1,101	88.1	55.0
14 (350)	22,014	17,611	1,174	89.5	55.9	1,761	141	88.1
16 (400)	22,014	17,611	1,174	89.5	55.9	1,761	141	88.1
18 (450)	34,573	27,738	1,849	141	88.1	2,774	222	139
20 (500)	34,573	27,738	1,849	141	88.1	2,774	222	139
24 (600)	55,036	44,029	2,935	224	140	4,403	352	220
27/28* (700)	88,057	70,446	7,045	451	282	7,045	704	440
30 (750)	88,057	70,446	7,045	451	282	7,045	704	440
32 (800)	88,057	70,446	7,045	451	282	7,045	704	440
36 (900)	137,590	110,072	11,007	704	440	11,007	1,100	688
39/40* (1000)	137,590	110,072	11,007	704	440	11,007	1,100	688
42 (1050)	137,590	110,072	11,007	704	440	11,007	1,100	688
44 (1100)	137,590	110,072	11,007	704	440	11,007	1,100	688
48 (1200)	220,143	176,115	17,611	1,127	704	17,611	1,761	1,101
52 (1350)	346,726	277,381	27,738	1,775	1,110	27,738	2,773	1,733
54 (1400)	346,726	277,381	27,738	1,775	1,110	27,738	2,773	1,733
60 (1500)	346,726	277,381	27,738	1,775	1,110	27,738	2,773	1,733
66 (1650)	346,726	277,381	27,738	1,775	1,110	27,738	2,773	1,733
68 (1650)	346,726	277,381	27,738	1,775	1,110	27,738	2,773	1,733
77 (1800)	550,358	440,287	44,029	2,818	1,761	44,029	4,403	2,752
77 (1950)	550,358	440,287	44,029	2,818	1,761	44,029	4,403	2,752
78 (2000)	550,358	440,287	44,029	2,818	1,761	44,029	4,403	2,752
78 (2000)	550,358	440,287	44,029	2,818	1,761	44,029	4,403	2,752
84 (2200)	880,573	704,459	70,446	4,509	2,818	70,446	7,045	4,403
96 (2400)	880,573	704,459	70,446	4,509	2,818	70,446	7,045	4,403

*Size is dependant on flange specification

WaterMaster reduced-bore meter (FER) flow performance – m^3/h (gal/min)

Size		Q4	Q3	Class 2 specification				Class 1 specification			
				$Q_{0.4\%}$	Q2	Q1	R	$Q_{0.2\%}$	Q2	Q1	R
mm	in.	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)		m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	m^3 / h (Ugal / min)	
40	1 1/2	31 (138)	25 (110)	0.83 (1.05)	0.063 (0.28)	0.04 (0.18)	630	1.7 (7.48)	0.1 (0.44)	0.063 (0.28)	400
50	2	50 (220)	40 (176)	1.0 (4.40)	0.1 (0.44)	0.063 (0.28)	630	2.0 (8.8)	0.16 (0.7)	0.1 (0.44)	400
65	2 1/2	79 (347)	63 (277)	1.6 (7.04)	0.16 (0.7)	0.1 (0.44)	630	3.2 (10.56)	0.25 (1.1)	0.16 (0.7)	400
80	3	125 (550)	100 (440)	2.0 (8.80)	0.25 (1.1)	0.16 (0.7)	630	4.0 (17.6)	0.4 (1.76)	0.25 (1.1)	400
100	4	200 (880)	160 (704)	3.2 (10.56)	0.41 (1.8)	0.25 (1.1)	630	6.4 (28)	0.64 (2.8)	0.4 (1.76)	400
125	5	200 (880)	160 (704)	3.2 (10.56)	0.41 (1.8)	0.25 (1.1)	630	6.4 (28)	0.64 (2.8)	0.4 (1.76)	400
150	6	500 (2200)	400 (1760)	8.0 (35.20)	1.0 (4.4)	0.63 (2.77)	630	16 (70.4)	1.6 (7)	1.0 (4.4)	400
200	8	788 (3470)	630 (2770)	13.0 (57.2)	1.6 (7.04)	1.0 (4.4)	630	25 (110)	2.5 (11)	1.6 (7)	400
250	10	1250 (5500)	1000 (4400)	20 (88)	2.5 (11.01)	1.6 (7)	630	40 (176)	4.0 (17.6)	2.5 (11)	400
300	12	2000 (8810)	1600 (7045)	32 (140.8)	4.1 (18.06)	2.5 (11)	630	64 (281.6)	6.4 (28)	4.0 (17.6)	200
350	14	2000 (8810)	1600 (7045)	32 (140.8)	6.4 (28.18)	4.0 (17.6)	400	64 (281.6)	12.8 (56)	8.0 (35.2)	200
375	15	2000 (8810)	1600 (7045)	32 (140.8)	6.4 (28.18)	4.0 (17.6)	400	64 (281.6)	12.8 (56)	8.0 (35.2)	200
400	16	3125 (13760)	2500 (11007)	50 (220)	10 (44)	6.3 (27.7)	400	100 (440)	20 (88)	12.5 (55)	200
450	18	3125 (13760)	2500 (11007)	50 (220)	10 (44)	6.3 (27.7)	400	100 (440)	20 (88)	12.5 (55)	200
500	20	5000 (22014)	4000 (17610)	80 (352)	16 (70.45)	10 (44)	400	160 (70.4)	32 (141)	20 (88)	200
600	24	7875 (34670)	6300 (27740)	126 (554.4)	25.2 (110.9)	15.8 (70)	400	252 (1108)	50.4 (222)	31.5 (138.7)	200

Attachment D

District Sample Bills

Westlands Water District

Westlands Water District

P O Box 6056, 3130 N Fresno St
Fresno CA 93703-6056
Telephone: Customer Accounting Dept. (559) 241-6250
FAX: (559) 241-6276

Statement of Account
February 1, 2022 - February 28, 2022

Payments received after February 28, 2022 will not appear on this statement.

Sample Bill
Test Address
Test, CA 93710

Account :	
Prior Balance:	-22,452.53
Payments:	0.00
Other Payment Activity:	0.00
Charges:	211.70
Amount Due:	-22,240.83

Please return this portion with your payment - Do Not Staple

Payment is Delinquent after March 25,2022

Delivery Number	Open Date	Close Date	Open Reading	Close Reading	Meter Adjust	Description	Quantity	Unit	Rate	Charges
3243	01/27	02/24	1787	1788		Supplemental Project 2021-22	1	ACFT	1,075.00	1,075.00
						Total Acre-Feet	**1**			
						2020-21 USBR Constr&Int Credit	1	Each		-3,437.61
						2020-21 USBR Constr&Int Refund	1	Each		3,437.61
						Supplemental 2021-22 Usage	-1	ACFT	863.30	-863.30

Summary

Sample **Account:** X X X

Date	Description	Amount
02/01/2022	Prior Balance	-22,452.53
02/10/2022	Payment	0.00
02/28/2022	Charges Detailed Above	211.70
03/25/2022	Amount Due	-22,240.83

Attachment E

Water Shortage Contingency Plan

Westlands Water District

Water Shortage Contingency Plan

Westlands delivers small quantities of untreated, non-potable CVP water which is ultimately used for municipal and industrial (M&I) purposes by Lemoore Naval Air Station and by various rural commercial and residential customers located within the District boundaries. Westlands also conveys raw water to the Cities of Huron and Coalinga, which have separate water supply contracts with the USBR. No water is treated prior to delivery. Westlands has no treatment facilities to provide potable water supplies to these incidental non-agricultural customers.

Westlands suffers under a water short situation even when 100% of the contract amount is available. Allocation and shortage procedures for agricultural water are presented in the Ag Water Management Plan for details on this topic. Even though M&I water supplies have been allocated under the agricultural contract and are currently last to be curtailed in a severe water shortage situation, discussions have occurred recently that propose the possibility of an M&I shortage provision.

The highest level of annual non-agricultural water deliveries has been approximately 6,500 AF. Given the reductions in Westlands' CVP water supplies due to federal regulatory restrictions, it is likely that future non-agricultural water deliveries will be reduced even with modest population increases in the area. This is because reduced agricultural water supplies from the federal government will lead to a reduction in processing-related uses and in the farm labor population living in Westlands.

Estimates of water demand for the next 12, 24, and 36 months should be similar to the non-agricultural water use in an average water year, about 5,000 AF. The "worst case" water supply estimates for the next 12, 24, and 36 months are zero. Currently all non-agricultural water is part of the CVP contract supply. Since the extent of the additional regulatory restrictions is unknown at this time, this possibility cannot be ruled out. However, it has been the policy of the USBR to deliver a minimum of 75 percent of historical M&I use, even when agricultural allocations are considerably less than that. Other supplies from internal groundwater transfers are possible but because of uncertainty that groundwater can meet Title 22 standards and the lack of proximity to District distribution facilities, these supplies cannot be guaranteed.

The CVP allocation to Westlands is shared between agricultural, incidental agricultural and incidental non-agricultural water users. The District's Regulations for the "Allocation of Agricultural Water Within the Westlands Water District" (Appendix A) state "The District's General Manager is authorized to set aside from the total entitlement whether they be from the District's basic contract supply or some other general source of water, for each area of the District the amount of water needed for M&I purposes…." Historically, when the overall water supply has been reduced, the non-agricultural water allocation may not be reduced a similar percentage. In certain cases of severe reduction, it is likely that the District would receive CVP hardship water for health and safety purposes based on the statement of need.

Westlands believes that although there have been no mandatory reductions imposed on the District's non-agricultural customers, water conservation has occurred during periods of reduced supply. This is apparent when comparing non-agricultural water use in full and reduced water supply years (in 2008 and 2011 water use was less than above average in each year). In the unlikely event, that the CVP allocates no water to Delta export water-service contractors and the allocation for M&I use is less than 75 percent of historical use, the District will purchase water from other sources including an Emergency Drought Water Bank. Mandatory rationing will be imposed to the extent that sufficient water cannot be purchased.

The District's General Manager is authorized by the Board of Directors to prohibit the wasteful use of water in Westlands. Westlands' Allocation Regulations state, "The unauthorized using, taking, or wasting of water may subject the water user to civil or criminal prosecution. The General Manager is authorized, after oral or written notice to the water user, if in his judgment, it is advisable and in the best interest of the District, to lock the delivery facilities of, or discontinue water service to, any water user." Additionally, the Westlands' board may adopt a resolution on the use of non-agricultural water.

Each non-agricultural customer is metered according to AWWA standards, according to customer type. The price of non-agricultural water is set at the beginning of each year, based on the anticipated supply, but changes can occur later. District revenues from the sale of incidental non-agricultural water vary annually between one and two percent of the District's overall revenues and have little influence on the District's overall financial resources.

Plan of Action

The General Manager has the authority to discontinue water service if, in his judgment, water is being wasted. Additionally, the Board adopted a resolution prohibiting the waste of M&I water. The District is encouraging other water suppliers (Cities of Huron and Coalinga, and Lemoore Naval Air Station) which receive water through Westlands' distribution system to develop water conservation plans and water shortage contingency plans. Westlands will continue to read all meters in the District on a monthly basis.

Attachment F

Groundwater Management Plan

The District's 1996 Groundwater Management Plan is available on the District website:

https://wwd.ca.gov/wp-content/uploads/2020/02/GWMP1996.pdf

Attachment G

Groundwater Banking Plan

The District currently manages the Groundwater Recharge Credit Program and the Aquifer Storage and Recovery (ASR) Program that allows water users to develop "groundwater credits" for future use. The programs are intended to promote conjunctive use in the Westside Subbasin and to inform the implementation of the Westside Subbasin Groundwater Sustainability Plan (GSP). Recharge Project types that are eligible to receive groundwater credits include percolation ponds/basins, over (flood) irrigation recharge, dry well injection, and Aquifer Storage and Recovery (ASR) wells.

The Groundwater Recharge Credit Program and Aquifer Storage and Recovery Program applications and associated documents are also available on the District's website: https://wwd.ca.gov/water-management/groundwater-management-program/sustainable-groundwater-management-act/

District water users have made investments in Semitropic Water Storage District (SWSD) groundwater bank and water transfers into and out of SWSD which are facilitated by the District. District water users may bank their District CVP allocations in SWSD. Additionally, as a contracting party under water service contracts with USBR, the District seeks USBR approval. This is done on an as needed bases when CVP allocations are high enough to justify the banking activity.

Attachment H

Annual Potable Water Quality Report: Urban

The District does not monitor potable water quality for urban use therefore this attachment is not applicable. The District depends upon water for irrigation purposes and provides limited quantities of untreated, non-potable water used for municipal and industrial purposes within the District.

Attachment I

Notices of District Education Programs and Services

The District's Notices of Education Programs and Services are also available on the District website:

https://wwd.ca.gov/news-and-reports/media-center/education-outreach/

https://wwd.ca.gov/news-and-reports/media-center/fact-sheets-and-infographics/

https://wwd.ca.gov/news-and-reports/media-center/newsletters-and-blogs/

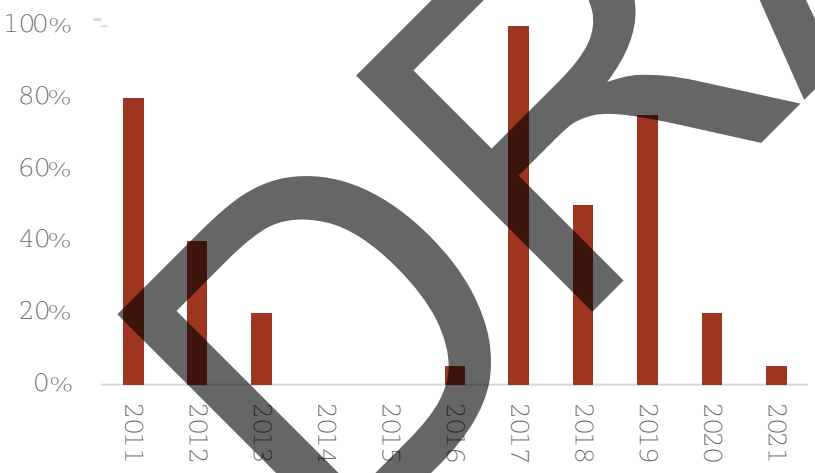
WESTLANDS WATER DISTRICT

Westlands Water District is recognized as a world leader in agricultural water conservation and is committed to environmental restoration to protect at risk species. Westlands has served the farmers, Naval Air Station Lemoore, and rural communities on the west side of Fresno and Kings counties for more than five decades. As stewards of one of California's most precious natural resources, Westlands continually invests in conservation and encourages farmers to deploy innovative irrigation methods and to utilize the best available technology.

WATER EFFICIENCY

Westlands receives water from the San Luis Unit of the Central Valley Project, which is operated by the U.S. Bureau of Reclamation. Westlands generally receives an initial water allocation from Reclamation in February. To help manage the extreme swings in water allocations from year to year, farmers in Westlands implement robust water efficiency measures, utilizing innovative water conservation technology, and change their crops or fallow fields to mitigate the impacts of low water allocation years.

Water Allocation % by Year



Westlands' water distribution system is comprised of approximately **1,100 miles of buried pipeline** and is outfitted with over **3,000 water meters**. Westlands continually invests in and updates this sophisticated system, which measures every drop of water and minimizes losses caused by seepage and evaporation. Westlands is among the few, if not the only, agricultural water agencies in the world that distributes water through an entirely enclosed system.

FARMING IN WESTLANDS

Farmers in Westlands rank among the most productive and water efficient in the world, producing approximately 60 different high-quality, nutritious crops for the fresh, dry, canned, and frozen food markets, domestically and abroad. More than $2 billion in crops are grown in Westlands every year, generating more than $6 billion in farm-related economic activity each year, supporting nearly 60,000 jobs and feeding families in the San Joaquin Valley, across the state and around the world.

CONSERVATION IN ACTION: LOWER YOLO RANCH RESTORATION PROJECT

Completed October 2020

- Westlands restored **2,100 acres** of cattle grazing land to tidal marsh, riparian, and upland buffer habitat
- Designed to **enhance regional food web productivity** in support of Delta smelt recovery and provide rearing habitats for out migrating salmon
- **Completed in partnership with the Department of Water Resources** as part of California's EcoRestore initiative
- **$9 million** to construct
- **13 years** to plan and permit

Westlands Water District

3130 N. Fresno Street P.O. Box 6056, Fresno, CA 93703-6056
Phone: 559-224-1523 | pubaffairs@wwd.ca.gov | **wwd.ca.gov**

Westlands Water District

By the Numbers: A World Leader in Agriculture Water Conservation

Westlands has served the farmers and rural communities on the west side of Fresno and Kings counties – an area spanning approximately 614,700 acres – for more than five decades. As stewards of one of California's most precious natural resources, Westlands continually invests in conservation and encourages farmers to deploy innovative irrigation methods and to utilize the best available technology to maximize every drop.

Westlands is one of the only water districts in the world that distributes irrigation water exclusively through pressurized pipe. The District's approximately

1,100 miles

of buried pipeline helps minimize losses caused by seepage and evaporation.

With **over 3,000** agricultural, municipal and industrial meters in the system, Westlands measures and tracks every drop from the moment it enters the system to the moment it is delivered to water users, providing a precise record of surface water use throughout the District.

Since 2017, Westlands has invested

$14.2 million

in its water infrastructure system, which is continually upgraded through improved metering and replacement pipeline.

94 pumping plants efficiently distribute water from the San Luis Canal to water users within Westlands, while a series of 16 reservoirs and 39 regulating tanks store the reserved water.

There are **86** traveling water screens and spray pumps that trap debris to prevent disruption in the network of sumps, pumps and pipelines and maximize available water.

There are more than **900** metered groundwater wells which reach two major aquifers and are monitored regularly to ensure the aquifers' health.

Westlands Water District Office | 3130 N. Fresno Street, P.O. Box 6056, Fresno, CA 93703-6056
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Top 10 Crops Grown in Westlands in 2021

Farmers in Westlands rank among the most productive and water efficient in the world. Approximately 60 different high-quality, nutritious crops are produced by these farmers for the fresh, dry, canned, and frozen food markets, domestically and abroad.

According to a 2021 economic study, farmers in Westlands Water District are a major contributor to the national production of agricultural goods, producing 3.5% of the fresh fruits and nuts and 5.4% of the vegetables and melons.

Cantaloupes

Cantaloupes and cucumbers come from the same plant family.

Tomatoes

There are around 10,000 varieties of tomatoes worldwide. Tomatoes from Westlands farmers are in some of your favorite soups, ketchup and sauces.

Garlic

Average consumption of garlic is believed to weigh in at around 2lbs per person per year.

Grain Hay

Hay is used for food and bedding for pets and livestock large and small, from cows and horses to rabbits and guinea pigs.

Almonds

As you order your next almond milk latte, there's a good chance you're drinking some of California's finest product.

Lettuce

Nearly 75% of the national supply of lettuce and leafy greens are grown in California.

Cotton-Lint-Pima

Cotton dates to at least 7,000 years ago, which makes it one of the world's oldest known fibers.

Wine Grapes

Botanists classify grapes as berries since each fruit forms from a single flower. Grapes from Westlands are shipped to some of the state's finest wine producing regions.

Wheat

In addition to using wheat for food and feed, farmers often plant wheat as a rotational crop to help manage disease and improve soil conditions.

Pistachios

Pistachios provide more than 30 different vitamins, minerals and phytonutrients.

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Westlands Water District

FACT SHEET

Westlands Water District Conversion of Water Services Contract

In 2016, Congress passed, and President Barack Obama signed, legislation that directed the Secretary of the Interior to convert any water service contract to a repayment contract, upon the request of the contractor. Pursuant to that law, Westlands Water District and numerous other water agencies elected to convert their water service contracts to repayment contracts, which under provisions of federal reclamation law enacted in 1939 remain in effect so long as the contractor satisfies the terms of the contract. The process followed by the Bureau of Reclamation (Reclamation) to convert to repayment contracts the water service contracts of these numerous Central Valley Project (CVP) contractors has been utilized throughout many administrations and has been supported by environmental organizations. The permanent nature of these converted contracts is based on a principle of federal reclamation law enacted nearly 120 years ago: once water users have repaid their share of the construction costs of a project, they would have a permanent right to the use of water developed by the project for which they paid.

BACKGROUND

The American West is largely an arid region, and for that reason the availability of water was, and continues to be, a dominating factor in development of the West, including the establishment of farms, industry, and communities. In the jargon of the nineteenth century, irrigation projects were known as "reclamation" projects. The concept was that irrigation projects would "reclaim" or "subjugate" arid lands for human use. Before 1900, the United States Congress had invested heavily in America's infrastructure. Roads, river navigation, harbors, canals, and railroads had all received major federal investments. However, western states wanted more. They sought federal government direct involvement in irrigation projects. On **June 17, 1902**, President Theodore Roosevelt signed the **Reclamation Act of 1902**.

Details have changed in the nearly 120 years since the Reclamation Act of 1902 was passed, but fundamental principles have remained unchanged: (1) federal monies spent on reclamation water development projects, which benefit water users, would be repaid by the water users; (2) unless transferred by an act of Congress, projects would remain federal property even when the water users repaid federal construction costs; and (3) upon water users repaying their share of the construction costs of a project, they would have a permanent right to the use of their proportionate share of water developed by the project. In fact, the 1902 Act provided "[t]he right to the use of water acquired under the provisions of this Act shall be appurtenant to the land irrigated, and beneficial use shall be the basis, the measure, and the limit of the right."

The principle that water users who repaid their share of the construction costs of a project would have a permanent right to the use of water developed by a project has been reaffirmed by Congress multiple

times. **In 1956, Congress passed an Act relating to the administration of contracts** under section 9, Reclamation Project Act of 1939, which provides a water user would have "a permanent right to such share or quantity upon completion of payment of the amount assigned for ultimate return by the [water users] subject to payment of an appropriate share of such costs. . ." 70 Stat. 483.

Most recently, in **December 2016, President Obama signed the Water Infrastructure Improvement for the Nation (WIIN) Act**, which provides "[u]pon request of the contractor, the Secretary of the Interior shall convert" any "[w]ater service contracts that were entered into under section (e) of the Act of August 4, 1939 (53 Stat. 1196), to be converted under this section shall be converted to repayment contracts under section 9(d) of that Act (53 Stat. 1195)." 130 Stat. 1878. The WIIN Act also provides that the converted contract shall "continue so long as the contractor pays applicable charges, consistent with section 9(d) of the Act of August 4, 1939 (53 Stat. 1195), and applicable law." 130 Stat. 1879.

LEGAL AUTHORITY FOR CONTRACT CONVERSION

Section 4011 of the WIIN Act, co-authored by Senator Feinstein and signed into law by President Obama, provides the Secretary of the Interior shall convert water service contracts to repayment contracts at the request of any existing water service contractor.

According to the Congressional Research Service, "Section 4011 of the WIIN Act allows for the conversion of agricultural and municipal water service contracts to repayment contracts to allow for prepayment of allocable construction costs that otherwise would have been repaid to Reclamation over extended terms. The section authorizes prepayment of outstanding construction cost obligations through a lump sum or in installments ... The legislation reiterates that once contractors have satisfied their repayment obligations, they are no longer subject to the acreage limitations and full-cost pricing (as well as other associated requirements) of the RRA. In addition, the section authorizes M&I contractors to convert to repayment contractors and/or repay their outstanding balances through prepayment."

https://crsreports.congress.gov/product/pdf/R/R44986

WELL-ESTABLISHED PROCESS

Congress has affirmed multiple times since the passage of the Reclamation Act of 1902 water users who have repaid their share of the construction costs of a project have a permanent right to the use of water developed by a project.

"Since the passage of the Reclamation Act of 1902, reclamation law has been based on the concept of project repayment—reimbursement of federal construction costs—by project water and power users. Agreements between the federal government (through Reclamation) and water users for delivering water generally are governed by one of two contract types: water service contracts or repayment contracts."

https://crsreports.congress.gov/product/pdf/R/R44986

The suggestion that the permanent nature of the proposed Westlands repayment contract makes it an "unusually good deal" is simply false. Indeed, Westlands' contract would not be the first section 9(e) water service contract converted to a section 9(d) repayment contract in the CVP. To the contrary, section 9(e) water service contracts in the Friant Division of the CVP were converted to section 9(d) repayment contracts pursuant to legislation authorizing implementation of the San Joaquin River settlement and, concurrent with Westlands' conversion, there are more than 75 other CVP contractors, including the State of California Department of Fish and Wildlife, which have requested conversion of their 9(e) water service contracts to section 9(d) repayment contracts pursuant to the WIIN Act. The substantive terms of those converted repayment contracts will all be identical to those in the proposed Westlands contract.

Questions have also been raised about why the Westlands conversion contract is the first to be completed and the suggestion has been made that Westlands was given special attention because of its influence. That is simply wrong. Within the CVP, Reclamation completed a CVP-wide process and has held numerous divisional negotiations. The draft of Westlands' converted contract was the first released for public review because of pending litigation, *North Coast Rivers Alliance, et al., v. United States Department of the Interior*. In that case, North Coast Rivers Alliance challenges Reclamation's National Environmental Policy Act compliance in connection with a prior renewal of their Westlands water service contract (a contract that was in effect from 2016-2018). The District Court has struggled with whether it should move the case forward or dismiss the case because it is moot. **The Court decided to hold proceedings in that case in abeyance in light of the contract conversion process but ordered Reclamation to provide updates on the progress of WIIN Act conversions every 30 days.**

ENVIRONMENTAL ORGANIZATIONS HAVE SUPPORTED CONTRACT CONVERSIONS

> Under the San Joaquin River Restoration Settlement Act, the Secretary of the Interior converted water service contracts in the Friant Division to repayment contracts to generate revenue for the San Joaquin River restoration program.

That legislation provided for conversion of the Friant Division contracts under terms that are substantively the same as terms provided under the WIIN Act and reflected in the proposed Westlands repayment contract. People and organizations that vigorously oppose conversion of Westlands' water service contract to a repayment contract were enthusiastic supporters of the conversion of Friant Division water service contracts to repayment contracts. This begs the question: what's the difference? The answer should be obvious. **The only difference between the two contract conversions is how Reclamation will expend funds provided by the early repayment of construction costs. The conversion itself, however, is substantially identical.**

The conversion of the Friant Division contracts under the San Joaquin River Restoration Settlement Act generated money for a project. The restoration of the San Joaquin River was supported by people and organizations who now oppose the conversion of Westlands' contract. The conversion of Westlands' and other contracts under the WIIN Act will generate money for projects they oppose, such as building water storage projects. Beyond that, there are no differences.

The Natural Resources Defense Council, the lead non-governmental organization in the San Joaquin River Restoration Settlement, praised the Friant contract conversion and, at the time, touted:

"The agreement provides for approximately $440 million from Friant water users for settlement implementation (through extending water user payments known as the "Friant Surcharge" for the life of the settlement, *redirection of capital repayments*, and authorizing the Secretary of Interior to allocate up to $2 million per year of additional Friant payments from the CVPIA Restoration Fund)."

https://www.nrdc.org/sites/default/files/leg_07010101A.pdf (emphasis added)

MANY CALIFORNIA WATER AGENCIES SEEK CONVERSION

As of October 2019, more than 75 agencies that have CVP water service contracts, including the State of California Department of Fish and Wildlife, have elected under the WIIN Act to convert their water service contracts to repayment contracts.

According to the Congressional Research Service, "The provisions of this section would apply to all Reclamation contractors; that is, all contractors would be eligible (either through optional conversion to repayment contracts and subsequent prepayment for water service contractors or through optional prepayment for existing repayment contractors) for prepayment of their obligations to the federal government. However, it is unclear how many contractors would take advantage of these provisions. In its estimate of similar provisions, the Congressional Budget Office previously estimated that approximately 35% of current users would convert to repayment contracts, and that a total of $639 million in receipts would be expected to accrue to the Treasury from accelerated repayment over the FY2015-FY2024 period. It is unclear what broader effects these payments (and the absence of RRA requirements on some contractors) might have."

https://crsreports.congress.gov/product/pdf/R/R44986

THE EARLY REPAYMENT WILL BE USED FOR CRITICALLY NEEDED WATER STORAGE

President Obama noted that the provisions of Subtitle J of the WIIN Act were intended to help meet California's long-term water needs, helping to "assure that California is more resilient in the face of growing water demands and drought-based uncertainty."

In the case of Westlands' contract conversion, like all contract conversions done before or after, it offers a win-win for all parties. The Westlands contract conversion will accelerate payment of between approximately $200 to $210 million to the federal government years before payment otherwise would be due. This money, pursuant to the WIIN Act, will be placed in the Reclamation Water Storage Account to be used for the construction of water storage and supply projects that will benefit all CVP purposes.

Follow the Water Drop: From Snow Melt to Food on a Farm

The farmers and rural communities in Westlands rely on water from the Central Valley Project, which is operated by the U.S. Bureau of Reclamation and extends from Redding to Bakersfield.

1 The Cascade and Sierra Nevada Mountain Ranges:

Water used to produce high-quality, nutritious crops in Westlands begins as rain or snowfall that flows into reservoirs including **Shasta Lake**, **Trinity Lake**, and **Folsom Lake**.

2 Lifted at Jones Pumping Plant:

Water flows to the **Sacramento-San Joaquin Delta** and is lifted into the **Delta-Mendota Canal** at the **C. W. "Bill" Jones Pumping Plant**. The nearby **Tracy Fish Collection Facility** operates in conjunction with the plant to protect fish from pump operations.

3 Stored in San Luis Reservoir:

The **San Luis Reservoir** is the largest off-stream reservoir in the country. By storing excess winter and spring flows from the Delta until the water is needed later in the year, it provides additional flexibility to both state and federal water delivery systems.

4 Moved through the San Luis Canal:

Water continues its journey to Westlands through the **San Luis Canal**, which extends approximately 102 miles from the **O'Neill Forebay**, near Los Banos, to **Kettleman City** in Kings County.

5 Entering Through Laterals, Ending on Farms:

Water enters the District's headworks, is pumped into Westlands' distribution system and is delivered to agricultural, municipal and industrial users through **Westlands'** water distribution system, which is comprised entirely of pressurized, buried pipeline (approximately 1,100 miles of pipe) and is outfitted with over 3,000 water meters that measure every drop of water and minimize losses caused by seepage and evaporation. Westlands also encourages farmers to deploy innovative irrigation methods and use the best available technology like microsprayers and drip irrigation to deliver water to crops, helping to maximize every drop.

Westlands Water District

Westlands Water District Office | 3130 N. Fresno Street, P.O. Box 6056, Fresno, CA 93703-6056

Phone: 559-224-1523 | pubaffairs@wwd.ca.gov | **wwd.ca.gov**

Committed to Conservation

Westlands Water District is committed to improving our environment and the viability of native species. A reliable water source for farms and communities is directly tied to the health of our ecosystems. We're proud to invest in an array of strategies that support the health of at-risk species and our ecosystems, the efficient use of water throughout California, and adaptive management of our resources to ensure a reliable water supply for future generations.

Conservation in Action

Westlands has a long history of collaborating with federal, state, and other public water agencies on projects that have restored thousands of acres of wetlands, enhanced instream habitat and flow, and improved water quality in the Delta for the benefit of at-risk species, fish, migratory birds and other wetland-dependent organisms.

Tule Red Restoration Project

Westlands, in partnership with Metropolitan Water District of Southern California and Valley Water, secured property in Suisun Marsh for the Tule Red Restoration Project. The project opened more than 400 acres of wetlands to daily tides.

Sacramento Valley Salmon Recovery Program

Westlands, alongside Sacramento Valley farmers and other water agencies, explored creative ways to spread water across agricultural lands for fish rearing and fish food production in the traditional floodplain.

Photos: Tule Red Restoration Project

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Committed to Conservation *(continued)*

Westlands Water District is committed to improving our environment and the viability of native species. A reliable water source for farms and communities is directly tied to the health of our ecosystems. We're proud to invest in an array of strategies that support the health of at-risk species and our ecosystems, the efficient use of water throughout California, and adaptive management of our resources to ensure a reliable water supply for future generations.

Lower Yolo Restoration Project

Westlands completed the Lower Yolo Restoration Project in partnership with the California Department of Water Resources. The project restored and enhanced approximately 2,100 acres of former cattle pastureland to tidal marsh, riparian, and upland buffer habitat that now provides new sources of food and shelter for native fish, including smelt and salmon.

Photo: Lower Yolo Restoration Project

The recovery of at-risk species will not occur overnight, but rather will take a long-term commitment to implement a mosaic of actions. ***Westlands' habitat restoration approach represents just one step on a long journey to recover at-risk species and to protect and restore our water supply.*** The Lower Yolo Restoration Project is part of California EcoRestore, an initiative launched in 2015 to advance 30,000 acres of critical habitat restoration and enhancement in the Delta. In particular, the Lower Yolo Restoration Project has four primary objectives:

1. *Provide ecosystem functions associated with the combination of Delta freshwater aquatic, tidal marsh, floodplain, seasonal wetland, and lowland grassland interfaces that existed historically,*
2. *Enhance regional food web productivity in support of Delta smelt recovery,*
3. *Provide rearing habitats for out-migrating salmonids, and*
4. *Support a broad range of other aquatic and wetland-dependent species, including Sacramento splittail and Swainson's hawk.*

Lower Yolo Restoration Project by the Numbers

- **$9 million** invested in construction
- **2,100** enhanced and restored acres
  - — ***1,682*** *acres of tidal marsh restoration*
  - — ***364*** *acres of transitional upland buffer habitat*
  - — ***47*** *acres of enhanced existing riparian habitat*
- **35** acres of existing tidal marsh enhancement

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About the 2019 Biological Opinions

The federal Central Valley Project (CVP) and California State Water Project (SWP) together provide water for more than 31 million Californians and 4.15 million of acres of highly productive farmland. Coordinated operations of the CVP and SWP are critically important to the health of California's economy and environment, including native fish species like Delta smelt and Chinook salmon.

During the Obama administration, in August 2016, the Bureau of Reclamation (Reclamation) and the California Department of Water Resources (DWR) began to develop a new operations plan and jointly requested reinitiation of consultation under the Endangered Species Act (ESA), based on new science and data related to listed species and drought impacts.

Over the course of the subsequent three years, Reclamation and DWR worked with the other agencies, including the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS), to develop a science-based real-time monitoring strategy that incorporates robust protections for native fish species into the proposed coordinated operations plan. Reclamation and DWR's approach and the services' draft biological opinions incorporated expert opinions not only from career biologists and other scientists, but also from independent scientific peer reviewers. Over the course of this consultation process, the proposed coordinated operations of the CVP and SWP were modified to ensure adequate protection of listed species and their designated critical habitat.

WHAT IS A BIOLOGICAL OPINION OR BiOP?

- The ESA requires a federal agency to consult with the FWS and the NMFS to determine if any action the agency intends to carry out, fund, or authorize – like operations of the CVP and SWP – would jeopardize endangered or threatened species or would harm or destroy designated critical habitat.
- During the consultation process, the relevant fishery services work with the federal agency to refine the proposed action to ensure the action will not jeopardize the continued existence of a listed species or adversely modify the species' critical habitat.
- A BiOp summarizes the analysis conducted through the consultation process and presents the service's conclusion regarding the potential harm the project poses to at-risk species and authorizes potential incidental take of a listed species.

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About the 2019 Biological Opinions: *Continued*

In October 2019, the FWS and the NMFS released new biological opinions (BiOps), which determined that proposed coordinated operations would not jeopardize threatened or endangered species or adversely modify their designated critical habitat.

Reclamation's and DWR's proposed operations plan includes:

- Real-time adaptive management and greater management oversight of Delta pumping operations based on real-time risks instead of the calendar-based pumping schedule included in the former biological opinions.
- A bigger cold-water pool and better cold water management at Lake Shasta to protect Sacramento River winter-run Chinook salmon.
- Reduced early wintertime pumping in order to protect spawning Delta Smelt and reduced early springtime pumping to protect migrating salmonids.
- A commitment to use the newest science, the latest scientific thinking, and increased monitoring to ensure Reclamation's updated operations are benefitting fish.
- Significant actions to support collaborative habitat restoration that will help support fish species in the early stages of life.
- $1.5 billion to support endangered fish over the next 10 years, including funding for a conservation hatchery in the Delta to assist in the recovery of Delta smelt and other species and $14 million to accelerate work underway to reintroduce winter-run Chinook salmon in the Sacramento River and its tributaries.

Timeline: Biological Opinions Scientific Analysis

AUGUST 2, 2016: Reclamation and DWR jointly request reinitiation of ESA consultation on the coordinated long-term operation of the CVP and SWP.

DECEMBER 2017: Reclamation announces intent to prepare a draft Environmental Impact Statement (EIS) exploring long-term changes to the coordinated operations of the CVP and SWP.

JANUARY 31, 2019: Reclamation transmits to FWS its final biological assessment, which discusses proposed operational changes designed to better reflect real-time monitoring, as well mitigation factors to support at-risk species.

About the 2019 Biological Opinions: *Continued*

APRIL 2019: FWS conducts an independent peer review of the draft BiOp with a three-person review panel including experts in aquatic and fisheries science, population dynamics and ecology.

JUNE 2019: The NMFS conducts an independent peer review of the draft BiOp with academic experts in environmental science and aquatic and fishery sciences from the University of Maryland the University of Washington.

AUGUST 2019: The FWS conducts a second independent scientific review of the draft BiOp with a four-person review panel including experts from UC Santa Cruz, the University of South Florida and the U.S. Geological Survey. The NMFS also conducts a second independent scientific review of the draft BiOp with three fish and hydrodynamics experts.

OCTOBER 21, 2019: The FWS and the NMFS release separate BiOps on Reclamation's and DWR's proposed operations plan.

DECEMBER 19, 2019: As called for by the National Environmental Policy Act, Reclamation issues the EIS, which evaluates four alternatives and selecting one that includes a combination of flow-related actions, habitat restoration, and measures to increase water deliveries and protect fish and wildlife.

FEBRUARY 20, 2020: Reclamation's accepts the BiOps through a Record of Decision.

Farming the Sun

With California's aggressive goal of 100% carbon-free electricity by 2045, the Central Valley is home to not only prime farmland providing food for the world, but also to prime solar energy potential that can help power the state.

SOLAR ENERGY: A SECOND LIFE FOR NON-IRRIGABLE LAND

Solar development in Westlands is largely on lands that are no longer irrigated because of inadequate water supply, which gives land a second life and helps avoid the need to develop solar projects on previously undisturbed lands. Due to this land's previous agricultural use, there is significantly lower risk of negative impact to native species from solar development.

"We're holding Westlands up as a model to utilities, regulators and solar developers on how to take pressure off undeveloped land and move projects forward."

-Helen O'Shea, Natural Resources Defense Council

SOLAR BY THE NUMBERS

- More than 700 MW of operational solar energy capacity in the Westlands footprint – enough electricity to power approximately 130,000 homes.
- To date, solar developers have purchased nearly 8,000 acres from the District, with an additional 18,000 acres optioned for solar development.

SOLAR IN WESTLANDS

Westlands Solar Park (2.7 GW – in development)

- Located in the San Joaquin Valley's only Competitive Renewable Energy Zone, designated through the California Renewable Energy Transmission Initiative.
- When fully built, would be the largest solar generating facility in the United States at more than 20,000 acres with 2.7 GW total capacity – enough to power more than 750,000 homes and offset more than 3.2 million tons of carbon dioxide.

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Farming the Sun: *Continued*

- Project has earned the support of NRDC, Sierra Club, Defenders of Wildlife and the CA Farm Bureau.

Tranquillity Project (400 MW)

- Comprised of 8 projects located on more than 3,500 acres in Fresno County, near Road 33.
- Total of 400 MW capacity – enough clean electricity to power approximately 75,000 homes.
- Power from these projects is sold to buyers across the state, including MCE and Southern California Edison.

Little Bear (180 MW)

- Comprised of 5 projects located on more than 1,200 acres in Fresno County, four miles south of the City of Mendota.
- Total of 180 MW capacity – enough clean electricity to power approximately 34,000 homes.

Sustainable Groundwater Management Act (SGMA)
Projects and Management Actions

The **Sustainable Groundwater Management Act (SGMA)** was signed into law by Governor Jerry Brown in 2014 to regulate groundwater pumping. It is designed to protect California's groundwater resources and, once fully implemented, will fundamentally change the way Californians use and manage groundwater in the state. In practice, the amount of groundwater available to pump will be capped in an effort to prevent undesirable results in California's aquifers.

SGMA requires local agencies to develop Groundwater Sustainability Agencies (GSAs), and Westlands Water District serves as the GSA for the Westside Subbasin. The GSA is responsible for developing a Groundwater Sustainability Plan (GSP) and Projects and Management Actions to achieve sustainability by 2040.

Projects and Management Actions

Projects and Management Actions were developed to achieve sustainability goals, measurable objectives, and avoid undesirable results in the Westside Subbasin. They include:

No. 1 - Surface Water Imports

Surface water imports will provide the majority of agricultural, municipal and industrial water supply and reduce the reliance on groundwater within the Westside Subbasin. Westlands Water District will continue to secure surface water supplies, which include Central Valley Project deliveries.

No. 2 – Groundwater Allocation

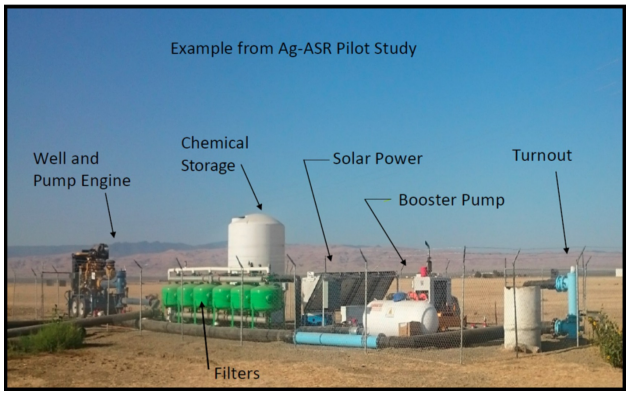
The Groundwater Allocation equitably distributes the Westside Subbasin's Sustainable Yield based on the gross acres in the Westside Subbasin. Beginning on March 1, 2023, the District will allocate groundwater for each acre of land within the Subbasin boundary in accordance with Article 1. The Groundwater Allocation Program will begin with a Transition Period starting with a uniform annual Groundwater Allocation of 1.3 AF per gross acre in 2023 and then subsequently reduced each year by 0.1 AF per Gross Acre until 2030 (Table 1). A landowner's groundwater allocation may be augmented through various activities that promote groundwater recharge in the Westside Subbasin.

Table 1

Water Year	Allocation Cap
2023	1.3 AF per acre
2024	1.2 AF per acre
2025	1.1 AF per acre
2026	1.0 AF per acre
2027	0.9 AF per acre
2028	0.8 AF per acre
2029	0.7 AF per acre
2030	0.6 AF per acre

No. 3 – Aquifer Storage and Recovery

The Agricultural Aquifer Storage and Recovery (ASR) program refers to the direct injection and temporary storage of surface water supplies into groundwater wells. Injection and storage of surface water supplies is one of the groundwater recharge options described in No. 2. Aquifer storage is anticipated to occur during periods when there is available surface water for injection. Sources of injected water include Section 215 non-storable water and allocated Central Valley Project water.



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Sustainable Groundwater Management Act (SGMA)
Projects and Management Actions

No. 4 – Targeted Pumping Reductions

Land subsidence near Checks 16, 17 and 20 of the San Luis Canal/California Aqueduct during the 2013-2016 drought highlighted the need to manage groundwater pumping in the Lower Aquifer to avoid undesirable results. The Subsidence-Prone Areas near Checks 16 and 17 was revised based on the InSAR data collected between January 2016 and January 2021. The GSA will provide landowners with incentives to reduce pumping in the Lower Aquifer in accordance with Article 1. The goal is to limit the subsidence rates and prevent declines in groundwater levels near the San Luis Canal. Figure 1 identifies the subsidence-prone areas (red shaded areas) in the Subbasin.

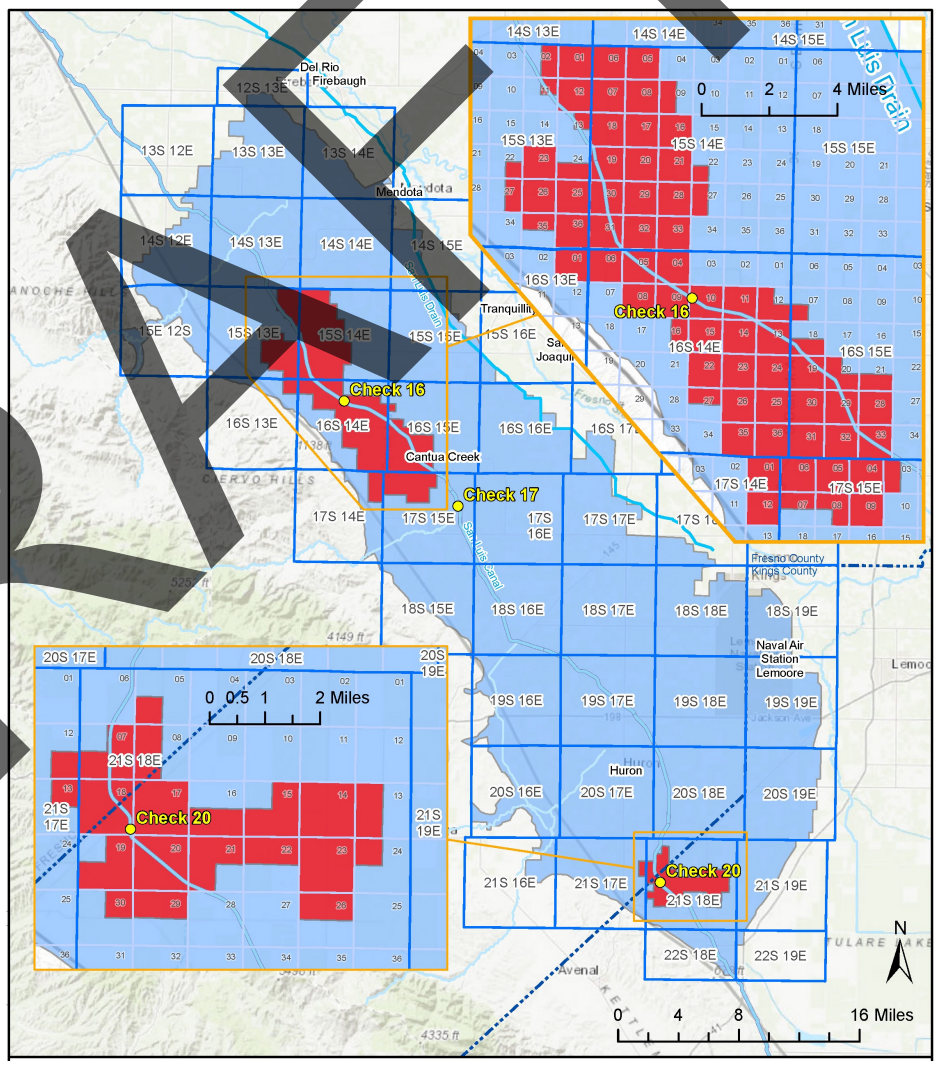
No. 5 – Percolation Basins

The District is proposing to construct and operate percolation basins on District-owned lands located along the western edge of the Subbasin where the Corcoran Clay is absent. Percolations basins promote surface water infiltration into the aquifer through permeable surficial deposits to recharge the groundwater subbasin. The District would utilize these percolation basins to recharge the aquifer to enhance groundwater conditions within the Subbasin. In addition, water users could use their privately-owned percolation basins and receive groundwater credits for the future.

Figure 1 Legend

- Westside Subbasin
- Subsidence-Prone Areas

Figure 1



LEARN MORE ABOUT WESTLANDS GSA

Westlands will continue to hold public meetings and workshops about the implementation of its GSP. Water users, neighboring water agencies and GSAs, community members, and other interested parties are welcomed and encouraged to share their comments, questions, and suggestions either at a meeting or workshop or by emailing **sgma@wwd.ca.gov**. For more information on SGMA and the groundwater recharge activities please visit: **https://wwd.ca.gov/SGMA**.

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Attachment J

District Agricultural Water Order Form

Westlands Water District

WESTLANDS WATER DISTRICT

2021-2022 AGRICULTURAL WATER ALLOCATION APPLICATION AND PURCHASE AGREEMENT

This Agricultural Water Allocation Application and Purchase Agreement must be received by January 22, 2021, in the District's Fresno or Five Points Offices. Postmarks will not be accepted.

_____, herein referred to as "Water User," hereby applies for agricultural water for the March 2021 – February 2022 Water Year and agrees, as a condition of the allocation and furnishing of any agricultural water during that water year and in accordance with the District's Regulations, policies, and applicable agreements, as follows:

1. To accept, if and when provided by the District, the total amount of: a) CVP contract water requested on the application form(s); b) the allocation of Long-Term Water acquired by the District; c) other water acquired by the District; and d) Water User's unused water rescheduled from a prior water year, unless Water User provides written notice to the District before the last day of the water year that Water User will not reschedule such water. Notwithstanding the foregoing, no water will be allocated or rescheduled to any land for which water charges, assessments, land-based charges, or any other money owed to the District have been delinquent for 30 days or more at the time the water is allocated or to any land for which advance payment is required until such advance payment is received, or in lieu thereof security, in a form acceptable to the General Manager, for such payment has been provided.

2. To make all payments by the due dates specified in the District's Terms and Conditions for Agricultural Water Service.

3. Except as otherwise provided by the District, to remain liable to the District for any unused portion of the water unless the District is able to sell the water to another water user or the water has been transferred to another water user.

4. To comply with the Terms and Conditions for Agricultural Water Service and the Regulations for the Allocation of Agricultural Water, copies of which will be furnished upon request, both of which are incorporated herein as though set forth at length.

5. Allocation calculations will be based on irrigable acres as determined by U. S. Farm Service Agency (FSA) measurements or District measurements.

6. The District will notify Water User as to the amounts of water allocated to him and maintain a record of the revisions, if any, of his allocated water supply.

7. Water User recognizes that, upon his application for agricultural water and the District's allocation of water to him, he is liable for all such water allocated to him except as otherwise provided by the District.

8. The District may use any funds held for the benefit of or on behalf of Water User to pay or offset any monetary obligation Water User has to the District.

9. Water User hereby further agrees that there are no intended third party beneficiaries to this Agreement and nothing contained herein, expressed or implied, is intended to give to any person, partnership, corporation, joint venture, limited liability company or other form of organization or association any right, remedy or claim under or pursuant hereto, and any agreement or covenant required herein to be performed by or on behalf of Water User or the District shall be for the sole and exclusive benefit of Water User or the District.

_____ _____
Date Print Name

_____
Signature

_____
Title

WESTLANDS WATER DISTRICT

2021-2022 AGRICULTURAL WATER ALLOCATION

APPLICATION AND PURCHASE AGREEMENT

WATER USER: _____ PREPARED BY: _____
(Please Print)

ADDRESS: _____

_____ _____
(Signature)

_____ TELEPHONE: (____) _____-_____

ACCOUNT NO: _____

LAND DESCRIPTION	FIELD NO.	FSA ACRES	FALLOWED ACRES [1]	ACRE-FEET REQUESTED [2]	DISTRICT USE ONLY

TOTAL ACRES: _____

TOTAL FALLOWED ACRES: _____

TOTAL AMOUNT OF CENTRAL VALLEY PROJECT CONTRACT WATER REQUESTED _____ACRE-FEET

[1] WESTLANDS IS REQUESTING AN ESTIMATE ON THE NUMBER OF ACRES YOU EXPECT TO FALLOW. PROVIDING THIS INFORMATION WILL NOT IMPACT YOUR REQUEST FOR A WATER SUPPLY ALLOCATION. THIS INFORMATION WILL ONLY BE USED TO EDUCATE THE PUBLIC ON HOW THE CONTINUED LACK OF WATER SUPPLY IS IMPACTING OUR WATER USERS.

[2] PLEASE ENTER ACRE-FEET REQUESTED FOR EACH FIELD USING WHOLE ACRE-FEET

PLEASE SIGN AGREEMENT ON THE REVERSE

Attachment K

Drainage Problem Area Report

The District is identified as a drainage problem area in the report titled *"A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley (September 1990)".*

Attached is Addendum C of the Water Management Plan as required of contractors located in a drainage problem area.

A copy of the report titled *"A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley (September 1990)"* is also available for review on the State Water Resources Control Board (SWRCB) website: https://www.waterboards.ca.gov/waterrights//water_issues/programs/bay_delta/wq_control_plans/1995wqcp/admin_records/part05/401.pdf.

Addendum C – Information Required of Contractors Located in Drainage Problem Areas

The District is included in the drainage problem area, as identified in *"A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley (September 1990)"* and here on referred to as the Report.

The contractors located in drainage problems areas shall describe which recommendations prescribed in *"A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley (September 1990)"* have been incorporated in their water conservation programs to improve conditions in drainage problem areas. These recommendations include:

1. **Source Control**

Source Control in the District consists of on-farm improvements in the application of irrigation methods to reduce deep percolation past the root zone. "*Problem Water*," is a term used in the Report to describe the volume of near-surface groundwater that, if reduced by source control or removed from plant root zones each year, would reduce drainage-related impediment to agriculture productivity.

To achieve the recommendations in Source Control to address drainage related problems, the District offers low interest loans to water users for the lease-purchase of irrigation equipment through the Expanded Irrigation System Improvement and Recharge Program (EISIP). Through EISIP, water users can purchase irrigation system equipment, or recharge project equipment including micro-irrigation systems, tailwater reuse systems, linear move, center pivot systems, portable aluminum irrigation equipment, filtration systems, monitoring devices, and sublateral recharge and drywall.

Additionally, the District also offers low interest loans with a cost share subsidy for the lease-purchase of irrigation system equipment through the Expanded Irrigation System Improvement Program/Power and Water Resources Pooling Authority (PWRPA) Public Purpose Program (P3) Grant (EISIP P3). Through EISIP P3, water users can purchase irrigation system equipment for micro-irrigation systems, portable aluminum irrigation equipment, or linear move and center pivot systems.

Water users are incentivized to convert from flood irrigation to high efficiency irrigation technology that allows for reduction of surface runoff and minimizes the impact which contributes to deep percolation. The District has 159,300 acres affected by drainage identified in the Report. If improvements to irrigation methods are applied, then the water application rate is reduced by 0.4 acre-feet per acre (AF/Acre). The average deep percolation for irrigated lands District-wide from 1978 to 2021 was 0.44 AF/Acre. The data

suggests that lands with drainage problems are improving average percolation throughout the District

2. Land Retirement

In 1998, the District began purchasing drainage impaired land through various land acquisition programs removing the purchased lands water allocation and reallocation to nonimpaired lands. As of September 2021, the District has retired approximately 82,595 acres from irrigation and 11,879 acres sold for solar development within Westlands, a total of 94,474 acres deemed non-irrigable. The District actively pursues to retire 100,000 acres of land within its boundaries under the District's Land Purchase Program and record a non-irrigation covenant on the title of all such retired lands.

3. Drainage Water Treatment

The District is currently evaluating a set of immediate, short-term, and long-term actions that provide potential water treatment and pre-treatment options for removing TDS and other constituents from shallow groundwater underneath drainage impaired lands. The options include Reverse Osmosis (RO), Electrodialysis Reversal and Electrostatic Deionization. The option treatment processes are being evaluated for technical feasibility.

4. Drainage Water Reuse

Integrated On-Farm Drainage Management (IFDM) is an agricultural irrigation drainage water and salt management system. IFDM provides drainage water reuse to improve water availability for crop production and to minimize salt and selenium risks to water quality and the environment. Once an irrigation system has been optimized to maximize water use efficiency and to minimize the production of subsurface drainage water, an IFDM system can be designed to enable a landowner to process the resulting drainage water on-farm. A landowner's manual for developing IFDM systems was written by the Westside Resource Conservation District (in conjunction with the Center for Irrigation Technology at Fresno State) for the State Water Resources Control Board. The following are excerpts from the IFDM manual.

Providing drainage service will take a longer planning and implementation process. The actions proposed here will continue to build upon the innovative and effective on-farm drainage management actions growers and district staff have developed over time that will provide immediate drainage benefits, while concurrently initiating activities to put in place a comprehensive regional plan for drainage service in the District.

5. Shallow Groundwater Pumping

There are currently no shallow ground water pumping activities in the District.

6. Evaporation Ponds

There are no evaporation ponds within the District's service area.

Attachment L

San Joaquin Valley Groundwater Basin (DWR)

Westlands Water District

San Joaquin Valley Groundwater Basin
Westside Subbasin

- Groundwater Subbasin Number: 5-22.09
- County: Fresno, Kings
- Surface Area: 640,000 acres (1,000 square miles)

Basin Boundaries and Hydrology

The San Joaquin Valley is surrounded on the west by the Coast Ranges, on the south by the San Emigdio and Tehachapi Mountains, on the east by the Sierra Nevada and on the north by the Sacramento-San Joaquin Delta and Sacramento Valley. The northern portion of the San Joaquin Valley drains toward the Delta by the San Joaquin River and its tributaries, the Fresno, Merced, Tuolumne, and Stanislaus Rivers. The southern portion of the valley is internally drained by the Kings, Kaweah, Tule, and Kern Rivers that flow into the Tulare drainage basin including the beds of the former Tulare, Buena Vista, and Kern Lakes.

The Westside Subbasin consists mainly of the lands in Westlands Water District. It is located between the Coast Range foothills on the west and the San Joaquin River drainage and Fresno Slough on the east. The subbasin is bordered on the southwest by the Pleasant Valley Groundwater Subbasin and on the west by Tertiary marine sediments of the Coast Ranges, on the north and northeast by the Delta-Mendota Groundwater Subbasin, and on the east and southeast by the Kings and Tulare Lake Groundwater Subbasins. Average annual precipitation varies across the subbasin from 7 inches in the south to 9 inches in the north.

Hydrogeologic Information

Water Bearing Formations

The aquifer system comprising the Westside Subbasin consists of unconsolidated continental deposits of Tertiary and Quaternary age. These deposits form an unconfined to semi-confined upper aquifer and a confined lower aquifer. These aquifers are separated by an aquitard named the Corcoran Clay (E-Clay) member of the Tulare Formation.

The unconfined to semi-confined aquifer (upper zone) above the Corcoran Clay includes younger alluvium, older alluvium, and part of the Tulare Formation. These deposits consist of highly lenticular, poorly sorted clay, silt, and sand intercalated with occasional beds of well-sorted fine to medium grained sand. The depth to the top of the Corcoran Clay varies from approximately 500 feet to 850 feet (DWR 1981).

The confined aquifer (lower zone) consists of the lower part of the Tulare Formation and possibly the uppermost part of the San Joaquin Formation. This unit is composed of lenticular beds of silty clay, clay, silt, and sand interbedded with occasional strata of well-sorted sand. Brackish or saline water underlies the usable groundwater in the lower zone.

Unpublished DWR (San Joaquin District) information indicates specific yield ranges from 5.1 to 17.8 percent to a depth of 300 feet. The highest

specific yields are associated with coarser sediments distributed along the eastern portion of the subbasin from the Sierra Nevada Mountains. The USGS (Williamson and others 1989) used a subbasin average specific yield of 10.3 percent for groundwater modeling purposes. Earlier USGS work estimated an average specific yield of 9 percent from a depth of 10 to 200 feet (Davis and others 1959).

Restrictive Structures

Flood basin deposits along the eastern subbasin have caused near surface soils to drain poorly thus restricting the downward movement of percolating water. This causes agriculturally applied water to buildup as shallow water in the near surface zone. Areas prone to this buildup are often referred to as drainage problem areas.

The Corcoran Clay is a lacustrine diatomaceous clay unit that underlies much of the subbasin. Within the subbasin it varies in thickness from 20 to 120 feet (Belitz and Heimes 1990). Prior to groundwater development, the Corcoran Clay effectively separated the upper and lower zones. Numerous wells penetrate the clay and have allowed partial interaction between the zones.

Recharge Areas

Primary recharge to the aquifer system is from the seepage of Coast Range streams along the west side of the subbasin and the deep percolation of surface irrigation. Davis and Poland (1957) indicated that secondary recharge to the upper and lower aquifers occurred from areas to the east and northeast as subsurface flows.

Groundwater Level Trends

Groundwater levels were generally at their lowest levels in the late 1960s, prior to importation of surface water. The Central Valley Project began delivering surface water to the San Luis Unit in 1967-68. Water levels gradually increased to a maximum in about 1987-88, falling briefly during the 1976-77 drought. Water levels began dropping again during the 1987-92 drought with water levels showing the effects until 1994. Through a series of wet years, after the drought, 1998 water levels recovered nearly to 1987-88 levels.

Groundwater Storage

Groundwater Storage Capacity. Davis and others (1959) estimated the groundwater storage capacity at 10,940,000 af in the depth zone from 10 to 200 feet of the Mendota-Huron storage unit. This was over an area of 639,000 acres and a specific yield varying from 8.0 to 9.6 percent. This occupies a portion of the upper aquifer.

Using an average thickness of 675 feet (ground surface to top of Corcoran Clay), specific yield of 9 percent, over an area of 600,000 acres; the storage capacity of the upper aquifer is approximately 36,500,000 af.

Using a thickness of 1,200 feet from the average base of the Corcoran Clay to the average base of fresh groundwater, a specific yield of 9 percent, over

600,000 acres; the storage capacity of the lower aquifer is approximately 65,000,000 af.

Groundwater in Storage. The USGS estimated the water in storage in 1961 was 52,000,000 af (Williamson 1989). This estimate was to a depth of less than or equal to 1,000 feet.
Using an average depth to water in October 1984 of 111 feet, a specific yield of 9 percent, over an area of 600,000 acres; the available storage is estimated to be 6,000,000 af.

Groundwater Budget (Type C)

Davis and Poland (1957) estimated seepage from west side streams amounted to 30,000-40,000 af per year. For 1951, secondary recharge from the east into the upper aquifer was 20,000-30,000 af and was 150,000-200,000 af into the lower aquifer (Davis and Poland 1957).

Westlands Water District (1999) estimated the average deep percolation between 1978 and 1996 was 244,000 af per year. The District (1998) also estimated the average applied groundwater between 1978 and 1997 was 193,000 af per year.

Groundwater Quality

Characterization. Groundwaters of the west side of the San Joaquin Valley are generally of the sulfate or bicarbonate type (Davis and others 1959).

The waters of the upper aquifer, generally, are high in calcium and magnesium sulfate (Davis and Poland 1957). Groundwater below 300 feet and above the Corcoran Clay shows a tendency of decreased dissolved solids with increased depth. Most of the groundwater of the lower aquifer is of the sodium sulfate type (Davis and Poland 1957). The difference in quality between the upper and lower aquifers is that the confined zone contains less dissolved solids (Davis and others 1959). Groundwater in western Fresno County can have an upper range between 2,000 and 3,000 mg/L (Davis and others 1959).

DHS data indicates an average TDS of 520 mg/L in the subbasin with a range from 220 mg/L to 1,300 mg/L based on the analyses of six Title 22 monitoring wells.

Dubrovsky and others (1993) indicated dissolved solids in shallow groundwater can be greater than 10,000 mg/L at some locations in the lower fan areas. One sample had a TDS of 35,000 mg/L.

Impairments. High total dissolved solids is one impairment of groundwater in the subbasin. Groundwaters at certain locations contain selenium and boron that may affect usability.

Water Quality in Public Supply Wells

Constituent Group[1]	Number of wells sampled[2]	Number of wells with a concentration above an MCL[3]
Inorganics – Primary	2	0
Radiological	1	0
Nitrates	2	0
Pesticides	2	0
VOCs and SVOCs	2	0
Inorganics – Secondary	2	2

[1] A description of each member in the constituent groups and a generalized discussion of the relevance of these groups are included in *California's Groundwater – Bulletin 118* by DWR (2003).
[2] Represents distinct number of wells sampled as required under DHS Title 22 program from 1994 through 2000.
[3] Each well reported with a concentration above an MCL was confirmed with a second detection above an MCL. This information is intended as an indicator of the types of activities that cause contamination in a given basin. It represents the water quality at the sample location. It does not indicate the water quality delivered to the consumer. More detailed drinking water quality information can be obtained from the local water purveyor and its annual Consumer Confidence Report.

Well Characteristics

	Well yields (gal/min)	
Municipal/Irrigation	Range: – 560-2,000	Average: 1,100 (Davis and Poland 1957)
	Total depths (ft)	
Domestic	Range: - Not determined	Average: Not determined
Municipal/Irrigation	Range: - 120-3,000	Average: 600-1,800 varies by type and location

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
Westlands Water District	Groundwater levels	960 Annually and may vary
Westlands Water District	Miscellaneous water quality	Varies
Department of Health Services and cooperators	Title 22 water quality	50 Varies

Basin Management

Groundwater management:	AB 3030 Plan adopted by Westlands Water District
Water agencies	
Public	Westlands Water District
Private	

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Errata

Updated groundwater management information and added hotlinks to applicable websites. (1/20/06)

Attachment M

Associate Resources Analyst Class Description

The minimum qualifications and job description of an Associate Resources Analyst at the District is attached.

Westlands Water District

Class Description

3130 N. Fresno St. Fresno, CA 93703

ASSOCIATE RESOURCES ANALYST

Bargaining Unit: Office and Clerical Employee Unit
Salary Code: 20
Fair Labor Standards Act Designation: Nonexempt
Effective Date: March 1, 2022

GENERAL DESCRIPTION:

Under general supervision of the Supervisor of Resources or Supervisor of Field Engineering and Planning, performs a variety of skilled technical engineering work. Depending upon assignment, individuals in this class provide estimates of water supply; coordinate, support, and assist in the development of the District's power, groundwater monitoring, groundwater integration, and irrigation water conservation programs, and distribution system construction and design; and perform computing, drafting, design, mapping, research, and plan check work.

EXAMPLES OF WORK PERFORMED:

The information below is meant to serve as examples of the job duties and responsibilities for this classification. This list is neither inclusive nor exclusive, but indicative of several types of duties performed.

1. Monitors, evaluates, and coordinates the Central Valley Project and State Water Project operations and forecasts.
2. Coordinates and assists collecting information for the District's groundwater and shallow groundwater monitoring programs, collects pH and electro-conductivity levels, and submits water samples to laboratories for analysis, and works with the Federal and State agencies as required.
3. Coordinates the District's power programs with other District staff, PG&E, and Western Area Power Administration, Power and Water Resources Pooling Authority, including annual power survey, power surcharges, contract administration, and annual budget calculations.
4. Coordinates and supports the District's Water Management Plan to comply with U.S. Bureau of Reclamation and the Department of Water Resources water conservation planning criteria.
5. Records and maintains a log of samples and tests for laboratories, water wells, etc.
6. Monitors groundwater extraction and instrumentation controls for data collection using appropriate equipment and recording devices.
7. Inspects the construction of facilities and materials for conformity with plans and specifications.
8. Assists with Underground Service Alert notifications/administration.
9. Develops and disseminates information, including technical reports and papers that promote efficient management of irrigation water.
10. Performs technical research, including gathering and analyzing technical data, and assists in developing engineering and technical reports to meet governmental requirements.

11. Conducts studies and prepares technical reports and specifications on water supply, power supply and other engineering related projects.

12. Administers water quality testing and compliance aspects of the District's groundwater integration programs, including water quality calculations and modeling of the San Luis Canal for water quality impacts.

13. Collects data and makes periodic determinations of water allocations for various crops, runoff, deep percolation losses, on-farm distribution system seepage losses, farm deliveries, peak water uses, and irrigation efficiencies. Analyzes seasonal and consumptive use of water for various crops.

14. Collects and analyzes daily weather data and is responsible for maintaining the District's weather stations.

15. Maintains historical weather and crop data files used in preparing weekly Irrigation Guide, Water Management Plans, and District water use and drainage studies.

16. Interprets and/or applies District rules and regulations, policies, and guidelines related to delivery installation requests and priority status for delivery of water and provides information to the public and other agencies in response to inquiries.

17. Coordinates work performed by other departments and non-District personnel to ensure the protection of District facilities.

18. Prepares technical information related to cost estimates, design, and construction of the District's pipeline, pump stations, and drainage structures.

19. Researches and interprets pertinent information from drawings, sketches, maps, field books, and catalogues. Performs and review engineering calculations.

20. Conducts surveys related to design, construction, and location of facilities and assists with preparing designs, plans, estimates, reports, specifications, and prepares maps, graphics and visual displays for public meetings.

21. Provides documents, drawings, water pressure calculations, and survey information to other departments, landowners and water users, and other agencies.

22. Maintains records; may prepare correspondence and reports.

23. Prepares and reviews contracts for lease and maintenance of District acquired lands.

24. Performs on-site inspections to ensure District land is being maintained so adjacent lands will not be impacted.

25. Performs other duties as assigned.

CLASSIFICATION REQUIREMENTS:

Education and Experience: Any combination of equivalent education and experience that has led to the acquisition of knowledge required by the position. A typical way of acquiring the knowledge would be:

A bachelor's degree in Business Administration, Industrial Technology, Agriculture, Earth Science, Engineering, Geology, Geographical Information Systems or a water related field, **and** two (2) years of agricultural, water regulatory, earth science, or related technical experience.

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Knowledge of:

- Federal, state, and local laws, codes, regulations, and ordinances related to projects when assigned.
- Mathematical problems involving addition, subtraction, multiplication, and division.
- Maps, charts, plans and property descriptions.
- Architectural/engineering drafting and Geographic Information System Techniques.
- Basic hydraulics.
- Basic engineering terminology, principles, and practices as applied to design and construction.
- Principles of planning soil-water relationships and soil science.
- Computer technology and design software, such as AutoCAD, Microsoft Word, and Excel to perform assigned duties.

Skills/Abilities to:

- Exercise independent judgment.
- Understand and apply District standards and regulations related to the design and construction of District facilities.
- Understand and apply applicable laws and regulations related to the design and construction of District facilities.
- Operate modern office equipment including computer equipment, and related software to perform required duties.
- Maintain accurate records and files.
- Communicate effectively both orally and in writing. Work cooperatively with staff, employees, and employee organizations.
- Provide prompt response to public concerns and complaints.
- Operate a District vehicle observing legal and defense driving practices.

WORKING CONDITIONS

- Possess physical characteristics to perform the critical and important duties of the job and, depending on assignment, the ability to occasionally enter confined spaces or climb stationary ladders.
- Work outdoors under adverse climatic weather conditions.

STANDARD REQUIREMENTS

- Possess a valid California Class C Driver's License with a driving record acceptable to the District's automobile insurance provider.

Attachment N

Abbreviations and Acronyms Index

AF	Acre-Feet
ASR	Aquifer Storage and Recovery Program
BAA	Bullard Avenue Airstrip
BiOps	Biological Opinions
BMPs	Best Management Practices
Broadview ASR	Broadview Aquifer Storage and Recovery
Cal Poly	California State Polytechnic University, San Luis Obispo
CC	Corcoran Clay
CDFW	California Department of Fish and Wildlife
CFS	Cubic Feet Per Second
CIMIS	California Irrigation Management Information System
CIP	Canal Integration Program
COA	Coordinated Operations Agreement
Coalition or WWQC	Westlands Water Quality Coalition
COC	Constituents of Concern
CSA	County Service Area
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
Delta	Sacramento-San Joaquin Delta
DIP	Distribution Integration Program

District	Westlands Water District
DWR	Department of Water Resources
EC	Electrical Conductivity
EISIRP	Expanded Irrigation System Improvement and Recharge Program
EISIP P3	Expanded Irrigation System Improvement/Power and Water Resources Pooling Authority Public Purpose Program
ESA	Endangered Species Act
ET or ETo	Evapotranspiration
GIS	Geographic Information System
GMP	Groundwater Management Plan
GO	Western Tulare Lake Basin General Order
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GWMP	Groundwater Management Program
HP	Horsepower
ID	Irrigation District
IFDM	Integrated On-farm Drainage Management
ILRP	Irrigated Lands Regulatory Program
ITRC	Irrigation and Training Research Center
KWB	Kern Water Bank
M&I	Municipal & Industrial
MRP	Monitoring and Reporting Program R5-2020-0809
NDVI	Normalized Difference Vegetative Index
NMFS	National Marine Fisheries Service
P3	Public Purpose Program

PWRPA	Power and Water Resources Pooling Authority
Reclamation or USBR	United States Bureau of Reclamation
RO	Reverse Osmosis
RWQCB	Regional Water Quality Control Board
SC	Specific Conductivity
SGMA	Sustainable Groundwater Management Act
SLC	San Luis Canal
STAR ASR	Storage Treatment Aquifer Recharge Aquifer Storage and Recovery
SWP	State Water Project
SWRCB	State Water Resources Control Board
SWSD	Semitropic Water Storage District
TAF	Total Acre-Feet
TDS	Total Dissolved Solids
U.S. FWS	United States Fish and Wildlife Service
WD	Water District
WMIS	Water Management Information System
WQMP	Water Quality Monitoring Program
WSCP	Water Shortage Contingency Plan
WSD	Water Storage District