



4 GROUNDWATER MANAGEMENT ZONE ACTIVITIES

4.1 The Groundwater Management Zones and the Basin Plan Update

According to the *West San Jacinto Groundwater Basin Groundwater Management Plan* (EMWD, 1995 [Management Plan]), the West San Jacinto Groundwater Management Area (Management Area) is located in western Riverside County within the San Jacinto River Watershed portion of the greater Santa Ana River Watershed as shown in Chapter 7, Figure 7-1. The 256-square mile Management Area (more than 164,200 acres) includes the cities of Moreno Valley, Menifee, and Perris, as well as the unincorporated areas of Lakeview, Nuevo, and Winchester. The Management Area is divided into six (6) groundwater management zones comprised of water bearing materials (aquifers), as well as essentially non-water bearing areas such as the Lakeview Mountains, the Bernasconi Hills and Mount Russell Range around Lake Perris, the Double Butte area near Winchester, and areas in the extreme northern and western portions of the District.

The California Regional Water Quality Control Board, Santa Ana Region, is responsible for adopting and implementing a water quality control plan and waste discharge requirements for the Santa Ana River Watershed. The State Water Resources Control Board adopted and approved the first Water Quality Control Plan for the Santa Ana River Basin (Basin Plan) in 1975. The most recent Basin Plan amendment was approved in early 2004. This amendment included changes in groundwater Basin Plan objectives, boundaries, and names. The nomenclature of the amendment was also revised and groundwater subbasins are now identified as groundwater management zones. Chapter 7, Figure 7-2 shows the groundwater management zone boundaries and the current Basin Plan water quality objectives. Water purveyors in the Management Area are shown in Chapter 7, Figure 7-3.

4.2 Groundwater Monitoring Programs

EMWD oversees the Groundwater Monitoring Programs within the Management Area. Well owners' participation in the Groundwater Monitoring Programs is voluntary. Groundwater quality samples are taken annually, groundwater levels are measured semi-annually, and groundwater extraction is read monthly. Chapter 7, Figure 7-4 presents the wells participating in the 2017 Groundwater Monitoring Programs and the March Air Reserve Base (MARB) wells reported to EMWD.

Annual Well Owner's Reports for calendar year 2016 were provided to well owners participating in the Groundwater Monitoring Programs in June of 2017. These reports contained the results of semi-annual groundwater level measurements, annual groundwater quality sampling, and annual groundwater extractions for calendar year 2016.

4.2.a Groundwater Quality Monitoring Program

Groundwater quality samples are taken annually and EMWD assumes the cost of the analyses. Generally in June of each year, participants receive copies of their groundwater quality analyses from the previous calendar year.

Groundwater quality samples are taken with either dedicated pumps or mobile pumps. In accordance with standard operating procedures, depth to groundwater readings are taken, then a minimum of three (3) well volumes of water are purged from the well prior to collecting a groundwater quality sample. Samples are collected in bottles following standardized sampling protocols and transported to the laboratory for analysis. Constituents tested in a typical groundwater quality sample are listed in Table 4-1 below.

Table 4-1: Constituents Tested in a Typical Groundwater Quality Sample

Type	Constituent:	Type	Constituent:
Cations	Calcium (Ca)	Metals	Boron (B)
	Magnesium (Mg)		Copper (Cu)
	Potassium (K)		Iron (Fe)
	Silica (SiO ₃)		Manganese (Mn)
	Sodium (Na)		Zinc (Zn)
	Hardness (Calculated from Ca/Mg)		
Anions	Chloride (Cl)	Alkalinity	Bicarbonate (HCO ₃)
	Fluoride (F)		Carbonate (CO ₃)
	Nitrate as Nitrogen (NO ₃ -N)		Hydroxide (OH)
	Sulfate (SO ₄)		Total Alkalinity as Ca CO ₃
Nitrogen	Ammonia as Nitrogen (NH ₃ -N)	Misc.	Electrical Conductance (EC)
	Nitrite as Nitrogen (NO ₂ -N)		Temperature at Collection
			pH
			Total Dissolved Solids (TDS)

During the 2017 groundwater quality monitoring effort, groundwater quality samples were collected from 89 wells in the Management Area. The highest and lowest concentrations of total dissolved solids (TDS) and detected nitrate as nitrogen (NO₃-N) in milligrams per liter (mg/L) from each groundwater management zone for 2017 are shown in Table 4-2. In 2017, the highest TDS registered in the Management Area was approximately 12,000 mg/L in the middle portion of the Perris South groundwater management zone; and the lowest was approximately 150 mg/L in the northeast portion of the Menifee groundwater management zone.

Table 4-2: 2017 Groundwater Quality Monitoring in the Management Area

Management Zone	No. of Samples	TDS (mg/L)		NO ₃ -N (mg/L)	
		High	Low	High	Low
Lakeview	24	3,000	270	14.0	< 0.1
Perris North	12	1,900	330	20.0	< 0.1
Perris South	45	12,000	420	27.0	< 0.1
San Jacinto Lower Pressure	4	1,600	350	8.1	< 0.1
Menifee	2	1,200	150	4.0	< 0.1
Hemet South (Partial)	2	550	590	12.0	12.0
Total	89	12,000	150	27.0	< 0.1

In 2017, the highest NO₃-N registered in the Management Area was approximately 27.0 mg/L in the Perris South groundwater management zone; the lowest was a “non-detect” (indicating that a constituent is either not present or is present in quantities below the testing detection limit for that compound) in the Lakeview portion of the Lakeview/Hemet North, Perris North, Perris South, Menifee, and San Jacinto Lower Pressure groundwater management zones. A map showing TDS and diagrams of graphic representations (i.e., stiff diagrams) for 2017 water quality characteristics at individual wells may be found in Chapter 7, Figure 7-5. NO₃-N concentrations for wells in the Management Area are presented in Chapter 7, Figure 7-6.

The highest and lowest concentrations of TDS and NO₃-N in mg/L for each management zone for 2013 through 2017 are shown in Chapter 6, Table 6-1. It should be noted that the same wells were not necessarily sampled each year due to access and usage issues, which may cause artificial fluctuations in some of the high and low values. It should also be noted that groundwater quality and the character of groundwater are affected by a number of factors including: type and mineral content of sediments, recharge and drainage patterns, historic land use practices, well screen intervals, and total depth of wells sampled.

4.2.b Groundwater Level Monitoring Program

The purpose of this program is to characterize basin hydrology and evaluate groundwater flow conditions. Measurements are taken twice annually, in the spring and fall. Copies of the results are provided to the well owners each subsequent year. The set of available wells varies from year to year due to reasons ranging from changes in access agreements to physical well access and usage of the well.

Wells are required to be turned off at least 24 hours prior to measuring a static water level. In some cases, a well may be in use during the semi-annual collection of water levels making the measuring of static water levels impractical at that location.

In spring of 2017, 151 wells were measured, plus an additional 257 results were reported from monitoring wells at the March Air Reserve Base (MARB), for a total of

408 wells. In fall of 2017, 148 wells were measured, plus an additional 257 results were reported from MARB, for a total of 405 wells. The minimum and maximum depths to groundwater are summarized and presented in Table 4-3. A comprehensive accounting of wells measured from 2012 through 2017 is presented in Chapter 6, Table 6-2. A map showing the change in groundwater elevation from Spring 2016 to Spring 2017 can be found in Chapter 7, Figure 7-7. A map showing the change in groundwater elevation from Fall 2016 to Fall 2017 can be found in Chapter 7, Figure 7-8.

Table 4-3: 2017 Groundwater Level Monitoring in the Management Area

Management Zone	Number of Wells Measured Spring	Number of Wells Measured Fall	Minimum Depth to Water (ft)	Maximum Depth to Water (ft)
Lakeview	28	29	89.7	232.4
Perris North	25	24	11.1	186.4
Perris South	60	60	1.7	193
San Jacinto Lower Pressure	21	21	13.1	257.6
Menifee	13	11	79.1	127.2
Hemet South (partial)	4	3	55.6	63.4
Totals	151	148	1.7	257.6

4.2.c Groundwater Extraction Monitoring Program

This monitoring program collects groundwater extraction data in order to develop an understanding of aquifer yield and health in the Management Area. This program involves the metering of significant (> 25 acre feet per year) extraction wells. The cost of installing meters and monitoring of metered wells is borne by EMWD. Groundwater extraction data is developed from a variety of sources including:

- 1) Meters installed and monitored by EMWD;
- 2) Privately owned meters read by EMWD personnel;
- 3) Meters monitored by other agencies and reported to EMWD; and
- 4) Estimates based on land use, acreage under cultivation, type of crop, or number of livestock.

The results are provided to the participating well owners to assist them in filing their Annual Recordation Notices of Groundwater Extraction. There were 56 wells monitored as part of the Groundwater Extraction Monitoring Program in 2017. Table 4-4 shows the 2017 groundwater extraction activities by groundwater management zone. Of the 56 wells, 42 (75%) were metered and 14 (25%) were estimated by EMWD. In

terms of actual groundwater extractions, 15,892 AF (73%) were metered and 5,947 AF (27%) were estimated by EMWD. Groundwater extraction for 2017 in the Management Area totaled 21,839 AF. Figures resulting from the Groundwater Extraction Monitoring Program effort for 2012 through 2017 are shown in Chapter 6, Tables 6-3 and 6-4.

Table 4-4: 2017 Groundwater Extraction Monitoring in the Management Area

Management Zone	No. of Wells Metered	No. of Wells Estimated	Total Number of Wells	Groundwater Extraction Metered (AF)	Groundwater Extraction Estimated (AF)	Total Groundwater Extraction (AF)
Lakeview	15	1	16	4,454	1,108	5,562
Perris North	8	1	9	3,541	400	3,941
Perris South	10	2	12	6,705	185	6,890
San Jacinto Lower Pressure	2	4	6	290	800	1,090
Meniffee	4	6	10	790	3,454	4,244
Hemet South (partial)	3	0	3	112	0	112
Total	42	14	56	15,892	5,947	21,839

Available data on groundwater extractions can also be obtained from the California Water Resources Control Board, Division of Water Rights (State). The State has microfiche records of filings from 1947 through 1985. From 1985 forward, records are kept as hard copy and a database has also been generated by the State. Actual groundwater extraction in most areas may be higher than the State recordation because not all groundwater producers file annual notices with the State. However, in a few instances the amount reported by individual well owners to the State exceeds the amounts measured in the Groundwater Extraction Monitoring Program.

Since many of the discrepancies occurred on metered wells, it can be assumed that either the State figures are inaccurate or the reporting well owner made an error. After checking the compilation process and an analysis of acreage and crop use, it was confirmed that the Groundwater Extraction Monitoring Program values compiled by EMWD were the most accurate figures available. Chapter 6, Table 6-5 shows extraction amounts for the years 2011 through 2016 as reported to and recorded by the State. A listing of zero indicates that the State had no recordation figures for that management zone for that year. It may or may not represent zero groundwater extraction.

In accordance with the statutes in the Water Code that were enacted by the State with the adoption of Assembly Bill 2733 in September 2004, the procedures for the filing of the notices of extraction have changed. As a result, EMWD assumed responsibility for

administration of the San Jacinto Watershed Groundwater Recordation Program within its service area in the San Jacinto Watershed. EMWD will send the notices of extraction for calendar year 2017 to all well owners in May 2018, which will be due by June 30, 2018.

4.3 Recycled Water Monitoring

EMWD owns five regional water reclamation facilities. These are located in Moreno Valley, Perris Valley, and Sun City, which are in the Management Area; and two in San Jacinto Valley and Temecula Valley, which are not within the Management Area. The Sun City facility has not been in operation since 1996 and is not currently planned to return to operation.

Recycled water use in the Management Area totaled 18,243 AF in 2017 as shown in Table 4-5. Forty-five percent (45%) of the recycled water sold in the Management Area was used for agricultural irrigation, thirty-six percent (36%) was utilized for municipal and industrial usage, and the remaining nineteen percent (19%) was used for irrigated landscaping, golf courses, construction, and habitat creation. Chapter 6, Table 6-6 presents recycled water use by groundwater management zone for 2012 through 2017.

Table 4-5: 2017 Recycled Water Use in the Management Area

Management Zone	Recycled Water Use (AF)
Lakeview	2,858
Perris North	1,218
Perris South	4,818
San Jacinto Lower Pressure	7,866
Menifee	1,178
Hemet South (partial)	305
Totals	18,243

During 2017, the Moreno Valley Regional Water Reclamation Facility treated a total of 11,127 AF of wastewater. Expansion of the treatment plant facility to total plant capacity of 21 MGD is completed.

The Perris Valley Regional Water Reclamation Facility treated a total of 12,976 AF of wastewater during 2017. Expansion of the treatment plant facility to a total plant capacity of 22 MGD was completed in 2014. Further expansion of plant capacity to 30 MGD is in preliminary design phase and is scheduled for completion in 2031.

4.4 Precipitation Monitoring Program

The Riverside County Flood Control and Water Conservation District maintains rainfall data in the Management Area for five representative stations. Precipitation in 2017 was

approximately 6.90 inches, which was lower than the long-term average (1910-2017) of approximately 10.60 inches per year for the area as shown in Table 4-6.

Table 4-6: 2017 Precipitation (inches) in the Management Area

Station	Lakeview	Lake Perris	Moreno Valley East	Sun City	Winchester
Long-term Average	1910-2012	1965-2017	2002-2017	1971-2017	1940-2017
	11.65	10.16	9.80	10.61	10.69
2017	-	6.90	8.91	8.42	7.76

The available precipitation data for 2012 through 2017 are shown in Chapter 6, Table 6-7. Some stations have closed, changed location over time, or have been added. For example, the Moreno Valley station closed in 2001, while another station, the East Moreno Valley station, has been online since 2001.

4.5 Inactive Well Capping/Sealing Program

Inactive, unused wells present a potential source of groundwater contamination as they can act as a direct conduit from the surface to the regional groundwater aquifer. Wells with open casings are especially vulnerable to contamination from surface flows or vandalism such as the dumping of oil or other waste products. Open casings larger than 16 inches in diameter also present a fall hazard to small children and animals. As a public service and to protect groundwater supplies, EMWD will cap and/or seal an inactive well by welding a bolted or locking cap to the well casing at no charge to the well owner. Capping and/or sealing wells instead of destroying them allow the wells to be used for water level and/or water quality monitoring. Priority is given to those wells that are potentially dangerous open holes (casings larger than 16 inches), wells located in potential flood areas, and wells located in areas with minimal existing monitoring.

In the Management Area, EMWD has capped and sealed sixteen (16) municipal, seven (7) state, and forty (40) private wells thus far. EMWD has also capped wells in the Hemet/San Jacinto Valley area, adjacent to the Management Area. In some instances, recently capped wells were quite old and only recently discovered by the property owner, who was not the original well owner. Table 4-7 lists the number of wells capped and sealed by EMWD in each management zone in 2017, and since program implementation in year 2000, in the Management Area. Chapter 7, Figure 7-9 shows the capped/sealed well locations. A listing of wells capped/sealed from 2010 through 2017, and since program implementation in year 2000, is presented in Chapter 6, Table 6-8.

Well owners who have, or know of, an old, unused well are encouraged to call the EMWD Planning Department for well capping consideration.

Table 4-7: 2017 Inactive Wells Capped/Sealed in the Management Area

Management Zone	2017	Total
Lakeview	1	8
Perris North	0	9
Perris South	0	26
San Jacinto Lower Pressure	0	10
Menifee	0	11
Hemet South (partial)	0	0
Totals	0	64

4.6 Imported Water

4.6.a North San Jacinto Water Supply Initiative

At the request of property owners in the Lakeview/Hemet North, San Jacinto Lower Pressure, and San Jacinto Upper Pressure Management Zones, EMWD undertook the North San Jacinto Water Supply Initiative. Issues of concern were: rising groundwater levels in management zones with poor quality groundwater; falling groundwater levels in management zones with good water quality; and the threatened loss of local groundwater supplies.

As a part of this effort, local dairy farmers along the Ramona Expressway worked cooperatively with EMWD to reduce groundwater production and construct a pipeline along Ramona Expressway to serve raw water to the area. In 2008, all facilities were completed, agreements were executed with the dairymen, and the pipeline became operational and began serving raw water to the dairymen.

During 2017, a total of 282 AF of raw imported water was served to the dairymen, with 77 AF of that amount used in the Management Area.

4.6.b Perris Water Filtration Plant

Construction on the Perris Water Filtration Plant began in 2001 to treat up to 11,000 AF/Y of imported untreated Colorado River water to potable water quality standards. It is located approximately one mile west of Lake Perris. During 2008, upgrades to the micro-filtration plant were completed including expansion of total plant capacity to up to 22,000 AF/Y, and construction of a pipeline to bring untreated State Project Water to the facility to improve water quality. Further plant expansion is planned for completion in April 2026, which increases the plant’s capacity up to 33,000 AF/Y.

In 2017, the Perris Water Filtration Plant produced 8,341 AF of potable water for use in the Management Area.

4.7 Groundwater Salinity Management Program

4.7.a Perris Basin Desalination Program

The Perris and Menifee Desalters are located at the Sun City Regional Water Reclamation Facility site and have a combined production capacity of 7,840 AF/Y. In 2017, the Menifee Desalter produced 2,393 AF, and the Perris Desalter produced 4,013 AF, of potable water for a total of 6,406 AF for the Management Area.

In 2017, the 8,447 AF of brackish groundwater produced for the desalters were provided by wells; 76 McLaughlin, 81 Antelope/Watson, 82 Mapes/Sherman, 83 Ellis/Sherman, 84 Ellis/Bradley, 86 Murrieta/San Jacinto, 87 Nuevo/Olivas, and 93 Nuevo, and with the operation of the iron and manganese removal facilities, also 75 Salt Creek, 85 Murrieta/Salt Creek, 88 Pico/San Jacinto, and 89 Ethanac II.

4.7.b Perris II Desalter

In July 2003, EMWD's Board of Directors approved and authorized an agreement with the Army Corps of Engineers (ACoE), in an amount not to exceed \$4 million, for the design of the South Perris Water Supply Desalination Project (Perris II Desalter, EMWD's third desalter). The financial commitment is subject to the availability of federal appropriations of \$3 million with the local share not to exceed \$1 million. The Board has approved and authorized an appropriation of over \$300,000 as part of EMWD's 25% local share under the agreement with the ACoE. The initial project design was completed in 2009 with subsequent revisions being completed in 2011.

EMWD completed exploratory drilling at six sites to evaluate potential future desalter wells in 2009, and four sites were acquired. During 2017, drilling and testing for Wells 95 (13th/Reservoir) and 96 (Santa Rosa) were completed and equipping of these wells are scheduled for 2018. Drilling, testing, and equipping of Well 94 (12th/Reservoir) is scheduled for 2018.

4.7.c Iron and Manganese Removal Facilities

High iron and manganese concentrations have irreversibly impacted select desalter membranes, and have resulted in several brackish groundwater extraction wells remaining off-line. In 2004, an effort was initiated to evaluate alternative technologies for removal of iron and manganese prior to desalination. A removal process was selected and final design was completed in 2009. EMWD was awarded grant funding from the California Department of Public Health in the amount of \$10M for construction of the facility. Construction was completed in 2013 and operation began in 2014, which has allowed EMWD to place Wells 75, 85, 88 and 89 back into active service.

4.8 Riverside County Well Information

Riverside County Ordinance No. 682.3 regulates the construction, reconstruction, abandonment, and destruction of wells. The Riverside County Department of Environmental Health is responsible for issuing well drilling permits. A valid permit along with the payment of all applicable fees is required before anyone digs, drills, bores, drives, or reconstructs a

well that is, or was, a water well, a cathodic protection well, or a monitoring well. Standards for the construction or reconstruction of wells are the standards recommended in the California Department of Water Resources Bulletin No. 74-81, Chapter II, and Bulletin No. 74-90, as amended by the State.

Permits issued in 2017 are itemized in Table 4-8. It should be noted that the figures indicate the number of permits issued, and does not necessarily reflect the actual number of wells drilled or abandoned, as permits may be issued but not used. EMWD initiated contact with the owners of these newly drilled agricultural wells in an effort to include them in the monitoring programs. EMWD also verifies abandoned wells and removes these wells from the monitoring programs. Well permits issued in the Management Plan area, by management zone and type of permit, for 2012-2017 are listed in Chapter 6, Table 6-9.

Table 4-8: 2017 Well Permits Issued in the Management Area

Management Zone	Domestic - Individual & Community	Agricultural Wells	Monitoring Wells	Cathodic Protection Wells	Abandoned Wells	Well Evaluation or Other	Total Permits
Lakeview	0	0	0	0	0	0	0
Perris North	1	0	8	0	29	0	38
Perris South	0	0	11	2	6	3	22
San Jacinto Lower Pressure	0	0	0	0	0	0	0
Menifee	0	0	0	0	0	0	0
Hemet South (partial)	0	0	0	0	0	0	0
Totals	1	0	19	2	35	3	60

4.9 Planned Development

EMWD maintains a database of proposed development projects within the District's boundaries. To assist in forecasting demand, projects can be separated into two categories (based on status): active construction and planned. Projects are in active construction once they have survey staking through completion. Proposed development includes projects in planning and design, starting with agency review through active construction. One single family residential unit is considered equivalent to one (1) Equivalent Dwelling Unit, which represents 0.53 acre feet per year of demand. The water demand shown is based on the number of residential units in each project and the acres of non-residential use. These demand projections are for planning purposes only and may change as information becomes available and projects are finalized.

Because of recent economic developments, completing a project in the Construction category could take up to nine years. Timing for completion of a project still in planning could

be up to 25 years in the future. Time frames are approximate with multiple factors affecting development including economic patterns and/or environmental constraints.

A map of proposed projects categorized by status is shown in Chapter 7, Figure 7-10.