CHAPTER 2
PLAN AREA AND BASIN SETTING

This chapter is organized in two major parts. The first covers administrative, statutory, and policy considerations, as well as aspects of the built environment related to water supply and demand (see Section 2.1 Description of Plan Area); whereas the second covers the physical setting and data used to develop the hydrogeologic framework for the San Jacinto Groundwater Basin (SJGB or Basin; see Sections 2.2 Basin Setting through 2.5 Water Budget). Specifically, Section 2.1 describes administrative boundaries, land use, and population characteristics; identifies existing water resources monitoring and management plans and programs; and describes the stakeholder process. Sections 2.2 through 2.5 describe the physical and geographic setting of the Basin, the hydrogeologic conceptual model, current, historical, and projected groundwater conditions, and the groundwater budget.

2.1 DESCRIPTION OF PLAN AREA

The SJGB is designated by the Department of Water Resources (DWR) under California Water Code (CWC) Section 12924 as one of California's 515 alluvial basins. The SJGB (DWR Basin No. 8-005) has an area of 158,531 acres[1], or 247.7 square miles, and underlies the San Jacinto, Perris, Moreno, and Menifee Valleys in western Riverside County (Figure 2-1; DWR 2016, 2019).[2] The Basin boundaries are formed by the San Jacinto Mountains on the east, the San Timoteo Badlands on the northeast, the Box Springs Mountains on the north, lower-relief hills on the west (e.g., Gavilan Peak and Steele Peak), and the Santa Rosa Hills and Bell Mountain on the south (Figure 2-1).

As described in Chapter 1, Introduction, this GSP has been developed to apply to the portions of the Basin that are not adjudicated (Plan Area), while incorporating data and management constraints on the adjudicated portions of the SJGB that are relevant to the groundwater conditions and management of the groundwater resources within the Plan Area (Figure 2-2). The Plan Area consists of 98,594 acres (154.1 square miles), or about 62% of the Basin. The Plan Area is covered

[1] Throughout this GSP, areas are shown to the nearest acre (or tenth of a square mile), water budget terms are shown to the nearest acre-foot (AF), and water level measurements are shown to the nearest tenth of a foot. As a result, large numbers may appear to be accurate to four or five digits, which may not be the case. All digits are retained in the text and tables to preserve correct column totals in tables and to maintain as much accuracy as possible during subsequent calculations.

[2] EMWD submitted a basin boundary modification to DWR based on scientific justification that more accurately defined the sedimentary basin relative to the well consolidated bedrock within and surrounding the existing basin boundaries. EMWD proposed that boundaries be adjusted to exclude areas underlain by bedrock, thin alluvial "fingers" or aprons where geologic mapping and data indicates an alluvial thickness of less than 25 feet, and/or the presence of an anthropogenic/engineered reservoir (i.e., Perris Reservoir). DWR accepted all of EMWD's proposed modifications, except the removal of Perris Reservoir. These boundary changes resulted in removal of bedrock areas in the southeastern and southwestern portion of the Basin, as well as smaller areas abutting the Bernasconi Hills and the Lakeview Mountains, totaling approximately 29,469 acres removed from the previous Basin boundary.

by Eastern Municipal Water District's (EMWD) service area, March Air Reserve Base (MARB), and areas under the land use jurisdiction of the March Joint Powers Authority (JPA).

Three separate adjudications cover parts of the Basin (Figure 2-1): 1) the 87.8 square mile Hemet-San Jacinto Basin, where groundwater was adjudicated in 2013 (Adjudication ID No. A24); 2) the 280.2 square-mile San Bernardino Basin Area (4.4 square miles are within the SJGB), where groundwater was adjudicated in 1969 (Adjudication ID No. A10); and 3) the 742.9 square-mile Santa Margarita River Watershed, where both surface water and groundwater were adjudicated in 1964 (Adjudication ID No. A12). Each adjudicated area has a watermaster that manages the production and distribution of groundwater within the adjudicated areas, in accordance with a court judgement. Although adjudicated areas are not considered to be part of the Plan Area, they make up a substantial portion of the SJGB; therefore, this GSP includes descriptions of these areas for reference, where relevant. Additionally, a water budget has been developed for the entire SJGB and flows across the boundaries between the Plan Area and adjudicated areas are discussed in Section 2.5 Water Budget.

Together, the adjudicated areas within the SJGB make up 39% of the SJGB (Table 2-1; Figure 2-1). The Hemet-San Jacinto Basin adjudication makes up the majority of this area (35% of the SJGB or 92% of the adjudicated area with the SJGB), covering 87.8 square-miles in the eastern and southern part of the SJGB. The Hemet-San Jacinto Basin is separated from the eastern side of the Plan Area by a boundary that extends to the north and south of the Lakeview Mountains (Figure 2-1). The San Bernardino Basin Area adjudication, which is 280.2 square-miles, has been subdivided into several discrete areas. An approximately 4.4 square-mile (2,806-acres) area of the "Riverside Basin Area within Riverside County (Riverside South)" intersects the SJGB north and west of the MARB (Figure 2-1). An approximately 3.8 square-mile (2,410-acre) area of the Santa Margarita River Watershed adjudication intersects the southern portion of the SJGB, west of Diamond Valley Lake (Figure 2-1). The vast majority of the 742.9 square-mile Santa Margarita River Watershed lies to the south of the SJGB. The San Bernardino Basin Area adjudication and the Santa Margarita River Watershed adjudication each make up approximately 2% of the SJGB (Table 2-1).

Table 2-1
Groundwater Management Boundaries within the San Jacinto Groundwater Basin

	Total Area (acres)	Area Within SJGB (acres)	Percent of SJGB
Plan Area			
West San Jacinto GSA Area[1]	93,878	93,878	59%
March Air Reserve Base	4,500	3,908	2%
March Joint Powers Authority (and other areas outside of EMWD's Service Area)	--	808[2]	<1%
Subtotal		*98,594*	*62%*

Table 2-1
Groundwater Management Boundaries within the San Jacinto Groundwater Basin

	Total Area (acres)	Area Within SJGB (acres)	Percent of SJGB
Adjudicated Areas			
Hemet-San Jacinto Basin[3]	56,226[4]	54,875[4,5]	35%
San Bernardino Basin[3] Area	179,316	2,806	2%
Santa Margarita River Watershed	475,426	2,410[5]	2%
Subtotal		*59,936[5]*	*39%*
Total		**158,530**	**100%**

Notes:
1 Approximately 63 acres of the West San Jacinto GSA Area lies within the March Air Reserve Base boundary.
2 Approximately 32 acres of this total consists of mapping "slivers" resulting from differences in mapping precision across sources.
3 Note that "basin" used in this context refers to the boundaries of the adjudication, and not a groundwater basin as defined by DWR under CWC §12924.
4 The 1,351-acre difference between the total area of the Hemet-San Jacinto Basin adjudication and the area within the SJGB is caused by imperfect overlap and is primarily representative of differences in mapping source and precision.
5 There is approximately 155 acres of overlap between the adjudicated areas of the Hemet-San Jacinto Basin and the Santa Margarita River Watershed. Because of this mapping overlap, 155 acres is subtracted from the subtotal for the adjudicated areas within the SJGB.

2.1.1 Summary of Jurisdictional Areas and Other Features

Because the adjudicated areas of the SJGB are under the jurisdiction of the respective watermasters for each area, the discussion of land use jurisdictions (see Section 2.1.1.1 Land Use Jurisdictions within the Plan Area) and water agencies (see Section 2.1.1.2 Water Agencies Relevant to the Plan Area) is limited to those agencies and jurisdictions that fall within the Plan Area. Impacts to groundwater conditions within the adjudicated areas resulting from changes to land use or water supply within the adjudicated area is subject to review and analysis by the watermaster and is not within the purview of this GSP.

2.1.1.1 Land Use Jurisdictions within the Plan Area

The Plan Area is subject to multiple federal, state, and local jurisdictions. The majority of the Plan Area consists of private land under the jurisdictions of the County of Riverside (25%) and the cities of Menifee, Moreno Valley, and Perris (55%; Figure 2-2). Approximately 15% of the Plan Area is under State jurisdiction, overseen by DWR and the California Department of Fish and Wildlife (CDFW). The former March Air Force Base occupies approximately 5% of the Plan Area, which is currently administered by the U.S. Department of Defense, the U.S. Department of Veterans Affairs, and the March JPA.

The areas occupied by each jurisdiction and agency in the Plan Area are shown in Table 2-2 and Figure 2-2, and further described below.

Table 2-2
Jurisdictional Boundaries within the Plan Area

Jurisdiction	Agency	Acres	Percent
Federal	U.S. Department of Defense	2,027	2%
	U.S. Department of Veterans Affairs	634	1%
	Subtotal	*2,661*	*3%*
State	California Department of Water Resources	4,812	5%
	California Department of Fish and Wildlife[1]	9,760	10%
	Subtotal	*14,573*	*15%*
County / JPA	County of Riverside	24,945	25%
	March Joint Powers Authority	1,991	2%
	Subtotal	*26,936*	*27%*
Municipal	City of Menifee	13,620	14%
	City of Moreno Valley	25,252	26%
	City of Perris	15,551	16%
	Subtotal	*54,424*	*55%*
	Total	**98,594**	**100%**

Notes:
1 The San Jacinto Wildlife Area includes privately owned parcels under county jurisdiction that are not owned or controlled by CDFW, but which have conservation easements and/or open space/recreational uses that are included within the park boundary.

2.1.1.1.1 Former March Air Force Base

Federal land use jurisdiction in the Plan Area includes the Department of Defense for activities and actions on MARB, and the U.S. Department of Veterans Affairs (National Cemetery Administration) for management of the Riverside National Cemetery (Figure 2-2). Federal lands occupy a total of 2,661 acres (or about 3%) of the Plan Area (Table 2-2). Both MARB and the Riverside National Cemetery are located on the former March Air Force Base, which prior to realignment and conversion from an active-duty base to a reserve base in 1996, encompassed approximately 6,500 acres straddling Interstate 215 just south of Highway 60 (March JPA 2019). After realignment, 4,400 acres of property and facilities were declared surplus and available for disposal actions. Jurisdiction on the surplus property was transferred to the County of Riverside briefly before the March JPA was formed to act as the federally recognized reuse authority (March JPA 2019). The remaining portion of the base remained under federal jurisdiction and the name was officially changed from March Air Force Base to MARB.

March JPA is governed by the March Joint Powers Commission, which is made up of elected officials from the four jurisdictions that intersect the former base, i.e., Riverside County, the City of Riverside, the City of Moreno Valley, and the City of Perris (March JPA 2019). March JPA administers its own General Plan; adopts and implements development/building codes and standards; and acts as the permitting authority for development of vacant lands, reuse or redevelopment of existing facilities, and joint use of the airfield facilities (March JPA 2019). The March JPA has been actively redeveloping numerous sites on the former base, primarily with commercial, industrial, and aviation-compatible land uses. Areas under March JPA jurisdiction occupy a total of 1,991 acres (or about 2%) of the Plan Area (Table 2-2).

2.1.1.1.2 State

State land use jurisdiction in the Plan Area includes DWR for the management of Lake Perris and the Perris Dam, the Department of Fish and Wildlife for management of the San Jacinto Wildlife Area (SJWA), and the California Department of Parks and Recreation for the management of the Lake Perris State Recreation Area (SRA; Figure 2-2).

Lake Perris and the area surrounding it are owned and managed by DWR as a critical component of the California State Water Project (SWP), whereas open space and open water recreation at Lake Perris is managed by the California State Parks. Constructed between 1970 and 1974, Lake Perris is the southernmost SWP reservoir, holding imported water delivered by the East Branch California Aqueduct (Figure 2-3). Lake Perris SRA, which covers about 8,800 acres (within and outside the Plan Area), provides opportunities for swimming, fishing, boating, camping, hiking, biking, climbing, horseback riding, and hunting. DWR is currently in the process of planning and implementing a multi-year dam safety project (Outlet Tower Improvements and Emergency Release Facility Project), as well as the Lake Perris Seepage Recovery Project (DWR 2019a). The Lake Perris area, managed by DWR and California Parks, occupy a total of 4,812 acres (or about 5%) of the Plan Area. The remainder of the Lake Perris SRA occurs in the bedrock hills outside of the Plan Area boundary (Figure 2-2).

In addition to the Lake Perris SRA, the other primary state land in the Plan Area is the 20,000-acre SJWA (Figure 2-2). SJWA is largely owned and managed by CDFW[3] for the purpose of wildlife conservation and recreational activities, such as fishing, hunting, and bird watching (Figure 2-2). The Davis unit of the SJWA, which is the part of the SJWA within the Plan Area, consists of approximately 9,760 acres (or about 10%) of the Plan Area. The larger portion of the Davis Unit, which contains the main wetland, riparian, and waterfowl habitats, is located east of the Lake Perris SRA, and the Davis Unit’s smaller portion of land is located southwest of the Lake Perris SRA (CDFW 2017). The SJWA is managed under a land management plan, currently undergoing a revision. The purpose of the land management plan is to outline the goals, objectives, and actions for protection and management of the lands within the SJWA. These goals include, among other things: protection, restoration, and enhancement habitat for sensitive species; management of existing and new waterfowl and upland game hunting opportunities; management of agricultural

[3] There are several private in-holdings of land within the SJWA, including Double Bar S (horse ranch), 21 Hunt Club, and the Four Winds Pheasant Club, as well as conservation easements on Little Ramona Duck Club and Mystic Duck Club (CDFW 2017).

activities to protect and enhance biological resources; development and implementation of a wildfire plan; and supporting the use of the wildlife area for other wildlife dependent public use activities (CDFW 2017).

2.1.1.1.3 County/Municipal

County and municipal land use jurisdiction in the Plan Area includes the County of Riverside (24,945 acres), the City of Perris (15,551 acres), the City of Moreno Valley (25,252 acres), and the City of Menifee (13,620 acres; Figure 2-2). It should be noted that the previously unincorporated communities (census-designated places) of Sun City, Quail Valley, Romoland, and Menifee were replaced by the municipal boundary of the City of Menifee when it was incorporated in 2008. Collectively, County of Riverside and municipal land makes up 80% of the Plan Area, and includes urban, open space, and agricultural land. Unincorporated parts of the Plan Area consist of open space and agricultural land, primarily along the San Jacinto River corridor, as well as the unincorporated communities of Lakeview and Nuevo, located north of the Lakeview Mountains between the SJWA and the City of Perris, and parts of Winchester and Homeland, located east of the City of Menifee and west of the City of Hemet (Figure 2-2). Land use in these areas are guided by general plans and governed under local municipal codes and ordinances, addressed in Section 2.1.3 Land Use Elements of Topic Categories of Applicable General Plans.

2.1.1.2 Water Agencies Relevant to the Plan Area

EMWD is the primary water supplier within the Plan Area, and thus is acting as the GSA for the Plan Area, in compliance with SGMA. In addition to EMWD, there are several other water agencies within the Plan Area that have important roles as either wholesale or retail water suppliers. Retail water agencies within the Plan Area include the City of Perris and the Nuevo Water Company, both of whom purchase imported water from EMWD. Western Municipal Water District's (WMWD) Riverside service area, which includes a portion of the city of Riverside and unincorporated portions of Riverside County, overlaps approximately 4,552 acres within the Plan Area, serving retail customers within the northwestern portions of the Plan Area (e.g., the MARB and the March JPA; Figure 2-4). Sixteen acres of the Box Springs Mutual Water Company's service area, which purchases imported water from WMWD, overlaps the Plan Area (Figure 2-4). The water agencies that utilize groundwater from within the Plan Area are EMWD, the City of Perris, and the Nuevo Water Company.

Water district boundaries, their roles as a wholesale or retail water supplies, and their basic characteristics are provided in Table 2-3, shown in Figure 2-4, and further described below.

Table 2-3
Water District Boundaries within the Plan Area

Water District	Water Agency Type	Service Connections / Retail Population	Total Size of Service Area (Acres)[1]	Service Area Within GSP Plan Area (Acres)[1]	Water Sources
Eastern Municipal Water District	Wholesale and Retail	147,300 / 546,146	279,371	93,878	CRA, SWP, groundwater, desalinated groundwater, and recycled water
Western Municipal Water District	Wholesale and Retail	23,654 / 94,107	61,965	4,552	CRA, SWP, and local groundwater from outside the SJGB
Nuevo Water Company	Retail	1,894 / 6,447	3,218	2,781	Purchased surface water (from EMWD), one groundwater well
City of Perris	Retail (Downtown Water System)	2,586 / 7,854	1,911	1,380	Purchased surface water (from EMWD)
	Retail (North Perris Water System)	1,389 / 4,500	245	245	Purchased surface water (from EMWD), four groundwater wells
Box Spring Mutual Water Company	Retail	629 / 2,100	449	16	Purchased surface water (from WMWD), local groundwater produced from outside the Plan Area

Sources: EMWD GIS, SWRCB 2019a, EMWD 2016a, WMWD 2016
CRA = Colorado River Aqueduct, SWP = State Water Project
1 Service area size given for EMWD and WMWD are their retail customer service areas, and thus is not inclusive of the service areas of retail water agencies.

2.1.1.2.1 Department of Water Resources and Metropolitan Water District

The SWP, operated by DWR, and the Colorado River Aqueduct (CRA), operated by Metropolitan Water District (MWD), along with their terminal reservoirs, together constitute the major backbone infrastructure that delivers imported surface water from the Sacramento-San Joaquin Delta and the Colorado River, respectively, to the Plan Area (Figure 2-3). Both EMWD and WMWD are two of MWD's 26 member agencies and MWD is the largest (in terms of water volume delivered) of the SWP's 29 contractors. MWD owns and operates Lake Mathews, Lake Skinner, and Diamond Valley Lake, none of which are within the Plan Area, but function as MWD's nearest storage reservoirs, from which a complex distribution system delivers water to MWD's member agencies. As previously described, DWR operates Lake Perris as the southern terminus of the SWP (Section 2.1.1.1 Land Use Jurisdictions within the Plan Area). Imported surface water infrastructure is shown in Figure 2-4.

Primarily SWP is imported from MWD to the Mills Plant, which is located approximately 2 miles west of the Plan Area, in the City of Riverside (Figure 2-4). Water delivered to EMWD from the Mills Plant has been treated and is used for domestic consumption to most of the Plan Area.

MWD's Skinner Filtration Plant receives both SWP and CRA and, at times, provides treated potable water to the southern portion of the Plan Area. Skinner Filtration Plant is located ¼ mile west of Skinner Reservoir, 6 miles south-southeast of the Plan Area.

The Perris Water Filtration Plant (PWFP) treats raw water delivered via the CRA and the SWP to potable standards (Figure 2-4). After treatment at the PWFP, the water is delivered to local customers for domestic consumption.

EMWD also purchases untreated raw water from MWD that is sent to the Hemet Water Filtration Plant, directly to agricultural parcels along the Ramona Expressway for irrigation purposes, and diverted to the Integrated Recharge and Recovery Program (IRRP) and Grant Avenue Ponds to recharge groundwater in the Hemet-San Jacinto Management Area (see Section 2.5 Water Budget).

Since the Plan Area and its surrounding watershed is semi-arid, without a significant source of local surface water, imported water from the SWP and CRA has historically supported urban growth within the Plan Area. Imported water continues to support urban growth in the Plan Area. Prior to the availability of imported water (i.e., the 1950s), groundwater constituted the region's primary source of water supply. Currently imported water and recycled water compose a larger portion of EMWD's municipal water supply portfolio than does groundwater (EMWD 2016a). Land and water use in portions of the Plan Area have largely shifted from rural and agricultural uses to urban uses, and the introduction of imported water has shifted water use in the urban parts of the Plan Area from groundwater to imported and recycled water for domestic and landscape irrigation purposes, causing groundwater levels to rebound from their lows in the 1950s and 1960s (see Section 2.4.1 Groundwater Elevation Data).

2.1.1.2.2 Eastern Municipal Water District

EMWD's 2015 Urban Water Management Plan (UWMP), the most recent UWMP available, provides the following summary of its service area and water portfolio:

> "EMWD provides potable water, recycled water, and wastewater services to an area of approximately 555 square miles in western Riverside County. EMWD is both a retail and wholesale agency, serving a retail population of 546,146 people and a wholesale population of 215,075 people. The agency was initially formed in 1950 to bring imported water to the area and in 1951 was annexed into the Metropolitan Water District of Southern California (MWD). EMWD is now one of MWD's 26 member agencies.
>
> The majority of EMWD's supplies are imported water purchased through MWD from the State Water Project (SWP) and the Colorado River Aqueduct (CRA). Imported water is delivered to EMWD either as potable water treated by MWD, or

as raw water that EMWD can either treat at one of its two local filtration plants or deliver as raw water for non-potable uses.

EMWD's local supplies include groundwater, desalinated groundwater, and recycled water. Groundwater is pumped from the Hemet/San Jacinto and West San Jacinto areas of the San Jacinto Groundwater Basin. Groundwater in portions of the West San Jacinto Basin[4] is high in salinity and requires desalination for potable use. EMWD owns and operates two desalination plants that convert brackish groundwater from the West San Jacinto Basin into potable water. EMWD also owns, operates, and maintains its own recycled water system that consists of four Regional Water Reclamation Facilities and several storage ponds spread throughout EMWD's service area that are all connected through the recycled water system. As of 2014, EMWD has used 100 percent of the recycled water it produces." (EMWD 2016a)

2.1.1.2.3 Western Municipal Water District

WMWD's 2015 UWMP provides the following description of its service area and water portfolio:

"Western's total service area covers 527 square miles, of which 104 square miles are included in its retail service area. Western is a wholesale agency with fourteen customers […]. Western's water supplies consist primarily of purchased or imported water. The majority of this water is purchased from Metropolitan Water District of Southern California (Metropolitan). Metropolitan is a regional water wholesaler that has 26 public member agencies, including Western. Metropolitan obtains its primary water supplies from the State Water Project (SWP) and Colorado River Aqueduct (CRA). […] Western also purchases local groundwater supplies from Meeks and Daley Water Company, Riverside Highland Water Company and when available, from the City of Riverside. Water is typically purchased from the City of Riverside on an emergency or off-season basis. Additional local groundwater supplies are pumped by Western from the Temecula-Murrieta portion of the Temecula Valley Groundwater Basin and the San Bernardino Basin Area for retail supplies, and from the Arlington Subsection of the Riverside-Arlington Groundwater Basin for wholesale supplies. To increase local supply reliability, Western produces and sells recycled water in its retail service area. Western plans to implement additional projects to increase local supply

4 The West San Jacinto Basin refers to the portion of the Plan Area that is within EMWD's service area, and corresponds to the extent of the West San Jacinto GSA area boundary.

> reliability including groundwater recharge projects and expansion of its retail distribution system" (WMWD 2016).

WMWD does not rely on groundwater from the SJGB to supply water to its service area (WMWD 2016). The portion of the SJGB that overlaps with WMWD's service area cannot be utilized as a source of potable water without costly treatment, due to high concentrations of total dissolved solids (TDS), and volatile organic compounds (VOCs) (AFCEC 2019), and WMWD does not maintain any groundwater production wells in the SJGB. The majority (over 70%) of WMWD's retail and wholesale water supplies comes from imported water purchased from MWD and EMWD. The remainder of WMWD's supply consists of groundwater (purchased from other agencies and/or produced from its own wells) from the Riverside-Arlington Groundwater Basin (Arlington subbasin [DWR 8-02.03]), the Temecula-Murrieta Groundwater Basin (DWR 9-05), the San Bernardino Basin Area (includes Bunker Hill Subbasin [8-2.06], and portions of Yucaipa Basin and Rialto-Colton Basin), and the Chino Basin (DWR 8-2.01) (WMWD 2016). Although WMWD's service area overlaps with the Plan Area, its role in the management of groundwater resources in the SJGB is limited because it does not currently, and has not historically, produced groundwater from the SJGB.

Within the Plan Area, WMWD provides potable and non-potable water service to MARB, Riverside National Cemetery, and the March JPA. Potable water delivered to this area is supplied via a 54-inch distribution main operated by EMWD. However, because MARB, the cemetery, and March JPA are within WMWD's service area, WMWD entered into an agreement with EMWD to take over the share of this pipe's capacity that was formerly controlled by March Air Force Base. A 20-inch pipeline transports water from Lake Mathews to the Lt. Gen. Archie Old Golf Course and to Riverside National Cemetery. In addition to this potable water source from Lake Mathews, WMWD provides non-potable water through its ownership and operation of the Western Water Recycling Facility (WWRF), formerly the March Wastewater Treatment Plant (Figure 2-4). The WWRF treats domestic wastewater from March Air Reserve Base and the north-central portion of WMWD's Riverside Service Area. WMWD's 2015 UWMP describes the WWRF as follows:

> "The plant was upgraded in 2014 to produce 2,200 AFY of tertiary treated wastewater, which is discharged to an impoundment and then pumped to supply the recycled water system. The recycled water is provided to the Riverside National Cemetery, General Archie Old Golf Course, and various landscaping, agricultural and commercial use sites. When supply exceeds demand, such as during wet winter months, excess recycled water is stored in the on-site impoundment until needed. If recycled water demands exceed supply, March Air Force Base's Expanded Groundwater Extractions and Treatment System (EGETS) may operate and send groundwater flows to blend with recycled water in Western's on-site storage ponds at the WWRF. If there is a large discrepancy between recycled water demand and

> recycled water supply, excess recycled water from the WWRF can be placed in Western's existing sewer collection system for conveyance and treatment at the WRCRWTP, where it is eventually discharged to the Santa Ana River. Current wastewater generation and recycled water demand projections indicate that most of the recycled water generated at the WWRF can be used, except during unusually wet winter weather events." (WMWD 2016)

The use of recycled water for irrigation of the cemetery, golf course, parks, and other agricultural/commercial uses reduces demand for groundwater which may have otherwise been used to supply these areas. WMWD has plans to expand delivery of recycled water to other locations within March JPA and further north (e.g., Meridian Business Center and Riverside Unified School District schools). In 2015, WMWD delivered approximately 1,300 AFY of recycled water, and anticipates delivering up to 2,700 by 2040, as it adds additional customers to its recycled water distribution system (WMWD 2016).

2.1.1.2.4 City of Perris Water / Liberty Utilities

The City of Perris is a retail water agency that purchases approximately 640 million gallons (1,964 acre-feet) of water each year from EMWD (City of Perris 2019). The City of Perris has a storage capacity of 2.5 million gallons and distributes the water to approximately 2,300 customers through a 37-mile distribution system within the City's downtown area (City of Perris 2019). The City also operates four groundwater wells (McCanna Ranch Well Nos. 1 through 4) in the Avalon development near the base of the Perris Dam. This part of the City's water system (formerly the McCanna Ranch Water Company) serves a population of approximately 4,500 through 1,389 service connections (SWRCB 2019a). The City's service area is thus non-contiguous and separated into two discrete water systems consisting of the Downtown Water System (SDWIS No. CA3310029), which supplies the city center, and the North Perris Water System (SDWIS No. CA3310082), which supplies the Villages of Avalon. The City has an appropriative water right for 462 AFY for the four wells in combination, under State Water Resources Control Board (SWRCB) Permit No. 021404 (SWRCB 2019b). The electronic Water Rights Information Management System database lists water pumped from these wells as underflow from Lake Perris into the SJGB (SWRCB 2019b). Figure 2-4 shows these two non-contiguous service areas.

In 2017, the City of Perris voters passed a ballot measure (Measure H) to sell the City's two municipal water systems to Liberty Utilities. The purpose of the measure was to mitigate the impact of the water system—which was in debt and continuing to incur annual operating deficits—on the City's general fund. Liberty provides water service to 12 incorporated cities in California and to unincorporated areas in San Bernardino and Los Angeles Counties. The California Public Utilities Commission regulates Liberty, and the water rates charged by Liberty must be approved by the California Public Utilities Commission. EMWD (2016a) reports water sales to retail water agencies in five-year increments. The City of Perris purchased 1,900, 1,700, and 1,542 AFY of water from EMWD in 2005, 2010, and 2015, respectively. Liberty Utilities purchased 913 acre-feet per year of water rights from the City of Perris.

2.1.1.2.5 Nuevo Water Company

Nuevo Water Company provides potable and non-potable water service to a population of 6,447 through 1,894 connections, 98% of which are residential (SWRCB 2019a). Besides the residential connections, there are eight agricultural service accounts, 30 commercial service accounts and seven industrial service accounts (SWRCB 2019a). Nuevo Water Company obtains its water supply from both local groundwater and imported surface water, purchased from EMWD. EMWD (2016a) reports water sales to retail water agencies in five-year increments, and Nuevo Water Company purchased 800, 600, and 247 AFY of water from EMWD in 2005, 2010, and 2015, respectively. Nuevo Water Company has one active groundwater well (NWC Archibeck aka Piester Well), and one pending groundwater well (6th Street Well) (SWRCB 2019a). Groundwater production from the NWC Archibeck (aka Piester Well) averaged 717 AFY between 2015 and 2018.

2.1.1.2.6 Box Springs Mutual Water Company

Box Springs Mutual Water Company (BSMWC) serves approximately 3,300 people (WMWD 2016). BSMWC currently receives water from one BSMWC-owned groundwater well (Well No. 17) located in the Riverside South Groundwater Basin, outside of the Plan Area. BSMWC purchases approximately 40 percent of its water from WMWD for blending with its local supplies and purchased 76 AF potable water in 2015 (WMWD 2016). The BSMWC has one well in the Plan Area, the Box Springs MWC well, which is not currently being used for groundwater production and has not been used for groundwater production since 1999.

2.1.2 Water Resources Monitoring and Management Programs

Numerous water resources monitoring and management programs have already been implemented in the SJGB by several entities and stakeholders seeking to maintain and/or enhance water resources in the region, and to comply with state and federal laws applicable to water supply, water quality, watershed health and/or wildlife habitat. This section focuses on the monitoring and management programs within the Plan Area that are most relevant to groundwater sustainability. Water resources monitoring and management programs within the adjudicated portion of the SJGB are implemented under their respective court judgements (see Section 2.1 Description of Plan Area). Additional details on the groundwater monitoring and management program for the Hemet/ San Jacinto Groundwater Management Area are also provided in Section 2.1.2.2.3 Hemet/San Jacinto Groundwater Management Area Adjudication.

Generally, water resources monitoring and management programs are anticipated to be integral to or complementary with the sustainable management criteria and/or the projects and management actions developed for this GSP. Certain monitoring programs described herein, such as the monitoring program established under EMWD's previous AB3030 Groundwater Management Plan (GMP) and the California Statewide Groundwater Elevation Monitoring (CASGEM) Programs are expected to be incorporated in future monitoring programs that will be conducted under the umbrella of SGMA compliance. Existing monitoring programs for precipitation, streamflow, groundwater elevation, water quality, and water supply within the Plan Area are described in Sections 2.1.2.1 Precipitation and Streamflow through 2.1.2.4 Water Supply. A description of how each of these existing monitoring networks will be incorporated into the GSP is provided at the end of each section. Section 2.1.2.5 Operational Flexibility and Conjunctive Use Programs describes how these programs may limit operational flexibility in the Plan Area.

2.1.2.1 Precipitation and Streamflow

Several entities monitor climate, weather, and stream flow in the Plan Area, including the Riverside County Flood Control and Water Conservation District, the U.S. Geological Survey (USGS), and DWR. The Riverside County Flood Control and Water Conservation District maintains rainfall data for six stations, one of which is inactive, in the Plan Area (Figure 2-5; Table 2-4; EMWD 2019a). The USGS monitors streamflow nationally through its National Water Information System, including five stream gauges along the San Jacinto River, three of which are outside of the Plan Area, one gauge on Salt Creek, and one gauge on the Perris Drain (Figure 2-5, Table 2-4). The USGS, in cooperation with the Riverside County Flood Control and Water Conservation District, maintains four stream gauges in the Plan Area. Gauge 1070210 is located on the San Jacinto River at the Ramona Expressway, gauge 11070365 is located on the San Jacinto River near the outlet to Canyon Lake gauge 11070270 is located on the Perris Valley storm drain at Nuevo Rd, and gauge 11070465 is located on Salt Creek at Murrieta Road (Figure 2-5). DWR plays an important role in disseminating information on how climate and weather translates to evapotranspiration (ET) rates through its California Irrigation Management Information System (CIMIS), which consists of a network of over 145 automated weather stations in California, one of which is located in the Plan Area. Another CIMIS weather station, 238 Moreno Valley, is located on the outside edge of the Plan Area.

The data from these water resources monitoring programs are used, as applicable, to inform the development of the groundwater basin setting, hydrogeological conceptual model, and groundwater budget (see Sections 2.2 Basin Setting through 2.5 Water Budget).

Table 2-4
Precipitation, Evapotranspiration, and Streamflow Monitoring Stations in the Plan Area

Station Name (Agency No./ID)	Agency	Monitoring Frequency	Status	Period of Record
Weather Stations				
124 – Moreno Valley East	RCFCWCD[1]	Daily	Active	03/1990 to current
134 – Lakeview	RCFCWCD	Monthly	Inactive	1/1910 to 12/2012
151 – Lake Perris	RCFCWCD	Daily	Active	1/1964 to current
161 – San Jacinto Valley	RCFCWCD	Daily	Active	7/1989 to current
212 – Sun City	RCFCWCD	Daily	Active	7/1970 to current
248 – Winchester	RCFCWCD	Daily	Active	11/1940 to current
California Irrigation Management Information System Stations				
240 – Perris/Menifee	CIMIS	Hourly	Active	05/2013 to current
238 – Moreno Valley	CIMIS	Hourly	Inactive	4/2013 to 4/2018
Stream Gauges				
11070210	USGS/RCFCWCD	Daily	Active	08/2000 to current
11070270	USGS/RCFCWCD	Daily	Active	10/1969 to 03/2020
11070365	USGS/RCFCWCD	Daily	Active	8/2000 to current
11070465	USGS/RCFCWCD	Daily	Active	10/2000 to current

1 RCFCWCD – Riverside County Flood Control and Water Conservation District

2.1.2.2 Groundwater Elevations

2.1.2.2.1 California Statewide Groundwater Elevation Monitoring Program

In response to SBX7-6, passed by the legislature in 2009, DWR developed the California Statewide Groundwater Elevation Monitoring (CASGEM) Program to encourage collaboration between local monitoring parties and DWR and to collect statewide groundwater elevations for the purpose of tracking seasonal and long-term groundwater elevation trends in groundwater basins statewide. DWR works cooperatively with local agencies to collect and maintain groundwater elevation data in a manner that is readily and widely available to the public through the CASGEM online reporting system. The groundwater elevation data collected through the CASGEM program is also made available to the public by incorporating the data into DWR's "SGMA Data Viewer" map application.[5]

EMWD is the umbrella monitoring entity for the purpose of tracking groundwater elevation trends within the SJGB, which includes part of the Hemet-San Jacinto Basin adjudicated area (EMWD 2011a). Cooperating agencies include Lake Hemet Municipal Water District, City of Hemet, City of San Jacinto, City of Perris, Nuevo Water Company, Box Springs Mutual Water Company, and California Department of Fish and Game (EMWD 2011a). These cooperating water agencies allow

5 https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#gwlevels.

EMWD access to their wells for monitoring purposes or monitor their own wells and report the data to EMWD. The frequency of water level measurements varies based on the needs of the monitoring agency: wells are monitored at a minimum twice per year. Water levels are measured in the spring and fall to capture the seasonal high and low water level. The wells that are part of the CASGEM program are a mixture of production wells and monitoring wells.

Data collected as part of the CASGEM program have been used to develop the Basin Setting (Section 2.2) and have been integrated into the monitoring and reporting program developed as part of this GSP (Section 3.5).

2.1.2.2.2 Assembly Bill 3030: EMWD Groundwater Management Plan

In June 1995, EMWD adopted the West San Jacinto Groundwater Basin Management Plan (GMP) in accordance with the statutes in the California Water Code Sections 10750 through 10755 resulting from the passage of AB 3030 (EMWD 1995, EMWD 2016a). The geographic extent of the area included in the GMP is similar to the geographic extent of the West San Jacinto GSA area (see Section 1.3 Agency Information), which covers the non-adjudicated portion of the SJGB within EMWD's service area. Differences in the geographic extent of the West San Jacinto GSA area and the GMP geographic extent occur where the SJGB boundaries were adjusted in 2019 (see Section 2.1 Description of Plan Area; DWR 2019b).

The GMP was adopted after extensive public outreach and meetings with interested individuals and agencies. Implementation of the GMP began directly after its adoption. Initial efforts to implement the GMP included establishing an advisory committee; prioritizing the management zones; evaluating groundwater resources including establishing groundwater quality, level, and extraction monitoring programs; and conducting hydro-geophysical investigations (EMWD 2016a).

Since 1996 EMWD has published a GMP Annual Report, which documents the implementation of the GMP and groundwater management activities within the West San Jacinto Basin. These activities include groundwater quality, groundwater level, and groundwater extraction monitoring, recycled water delivery, inactive well capping/sealing, and additional activities affecting specific groundwater management zones and/or EMWD's service in the non-adjudicated portion of the SJGB (EMWD 2019a). During 2018, water quality samples were collected from 105 wells in the GMP management area; depth to water was measured in 149 wells (an additional 257 depth to water readings were reported by March Air Reserve Base providing a total of 406 wells for analysis); and groundwater extraction was monitored from 57 wells (EMWD 2019a). EMWD's groundwater monitoring network is detailed in Appendix C and shown in Figure 2-6.

In 2018, groundwater extraction from the West San Jacinto Basin was calculated to be 21,813 acre-feet (EMWD 2019a). This is a minimum estimate of groundwater production since participation in EMWD's extraction monitoring program is voluntary, and not all well owners report their usage. Additionally, only extraction wells that produce ≥ 25 AFY are reported.

Data gathered throughout implementation of EMWD's AB 3030 GMP has been used to develop the groundwater basin setting, hydrogeologic conceptual model, and groundwater budget for this GSP. This GSP will replace the 1995 GMP as EMWD's guiding document for groundwater management in the Plan Area.

2.1.2.2.3 Hemet/San Jacinto Groundwater Management Area Adjudication

A stipulated Judgment entered on April 18, 2013, in Riverside County Superior Court (Case No. RIC 1207274; Appendix D) has resulted in the management of the Hemet/San Jacinto Groundwater Management Area (Figure 2-1), which is adjacent to the Plan Area, by the Hemet-San Jacinto Watermaster.[6] The groundwater monitoring program that supports the tracking of groundwater levels, groundwater quality, and production, like that described above for the GMP, is contracted to EMWD by the Hemet-San Jacinto Watermaster and performed by EMWD. During 2018, 363 groundwater level measurements were taken and 115 groundwater quality samples were collected. Groundwater extraction was metered at 113 well sites and estimated at 39 well sites (EMWD 2019b).

2.1.2.3 Water Quality

2.1.2.3.1 AB3030: Groundwater Management Plan for the West San Jacinto Basin

Groundwater quality monitoring and reporting that has occurred in accordance with AB3030 will be replaced with the monitoring and reporting that will occur with adoption of this GSP. GSA annual reports will be submitted to DWR in compliance with SGMA. The following are additional monitoring and management programs that occur in the SJGB related to water quality.

2.1.2.3.2 Clean Water Act and Porter Cologne Water Quality Control Act Permitting

As the primary water quality control laws for California, the Clean Water Act (CWA) and the Porter–Cologne Water Quality Control Act (CWC §13000 et seq.) prompt most of the water quality plans and programs in the Plan Area. Whereas CWA applies to all waters of the United States, the Porter–Cologne Water Quality Control Act applies to waters of the state, which include isolated wetlands and groundwater in addition to federal waters. The Porter-Cologne Water Quality Control Act is implemented by the State Water Resources Control Board (SWRCB) and

[6] The Watermaster, established by the Stipulated Judgment, is a board composed of one elected official and one alternate selected by each of the Public Agencies and one Private Pumper representative and one alternate selected by the participating Private Pumpers.

the nine Regional Water Quality Control Boards (RWQCBs). In addition to other regulatory responsibilities, the RWQCBs have the authority to conduct, order, and oversee investigation and cleanup where discharges or threatened discharges of waste to waters of the State[7] could cause pollution or nuisance, including impacts to public health and the environment.

Surface water and groundwater quality data are generated through permitting and compliance activities in the SJGB required under the Clean Water Act and the Porter Cologne Water Quality Control Act. Salt and nutrient management has been a major focus in the Plan Area, because past and present land uses (e.g., irrigated agriculture, confined animal feeding operations, landscape irrigation, import of Colorado River water with high salt concentrations, etc.) have increased concentrations of TDS and nitrate in groundwater relative to historical background concentrations (RWQCB 2019).

Water Quality Control Plan for the Santa Ana River Basin

The *Water Quality Control Plan for the Santa Ana River Basin* (Basin Plan; RWQCB 2019) designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for all waters addressed through the plan (CWC §13240 through 13247). Included within the Basin Plan are water discharge prohibitions applicable to particular conditions, areas, or types of waste. The Basin Plan is continually being updated to include amendments related to implementation of TMDLs, revisions of programs and policies within the Santa Ana RWQCB jurisdiction, and changes to beneficial use designations and associated water quality objectives. The Basin Plan defines eight groundwater management zones (GMZs) within the SJGB, five of which (Perris North, Perris South, Lakeview – Hemet North, San Jacinto–Lower Pressure Zone, and Menifee) intersect the Plan Area (Figure 2-7). The Lakeview-Hemet North GMZ straddles the boundary between the Plan Area and the Hemet-San Jacinto Groundwater Management Area, with the Lakeview portion of the Lakeview-Hemet North GMZ in the Plan Area, and the Hemet North portion of the Lakeview Hemet-North GMZ in the Hemet-San Jacinto Groundwater Management Area.

The Basin Plan designates beneficial uses for both surface waters and groundwater for the GMZs within the San Jacinto River Basin (Table 2-5). Within the Plan Area, the primary surface water bodies are the San Jacinto River, Salt Creek, Mystic Lake, and Lake Perris. The actual and potential beneficial uses of the San Jacinto River, of which reaches 3 through 6 cross the Plan Area, consist

[7] "Waters of the state" are defined in the Porter–Cologne Act as "any surface water or groundwater, including saline waters, within the boundaries of the state" (California Water Code, Section 13050(e)).

of RARE[8]; and intermittent beneficial uses consist of AGR[9], GWR[10], REC1[11], REC2[12], WARM[13], and WILD[14] (RWQCB 2019). Salt Creek has intermittent beneficial uses of REC1[15], REC2[16], WARM and WILD (RWQCB 2019). Mystic Lake and Lake Perris, in addition to the beneficial use previously mentioned, also have beneficial uses related to wildlife habitat, commercial/sportfishing and industrial service supply, and cold-water ecosystems (RWQCB 2019). The beneficial uses for groundwater for the GMZs within the Plan Area are MUN,[17] IND,[18] AGR[19], and PROC[20] (RWQCB 2019).

8 Rare, Threatened or Endangered Species: Waters that support the habitats necessary for the survival and successful maintenance of plant or animal species designated under state or federal law as rare, threatened or endangered.

9 Agricultural Supply: Use of water for farming, horticulture, and ranching; including irrigation, stock watering, and support of vegetation for range grazing.

10 Groundwater Recharge: Uses of water for natural or artificial recharge of groundwater for purposes that may include, but are not limited to, future extraction, maintaining water quality or halting saltwater intrusion into freshwater aquifers

11 Water Contact Recreation: Uses of water for recreational activities involving body contact with water where ingestion of water is reasonably possible. These uses may include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, whitewater activities, fishing and use of natural hot springs.

12 Non-contact Water Recreation: Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water where ingestion of water would be reasonably possible. These uses may include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing and aesthetic enjoyment in conjunction with the above activities.

13 Warm Freshwater Habitat: Waters that support warmwater ecosystems that may include, but are not limited to, preservation and enhancement of aquatic habitats, vegetation, fish and wildlife, including invertebrates.

14 Wildlife Habitat: Waters that support wildlife habitats that may include, but are not limited to, the preservation and enhancement of vegetation and prey species used by waterfowl and other wildlife.

15 Primary Contact Recreation: waters used for recreational activities including swimming, wading, and fishing that may result in ingestion of the water.

16 Non-contact Water Recreation: waters used for recreational activities that do not normally involve body contact.

17 Municipal and Domestic Supply: Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.

18 Industrial Service Supply: Uses of water for industrial activities that do not depend primarily on water quality, including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, and oil well repressurization.

19 Agriculture Supply: Uses of water for farming, horticulture, or ranching, including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

20 Industrial Process Supply: Uses of water for industrial activities that depend primarily on water quality. These uses may include, but are not limited to, process water supply and all uses of water related to product manufacture or food preparation.

Basin Plan water quality objectives are listed in Table 2-5 by GMZ.

Table 2-5
Basin Plan Beneficial Uses, Select Water Quality Objectives, and Water Quality Impairments for Receiving Waters within the SJGB

Receiving Waters	Designated Beneficial Uses	Water Quality Objectives for TDS/Nitrate (mg/L)
Groundwater Management Zones		
Perris North	MUN, AGR, IND, PROC	Total Dissolved Solids: 570 Nitrate (as Nitrogen): 5.2
Perris South	MUN, AGR	Total Dissolved Solids: 1,260 Nitrate (as Nitrogen): 2.5
Lakeview – Hemet North[1]	MUN, AGR, IND, PROC	Total Dissolved Solids: 520 Nitrate (as Nitrogen): 1.8
San Jacinto–Lower Pressure Zone	MUN, AGR, IND	Total Dissolved Solids: 520 Nitrate (as Nitrogen): 1.0
Menifee	MUN, AGR, PROC	Total Dissolved Solids: 1,020 Nitrate (as Nitrogen): 2.8
San Jacinto–Upper Pressure Zone	MUN, AGR, IND, PROC	Total Dissolved Solids: 320 / 500** Nitrate (as Nitrogen): 1.4 / 7.0**
Hemet South	MUN, AGR, IND, PROC	Total Dissolved Solids: 730 Nitrate (as Nitrogen): 4.1
Canyon	MUN, AGR, IND, PROC	Total Dissolved Solids: 230 Nitrate (as Nitrogen): 2.5

** Maximum benefit objective specific to the San Jacinto-Upper Pressure Zone.
The designated beneficial uses and water quality objectives for TDS/Nitrate are for the entire Lakeview-Hemet North GMZ, although only the Lakeview portion of the Lakeview Hemet-North GMZ is within the Plan Area.

Total Dissolved Solids and Nitrogen Management Plan

The *Total Dissolved Solids and Nitrogen Management Plan,* which is part of the Basin Plan, addresses TDS and nitrogen in both surface waters and groundwaters throughout the Santa Ana River basin (RWQCB 2019). EMWD has an approved maximum benefit objective adjustment for the San Jacinto Upper Pressure Management Zone, which is adjacent to the Plan Area, within the Hemet-San Jacinto Groundwater Management Area. The comprehensive maximum benefit includes the addition of TDS and nitrate-nitrogen "maximum benefit" objectives for the San Jacinto Upper Pressure Management Zone. The "maximum benefit" TDS and nitrate-nitrogen objectives are less stringent than the existing "antidegradation" objectives. Per Resolution R8-2010-0039, the Santa Ana RWQCB found the following:

> “Implementation of the projects/management actions proposed by EMWD, as part of EMWD's "maximum benefit" proposal and the Hemet/San Jacinto Water Management Plan, would reduce local overdraft in the San Jacinto Upper Pressure Management Zone and increase the sustainability and reliability of the local groundwater resources, maximize the use of recycled water produced from local

> water reclamation plants, and maximize the reasonable and beneficial use of all waters available to the area. Therefore, implementation of these projects/management actions in concert with the proposed "maximum benefit" TDS and nitrate-nitrogen objectives would assure that water quality consistent with maximum benefit to the people of the state will be maintained. This finding is contingent upon EMWD's timely and successful implementation of these specific projects/management actions, which are delineated in the proposed Basin Plan amendment set forth in […] this resolution" (RWQCB 2010).

The Santa Ana RWQCB uses the revised nitrogen and TDS water quality objectives to assess assimilative capacity[21] of the GMZs and to set the limitation of recycled water discharge or reuse in these GMZs. The revised water quality objectives for the San Jacinto Upper-Pressure Management Zone are included in Table 2-5. The Basin Plan Amendment also specifies beneficial uses for the GMZs to aid in the implementation of effective water quality criteria and control plans.

Triennial Ambient Water Quality Update

The Santa Ana Watershed Project Authority (SAWPA) Basin Monitoring Task Force was formed in August 2004 in response to the Basin Plan Amendment for the Santa Ana River Watershed. SAWPA produces a triennial (every 3 years) update report that uses TDS and nitrate concentration data to revise estimates of ambient water quality, assess compliance with groundwater quality objectives, and determine if assimilative capacity exists in the GMZs. Information from SAWPA reports are incorporated into the discussion of groundwater quality in Section 2.4.4.

General Waste Discharge Requirements and Stormwater Programs

Due to the broad scope of state and federal water quality regulations, the SWRCB and RWQCBs have developed general waste discharge requirements (WDRs) specific to activities that involve similar types of discharges and thus also require similar types of pollution control. This is the focus of the various stormwater programs administered by the SWRCB and RWQCB, such as the construction stormwater program, the industrial stormwater program, and the municipal stormwater program (Table 2-6). RWQCBs, including the Santa Ana RWQCB, also have the authority to implement general permits to multiple permittees, and to provide for waivers of WDRs. The permits applicable to the Plan Area are summarized in Table 2-6, along with a description of the data reporting the general permit prompts. Most reporting of data occurs through one of two SWRCB databases: 1) the Stormwater Multiple Application and Report Tracking

[21] Assimilative capacity is defined as the difference between the Basin Plan water quality objectives concentrations and the current ambient water quality concentration, as determined from a selected set of wells for each GMZ. If the ambient water quality concentration for a given constituent (e.g., TDS or nitrate) exceeds the water quality objective concentration, there is no assimilative capacity remaining for that constituent in the GMZ (RWQCB 2019).

System (SMARTS) for compliance with stormwater permits, and 2) the Geotracker online database for compliance activities related to WDRs (point source discharges).

Table 2-6
SWRCB and Santa Ana RWQCB General and Individual Permits Applicable to the Plan Area

Program/Activity	Order Number/ NPDES Number	Permit Name	Affected Area/ Applicable Activity	Water Resources Data Reporting
General Permits				
Construction stormwater program	2009-0009-DWQ/ CAS000002, as amended	NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Construction General Permit)	Statewide/Construction-related land disturbance of > 1 acre.	Annual report submittals to SMARTS database, including sampling and analysis results.
Municipal Stormwater Program	Santa Ana RWQCB Order No. R8-2010-0033/CAS618033	Waste Discharge Requirements for the Riverside County Flood Control and Water Conservation District, the County of Riverside, and the Incorporated Cities of Riverside County within the San Ana Region (MS4 [Municipal Separate Storm Sewer System] Permit for Santa Ana Region)	Santa Ana Region within Riverside County/ Creation or replacement of > 5,000 square feet of impervious surface	Annual report submittals to SMARTS database, including sampling and analysis results.
Non-Stormwater Discharge to Land	SWRCB Order No. 2003-0003-DWQ	Statewide General Waste Discharge Requirements for Discharges to Land with a Low Threat to Water Quality (WDR for Discharge to Land)	Statewide/Non-stormwater discharges to land only	Notice of Intent and, if applicable, discharge monitoring. Water Quality BMPs for discharge are required as condition of General WDR.
Non-Stormwater Discharge to Surface Water	Santa Ana RWQCB Order No. R8-2020-006 / CAG998001)	General Waste Discharge Requirements for Discharges to Surface Water that Pose an Insignificant (De-Minimus) Threat to Water Quality	Santa Ana Region/Non-stormwater discharges to surface water	Notice of Intent and, if applicable, discharge monitoring. Water Quality BMPs for discharge are required as condition of General WDR.
Individual Permits				
Irrigated Lands Regulatory Program	Santa Ana RWQCB Order R8-2008-008	Conditional Waiver of Waste Discharge Requirements for Agricultural Discharges	Agricultural operations >20 acres within the San Jacinto River Watershed	Water quality monitoring to directly and indirectly measure waste load allocations (WLA)

Table 2-6
SWRCB and Santa Ana RWQCB General and Individual Permits Applicable to the Plan Area

Program/Activity	Order Number/ NPDES Number	Permit Name	Affected Area/ Applicable Activity	Water Resources Data Reporting
EMWD Recycled Water Discharge Permit	Santa Ana RWQCB Order No. R8-2014-0016	Waste Discharge and Producer/User Reclamation Requirements for Eastern Municipal Water District's Regional Water Reclamation Facilities	EMWD Water Reclamation Facilities in the Santa Ana River Basin	Monitoring for compliance with effluent and receiving water limitations
Groundwater discharges on MARB	Santa Ana RWQCB Order No. R8-2003-0055	Waste Discharge Requirements for the United States Air Force Reserve March Air Force Base, Riverside County.	Discharge from groundwater pump and treatment systems, groundwater sampling, and well construction and maintenance activities.	Monitoring for compliance with effluent and receiving water limitations

Individual Permits

Irrigated Lands Regulatory Program/ Conditional Waiver of Waste Discharge Requirements for Agricultural Discharges (Santa Ana RWQCB Order R8-2016-0003): Water discharges from agricultural operations include irrigation runoff, flows from tile drains, irrigation return flows, and stormwater runoff. These discharges can affect water quality by transporting pollutants, including pesticides, sediment, nutrients, salts (including selenium and boron), pathogens, and heavy metals, from cultivated fields into surface waters and/or groundwater. To prevent agricultural discharges from impairing the waters that receive these discharges, the Irrigated Lands Regulatory Program regulates discharges from irrigated agricultural lands. This is done by issuing WDRs or conditional waivers of WDRs to growers. These orders contain conditions requiring water quality monitoring of receiving waters and groundwater with corrective actions when impairments are found.

The Santa Ana RWQCB issued a Conditional Waiver of Waste Discharge Requirements for Agricultural Discharges (CWAD) in order to regulate discharges from agricultural operations under the IRLP within the San Jacinto River Watershed. The conditional waiver seeks to ensure that irrigation and other agricultural discharges are not causing or contributing to conditions of pollution or nuisance; exceedance of applicable water quality objectives for surface and ground waters; failing to achieve TMDLs; or, impairing of beneficial uses of receiving waters, including surface and ground waters. This general order applies to owners, owner/operators, and operators of agricultural operations on multiple parcels, where the cumulative acreage equals or exceeds 20 acres that includes any portion that is irrigated, dry farmed or fallow. The order prohibits the land application of compostable materials, other than mulch, compost, and manure, and requires applicable dischargers to, among other things:

a. Develop and implement approved nutrient management plans, monitoring plans, and, as appropriate, Pollutant Trading Plans, consistent with the Lake Elsinore and Canyon Lake Nutrient TMDLs;
b. Evaluate and implement management practices to reduce or eliminate adverse impacts to water quality objectives and beneficial uses that result from agricultural waste discharges;
c. Employ adaptive management strategies as necessary to improve water quality management practices; and
d. Submit a proposed water quality monitoring program plan and to implement that plan upon approval by the Executive Officer (this may also be done by an agricultural coalition group, if applicable).

This conditional waiver was adopted by the Santa Ana Regional Water Quality Control Board on July 29, 2016. Most of the agricultural users in the Plan Area have formed a coalition, i.e., the Western Riverside County Agriculture Coalition with the purpose of complying with conditional waiver requirements for the surface water discharge of the CWAD. EMWD has formed the San Jacinto Coalition for the recycled water and citrus agriculture users and complies with groundwater requirements of the CWAD.

Waste Discharge and Producer/User Reclamation Requirements for Eastern Municipal Water District's Regional Water Reclamation Facilities (Santa Ana RWQCB Order No. R8-2014-0016 amending order No. R8-2008-0008): On September 5, 2008, the Santa Ana RWQCB adopted Order No. R8-2008-0008, prescribing waste discharge and producer/user reclamation requirements for EMWD's regional water reclamation facilities. The order applies to EMWD's production of recycled water from its five regional water reclamation facilities, as well as its storage and distribution system consisting of a series of storage ponds, pump stations, and distribution systems in its service area. The order outlines discharge prohibitions, effluent limitations and discharge specifications, receiving water limitations and specifications, standard provisions, monitoring and reporting requirements, and compliance determination procedures that EMWD must meet in order to comply with the Basin Plan and other governing regulations.

A major focus of the WDR is the implementation of new nitrogen and TDS management strategies applicable to both surface and ground waters. The order recognizes that Basin Plan objectives for TDS and nitrogen may be difficult to achieve and thus allows EMWD to "offset" contributions through implementation of a Salinity Management Plan and a conjunctive use project in the San Jacinto Upper Pressure Zone, which is adjacent to the Plan Area (Figure 2-7). An amendment to the order in 2014 (R8-2014-0016), among other things, removed the recycled water TDS limitation for the San Jacinto–Lower Pressure Zone, which is within the Plan Area, based on soil characterization studies showing areas within the San Jacinto–Lower Pressure Zone are underlain by clay-rich sediments that act as natural barriers between surface water and groundwater. These sediments preclude the reclaimed water used at the surface in the groundwater management zone, and the commensurate TDS, from impacting the groundwater in the water bearing zones at lower depths. The amendment also continues the implementation of EMWD's extensive groundwater monitoring program.

2.1.2.3.3 Installation Restoration Program for the March Air Reserve Base and Former March Air Force Base

Prior to realignment, activities on MARB including aircraft maintenance and repair, refueling operations, and training activities resulted in contamination of soil and the underlying groundwater aquifer with hazardous chemicals. The contaminants detected in groundwater include fuels, oils and solvents; VOCs; polycyclic aromatic hydrocarbons (PAH); per- and polyfluoroalkyl substances (PFAS); and perfluorooctane sulfonate and perfluorooctanoic acid (PFOS/PFOA); along with household/sanitary waste, treated wastewater, and construction rubble (AFCEC 2019a). Contaminated groundwater has migrated to the southeast and has been detected in wells located off-base (EPA 2020). A groundwater containment system[22] was installed to prevent further off-site migration of the contaminated groundwater.

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the site participated in the Installation Restoration Program, which addresses cleanup of Department of Defense sites containing hazardous substances. The site has been organized into five operable units (OUs), in which cleanup sites are grouped due to similar geography, contaminant source, and/or remediation strategy. OU-5 encompasses the groundwater on MARB and the former March Air Force Base (AFCEC 2019b). The Air Force and Air Reserve Board are the lead agencies and potentially responsible parties (PRPs) for the site, with EPA and the State providing oversight (EPA 2020). State of California regulatory agencies providing oversight include the Department of Toxics Substances Control (DTSC) and Santa Ana RWQCB.

EGETS pumps contaminated groundwater along the eastern edge of MARB and treats it using granular activated carbon for delivery to WMWD's WWRF, when there is demand, and/or for discharge to the Heacock storm drain (AFCEC 2019b). EGETS consists of 19 groundwater extraction wells located along the eastern perimeter of the base. Pumping has been suspended in about half of the EGETS wells due to low contaminant concentrations. Groundwater quality of the raw influent is monitored quarterly for a suite of contaminants of concern (COCs; e.g., fuels,

[22] The original groundwater extraction and treatment system (GETS) was installed in 1992. A new treatment plant was constructed in 1996, along with additional extraction and injection wells. At this time the GETS became the Expanded Groundwater Extraction and Treatment Systems (EGETs).

VOCs, solvents) from grab samples, and the water quality of treated effluent is monitored anywhere from quarterly to yearly (depending on COC) for compliance with the NPDES/WDR Permit applicable to the treatment system (Table 2-6).

On-Site Wastewater Treatment System Requirements

The On-Site Wastewater Treatment System (OWTS) Policy regulates the siting, design, operation, and maintenance of on-site wastewater treatment systems. The Policy implements the California Water Code, Chapter 4.5, Division 7, § 13290-13291.7 by establishing statewide regulations and standards for permitting on-site wastewater systems. The OWTS Policy specifies criteria for existing, new and replacement on-site systems and establishes a conditional waiver of waste discharge requirements for on-site systems that comply with the Policy. The Riverside County Department of Environmental Health (DEH) or the local city is the Local Agency Management Program for permitting of OWTS's in the Plan Area. Permitting of OWTS occurs under the authority of the Riverside County Code Chapter 8.124 (Sewage Discharges). These regulations set forth specific requirements related to (a) permitting and inspection of on-site systems; (b) septic tank design and construction; (c) drywell and disposal field requirements; and (c) servicing, inspection, reporting and upgrade requirements, with the purpose of protecting water quality and public health and complying with the statewide OWTS policy.

2.1.2.3.4 SWRCB Division of Drinking Water Required Monitoring

The SWRCB Division of Drinking Water (DDW) is responsible for regulating and enforcing potable water quality standards. The SWRCB receives the majority of its statutory authority related to public health and potable water from the California Safe Drinking Water Act, as defined in the California Health and Safety Code and Titles 17 and 22, California Code of Regulations. In addition, the SWRCB DDW has the primary enforcement authority (primacy) to enforce the federal Safe Drinking Water Act (SDWA) and is responsible for the regulatory oversight of about 8,000 public water systems throughout the state including EMWD and others within the Plan Area.

SWRCB requires public water systems to report data on the water quality of raw water as well as finished treated water to ensure the water meets drinking water standards prior to delivery to customers. Thus, a substantial amount of data on groundwater quality is produced through this program and is made publicly available through consumer confidence reports and other online web services (e.g., California Drinking Water Watch and Groundwater Ambient Monitoring and Assessment Program). Where relevant (e.g., raw groundwater), information from water quality compliance reports to DDW is incorporated into the discussion of groundwater quality in Section 2.4.4.

2.1.2.3.5 Groundwater Ambient Monitoring and Assessment and Surface Water Ambient Monitoring Program

The Groundwater Ambient Monitoring and Assessment (GAMA) Program conducts comprehensive monitoring of California's groundwater quality, compiles and standardizes groundwater quality data across several different sources and regulatory programs and makes that data readily accessible to the public. Water quality data from the SWRCB DDW and other regulatory programs is included in GAMA. In addition, the GAMA Program conducts groundwater studies related to groundwater vulnerability, groundwater quality in domestic wells, and groundwater impacts associated with non-point sources of contamination.

2.1.2.3.6 Perris II Reverse Osmosis Treatment Facility (ROTF) Monitoring and Reporting Plan (MRP)

The Perris II Reverse Osmosis Treatment Facility, which will be located next to the existing EMWD desalter facilities in the City of Menifee, will treat brackish groundwater produced from the Lakeview and Perris South GMZs. The goals of expanding the existing desalting facilities to include the Perris II Reverse Osmosis Treatment Facility are to provide additional control on the migration of brackish water in the Lakeview GMZ, reduce contamination in the SJGB, and reduce the dependence on imported water (EMWD 2019c). In order to evaluate the effectiveness of the additional groundwater production on controlling migration of brackish water and reducing contamination in the SJGB, EMWD prepared a monitoring and reporting plan, as was required under the grant agreement for the project (EMWD 2019c). Groundwater quality samples will be collected as part of the Perris II Reverse Osmosis Treatment Facility evaluation process and quarterly progress reports that provide a description of monitoring results will be submitted to the Grant Manager (EMWD 2019c).

2.1.2.4 Water Supply

The regulatory framework for water conservation, water supply planning, and for considering issues of water availability in the environmental and permitting process for land use plans, projects, and subdivisions in California is set forth in a series of Senate Bills (SB), including SB X7-7, SB 610, SB 221, SB 1262, and most recently SB 606. These bills have been codified in CWC §10608 through 10609.42, which establish water use and demand reduction targets, §10610 through 10657, which address Urban Water Management Plans (UWMPs), §10910 through 10914, which address Water Supply Assessments (WSAs), and California Government Code (GOV) Section 66473.7 (part of the Subdivision Map Act), which contains requirements related to written verifications (i.e., "will-serve" letters). Collectively, these laws, along with the California Environmental Quality Act (CEQA), prompt cities, counties, special districts, and water suppliers to evaluate growth in a broader geographic and temporal context, by coordinating land use planning with water availability and sustainability.

Urban water suppliers[23] like EMWD and WMWD are required to prepare water management plans that describe existing and planned water supply sources, identify human and/or environmental threats to water reliability, outline how they will meet State-mandated water conservation targets,[24] establishes water shortage contingency plans, and assess whether their existing and future water supplies will be sufficient over a 20-year planning horizon, incorporating projections of growth and land use in the service area along with drought scenarios. UWMPs provide valuable data on regional water demand and supply, provide a means to measure how effective water conservation and water use efficiency efforts have been, and set the framework for evaluating and prioritizing future capital improvements.

Water agencies outside the Plan Area but within the SJGB that are required to prepare an UWMP are the City of San Jacinto, the City of Hemet, and Lake Hemet Municipal Water District. The Box Springs Mutual Water Company, City of Perris Water, and the Nuevo Water Company are not required to prepare water management plans because they do not meet the threshold for number of customers or connections. There are no entities considered to be agricultural water suppliers[25] in the SJGB and thus there are no Agricultural Water Management Plans relevant to the Plan Area.

WSAs apply to specific categories of projects subject to CEQA and are required to do a similar assessment as UWMPs, but at a greater level of detail (e.g., project or subdivision). WSAs must include a discussion of the availability of an identified water supply under normal-year, single-dry-year, and multiple-dry-year conditions over a 20-year projection, accounting for the projected water demand of the project in addition to other existing and planned future uses of the identified water supply. For all projects subject to CEQA, the environmental document (e.g., Mitigated Negative Declaration or Environmental Impact Report) must provide an analysis of water supply in accordance with CEQA Appendix H and/or the lead agency's own CEQA standards of significance.

2.1.2.5 Operational Flexibility and Conjunctive Use Programs

Operational flexibility is a key consideration in integrated water resource management because it helps water purveyors adapt to known legal, operational, and environmental constraints, and plan for an uncertain future, especially as it relates to drought resiliency and the effects of

[23] Per CWC §10617, an urban water supplier means a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually.

[24] Water Conservation Act of 2009 (i.e., Senate Bill X7-7) requires that the state reduce urban water consumption by 20% by the year 2020, as measured in gallons per capita per day.

[25] Per CWC §10608.12(a), an agricultural water supplier means a water supplier, either publicly or privately owned, providing water to 10,000 or more irrigated acres, excluding recycled water.

climate change. Operational flexibility is maximized when a water purveyor has a large variety of sources in a water supply portfolio, when it has local control over such sources, and when such sources are connected to each other (e.g., conjunctively managed).

For the Plan Area, EMWD and retail water agencies collectively draw from a combination of sources—including surface water imports from the SWP and the CRA, recycled water, and groundwater. These sources differ in terms of the volume available, area served, timing of peak availability, and reliability. Climate and regulatory constraints (e.g., water quality standards, water rights, and minimum environmental flows) have historically had a greater impact on the availability of surface water supplies. Until 1995, when EMWD began implementing its AB3030 groundwater management plan to avoid overdraft conditions, groundwater sources with adequate water quality were historically limited only by the capacity of production wells accessing the aquifer. With the passage of SGMA and the sustainable management criteria established in this GSP (Chapter 3), groundwater extraction will be managed sustainably by evaluation against minimum thresholds established for each sustainability indicator.

The GSP complements and enhances existing projects and programs currently in place to maximize beneficial use of water resources and increase operational flexibility within the Plan Area and within the Basin as a whole. Examples of projects that have increased operational flexibility within the Basin include the Integrated Recharge and Recovery Program (IRRP), filtration plants to treat and deliver imported water to areas dependent on groundwater, and recycled water use for irrigation of landscape and agriculture (EMWD 2016a). In addition to the existing IRRP, EMWD is developing the Enhanced Recharge and Recovery Program (ERRP) to increase conjunctive use and facilitate groundwater banking (EMWD 2016a). Phase 1 of the ERRP program is included in the Santa Ana River Conservation & Conjunctive Use Program (SARCCUP), a cooperative program to store imported water during wet years for use during dry years (EMWD 2016a). The ultimate goal of the ERRP is to overcome up to three years of MWD cutbacks during drought years through the conjunctive use of groundwater.

2.1.3 Land Use Elements of Topic Categories of Applicable General Plans

2.1.3.1 Land Use and Population

The Plan Area comprises urban and semi-rural communities and is bordered by mountainous open space (Figures 2-8A through 2-8D). Agriculture historically occupied a majority of the Plan Area but is now confined to areas along the San Jacinto River, adjacent to the San Jacinto Wildlife Area, and west of Diamond Valley Lake (Figures 2-8A through 2-8D). The San Jacinto River creates a corridor of undeveloped open space, farmland, and agricultural zones that cuts through the urbanized portions of the Plan Area. From north to south, the urbanized portions of the Plan Area are Moreno Valley, Perris, Lakeview, Nuevo, Homeland, Menifee, and Winchester (Figure 2-8D). Industrial and commercial areas, as well as major transportation and warehousing hubs (such as MARB and March JPA) are the major employment centers in the Plan Area. Residential zones consist of large swaths of single-family tract homes that occupy most of the urbanized areas of the Plan Area. All cities and communities experienced significant growth over the 20-year timeframe reducing the amount of undeveloped open space and agricultural land within the Plan Area. It should be noted that there is a 26,000-acre gap in the 2014 dataset that has resulted in an undercounting of urban land and open space.

DWR conducts periodic land use surveys of the state. The DWR dataset provides a useful means of assessing land use in the context of water resources, because it focuses on identifying and differentiating agricultural crop types. Though they provide less detail on urban land uses (e.g., residential, commercial, industrial, etc.) and native vegetation (i.e., undeveloped land), the DWR surveys have been repeated since the 1960s, and provide information on land use trends over time. Since 1993, agricultural and open space land uses in the Plan Area have decreased, while urban land cover has increased (Table 2-7).

EMWD estimated future buildout based on a review of general plans and other land use plans (Table 2-8 and Figure 2-8E; EMWD 2019d). The 2012 data suggests that urban land uses will grow to occupy about 73% of the Plan Area by 2040.

Table 2-7
Past and Future Land Use in the Plan Area (Acres)

Year	Agriculture	Urban	Open Space
1993*	34,523	29,362	25,233
2000*	17,564	46,595	24,971
2014*1	5,033	43,292	13,962
2019^	21,866	19,166 (Commercial) 19,434 (Residential)	24,235

Sources: (*) DWR, (^) County of Riverside
There is a 26,000-acre gap in the 2014 dataset that primarily covers historical areas of agriculture and open space. This gap results in an inaccurate representation of the total land use areas in the Plan Area.

Table 2-8
EMWD Estimates of Ultimate Land Use (Buildout) in the Plan Area

Land Use	Acres	Percent
Agriculture	3,074	4%
Industrial and Commercial	14,816	20%
High Density Residential	6,236	8%
Medium Density Residential	20,098	27%
Low Density Residential	10,566	14%

Table 2-8
EMWD Estimates of Ultimate Land Use (Buildout) in the Plan Area

Land Use	Acres	Percent
Mixed Use	345	<1%
Open Space	16,353	22%
Public Facilities	3,586	5%

Sources: EMWD 2012

EMWD has estimated population within its service area as required for preparation of UWMPs every 5 years. However, EMWD's service area is about 3 times the size of the Plan Area. In order to estimate population within the Plan Area, a combination of sources was used. These sources are:

- Decennial Census Data for 1990, 2000, and 2010, along with American Community Survey information for Census Designated Places
- Regional Growth Forecast by the Southern California Association of Governments
- Information in the Housing element of the Riverside County General Plan

Through the past decade, EMWD's service area was one of the fastest growing regions in California. Since 1990, more than 350,000 people have been added to the service area, doubling the population (EMWD 2016a). As the population within EMWD's service area continues to grow, the characteristics of the service area are continually changing. Tract homes, commercial centers and new industrial warehouses are replacing areas of agriculture and vacant land. The Plan Area includes portions of three incorporated cities, the March JPA, and four unincorporated communities. Lakeview and Nuevo are completely within the Plan Area whereas the Plan Area boundary intersects Perris, Moreno Valley, Menifee, Homeland, and Winchester.

Average annual growth rate within the entire Southern California Association of Governments area was 0.9% in 2000-2010, was 0.8% in 2010-2015, and is projected to be 0.7% before 2040 (SCAG 2016). The regional growth forecast is an average over the southern California region, so there are marked regional and local differences, but the overall trend of a continuation of growth, but at a decelerating pace, holds true for the Plan Area. Compared to the southern California Region as a whole, the Plan Area experienced higher growth rates from the combination of employment opportunities, available space, and lower housing costs compared to coastal southern California. The current population of the Plan Area is roughly 386,944 people (Table 2-9). The Southern California Association of Governments does not provide growth projections for unincorporated communities but applying a 0.7% annual growth rate to the unincorporated communities, the estimated Plan Area Population in 2040 is 519,627. Because the Plan Area intersects several communities, the estimates of current and 2040 population within the Plan Area is likely to be an overestimate.

The Plan Area contains several Disadvantaged Communities (DAC) and Severely Disadvantaged Communities (SDAC)[26]. As defined in California Health and Safety Code, Section 116760.20, DACs are Census geographies having less than 80% of the statewide annual median household income ($51,026 for 2018) and SDACs are Census geographies having less than 60% of the statewide annual median household income ($38,270 for 2018). According to DWR's DAC Mapping Tool, SDACs in the Plan Area are located in Homeland and Winchester, and DACs are located in Lakeview, the unincorporated area Mead Valley west of Interstate-215 and south of the MARB, and the unincorporated area Romoland northwest of Homeland (Figure 2-9). These communities are not known to rely on groundwater for drinking water, as the groundwater quality underlying these communities may require treatment prior to consumption (see Section 2.4.4 Groundwater Quality).

Table 2-9
Past, Current, and Projected Population for Perris, Moreno Valley, Menifee, and Unincorporated Communities

Population	1990	2000	2010	2012	2016 (2014 for CDPs)	2040 SCAG Projection
Incorporated Cities						
Perris	51,500 [1]	36,189 [1]	68,386 [1]	70,700 [2]	73,722 [3]	116,700 [2]
Moreno Valley	118,779 [1]	142,379 [1]	193,365 [1]	197,600 [2]	205,383 [3]	256,600 [2]
Menifee	—	—	77,519 [1]	81,600 [2]	89,004 [3]	121,100 [2]
Unincorporated Areas						
March JPA	—	—	—	500 [2]	1,129 [3]	4,000 [2]
Lakeview	—	—	—	—	1,723 [3]	2,066 [4]
Nuevo	—	—	—	—	7,345 [3]	8,806 [4]
Winchester	—	—	—	—	2,717 [3]	3,257 [4]
Homeland	—	—	—	—	5,921 [3]	7,098 [4]
				GSP Plan Area Estimate	**386,944**	**519,627**
Countywide Counts						
Riverside County (all)	1,170,400 [1]	1,545,400 [1]	2,189,600 [1]	2,227,600		3,183,000
Riverside County (unincorporated)				359,000		499,200

Sources: 1) U.S. Census Bureau 2) SCAG 2016 (for Riverside County 1990–2040, 3) Riverside County General Plan, 4) 0.7% growth rate applied.
Note: — = not available or unknown.

2.1.3.2 Municipal General Plans

The following section presents a review of population and land use characteristics of the Plan Area, and the various land use plans and their applicability to groundwater resource management. State law requires that all cities and counties adopt a comprehensive, long-term general plan that outlines

[26] Map-based DAC information developed by the DWR can be reviewed at https://gis.water.ca.gov/app/dacs/.

physical development of the county or city, in accordance with Section 65300 of the California Government Code. The general plan must cover a local jurisdiction's entire planning area so that it can adequately address the broad range of issues associated with urban and/or community development. Ultimately, the general plan expresses the community's development goals and embodies public policy relative to the distribution of future public and private land uses. The general plan may be adopted as a single document or as a group of documents relating to subjects or geographic segments of the planning area.

Most of the planning documents relevant to the Plan Area fall under the umbrella of the Riverside County General Plan or the general plans of the incorporated cities within the Plan Area. Land use within the Plan Area is guided by the Riverside County General Plan (and its associated community plans), the March JPA General Plan, the City of Moreno Valley General Plan, The City of Menifee General Plan, and the City of Perris General Plan (County of Riverside 2019, March JPA undated, City of Perris 2016, City of Moreno Valley 2016, City of Menifee 2018). These are living documents made up of many parts that are periodically updated by the municipal planning departments. The core structure of these general plans is to start with a broad vision and goals, that are refined into specific land use policies and community plans, where the local setting, policy issues and community concerns are taken into account through a public participation process. All elements of a general plan, whether mandatory or optional—including community plan principles, goals, objectives, policies, and plan proposals—must be internally consistent with each other and all elements have equal legal status (i.e., no element is legally subordinate to another).

The development and implementation of the GSP is relevant to several General Plan and community plan elements, and vice versa, because both contain policies and implementation actions that are intended to be protective of water resources. General plans, because they outline a community's vision for the future—which usually includes the accommodation of population growth and provision of additional housing (including affordable housing provisions)—have significant implications for the sustainability of water resources. Population growth and economic development can often result in increases in water demand that, if not planned for and/or managed properly, can lead to depletion of available water supplies over time. All applicable land use plans acknowledge and broadly encourage water conservation and prohibit new development and redevelopment unless the owner/applicant can demonstrate that adequate water resources are available.

These plans were reviewed for policies relevant to groundwater resources, which are provided in Table 2-10.

2.1.3.2.1 County of Riverside General Plan

In general, the County of Riverside General Plan does not have a dedicated element for natural resources or public utilities/water. The County of Riverside divides its general plan into 21 different "area plans" for the purpose of land use planning, as each has unique physiography, demographics, development pressures, and priorities. The Plan Area intersects six area plans consisting of: Lakeview/Nuevo, Sun City/Menifee Valley, Mead Valley, Harvest Valley/Winchester, Reche Canyon/Badlands, and March.

The most relevant land use elements to groundwater resources consist of the multipurpose open space element, the land use element, and the environmental health portion of the Healthy Communities Element (County of Riverside 2019). The Multipurpose Open Space Element includes a section on water resources, including groundwater recharge.

The Land Use Element has general language indicating the County will support and regionally cooperate on clean water issues, watershed management, and water conservation and efficiency.

Table 2-10
Summary of General Plan and Community Plan Land Use Policies Relevant to Groundwater Sustainability in the Plan Area

Element	Policy	Description
County of Riverside General Plan		
Land Use Element	LU 1.5	The County of Riverside shall participate in regional efforts to address issues of […] water quality, watershed and habitat management with cities, local and regional agencies, stakeholders, Indian nations, and surrounding jurisdictions.
	LU 4.1	Require that new developments […] d. utilize drought tolerant landscaping and incorporate adequate drought-conscious irrigation systems [...] f. incorporate water conservation techniques, such as groundwater recharge basins, use of porous pavement, drought tolerant landscaping, and water recycling, as appropriate.
	LU 5.3	Review all projects for consistency with individual urban water management plans.
	LU 9.2	Require that development protect environmental resources by compliance with the Multipurpose Open Space Element of the General Plan and federal and state regulations such as CEQA, NEPA, the Clean Air Act, and the Clean Water Act.
	LU 18.1 through LU 18.6	*Summary:* Together, these policies commit the County to enforcing its water efficient landscape ordinance, promote public participation in water conservation, minimize use of turf and closely check irrigation plans, encourage use of recycled water, and cooperate and coordinate with the water-efficiency efforts of local water agencies.
Multipurpose Open Space Element	OS 1.1	Balance consideration of water supply requirements between urban, agricultural, and environmental needs so that sufficient supply is available to meet each of these different demands.
	OS 1.2	Develop a repository for the collection of County water resource information.
	OS 1.3	Provide active leadership in the regional coordination of water resource management and sustainability efforts affecting Riverside County and continue to monitor and participate in, as appropriate, regional activities, addressing water resources, groundwater, and water quality, such as a Groundwater Management Plan, to prevent overdraft caused by population growth.
	OS 1.4	Promote the use of recycled water for landscape irrigation.
	OS 2.1	Implement a water-efficient landscape ordinance and corresponding policies that promotes the use of water-efficient plants and irrigation technologies, minimizes the use of turf, and reduces water-waste without sacrificing landscape quality.

Table 2-10
Summary of General Plan and Community Plan Land Use Policies Relevant to Groundwater Sustainability in the Plan Area

Element	Policy	Description
	OS 2.2	Encourage the installation of water-conserving systems such as dry wells and graywater systems, where feasible, especially in new developments. The installation of cisterns or infiltrators shall also be encouraged to capture rainwater from roofs for irrigation in the dry season and flood control during heavy storms.
	OS 2.3	Seek opportunities to coordinate water-efficiency policies and programs with water service providers.
	OS 2.4	Support and engage in educational outreach programs with other agencies, the public, homebuilders, landscape installers, and nurseries that promote water conservation and widespread use of water-efficient technologies.
	OS 2.5	Encourage continued agricultural water conservation and recommend the following practices where appropriate and feasible: lining canals, recovering tail water at the end of irrigated fields, and appropriate scheduling of water deliveries.
	OS 3.1	Encourage innovative and creative techniques for wastewater treatment, including the use of local water treatment plants.
	OS 3.2	Encourage wastewater treatment innovations, sanitary sewer systems, and groundwater management strategies that protect groundwater quality in rural areas.
	OS 3.3	Minimize pollutant discharge into storm drainage systems, natural drainages, and aquifers.
	OS 3.4	Review proposed projects to ensure compliance with the National Pollutant Discharge Elimination System (NPDES) Permits and require them to prepare the necessary Stormwater Pollution Prevention Program (SWPPP).
	OS 3.5	Integrate water runoff management within planned infrastructure and facilities such as parks, street medians and public landscaped areas, parking lots, streets, etc. where feasible.
	OS 3.6	Design the necessary stormwater detention basins, recharge basins, water quality basins, or similar water capture facilities to protect water-quality. Such facilities should capture and/or treat water before it enters a watercourse. In general, these facilities should not be placed in watercourses, unless no other feasible options are available.
	OS 3.7	Where feasible, decrease stormwater runoff by reducing pavement in development areas, reducing dry weather urban runoff, and by incorporating “Low Impact Development,” green infrastructure and other Best Management Practice design measures such as permeable parking bays and lots, use of less pavement, bio-filtration, and use of multi-functional open drainage systems, etc.
	OS 4.1	Support efforts to create additional water storage where needed, in cooperation with federal, state, and local water authorities. Additionally, support and/or engage in water banking in conjunction with these agencies where appropriate, as needed.
	OS 4.2	Participate in the development, implementation, and maintenance of a program to recharge the aquifers underlying the county. The program shall make use of flood and other waters to offset existing and future groundwater pumping, except where: a. The groundwater quality would be reduced; b. The available groundwater aquifers are full; or c. Rising water tables threaten the stability of existing structures.
	OS 4.3	Ensure that adequate aquifer water recharge areas are preserved and protected.
	OS 4.4	Incorporate natural drainage systems into developments where appropriate and feasible.
	OS 4.5	Encourage streets in a vicinity of watercourses to include park strips or other open space areas that allow permeability.

Table 2-10
Summary of General Plan and Community Plan Land Use Policies Relevant to Groundwater Sustainability in the Plan Area

Element	Policy	Description
	OS 4.6	Retain storm water at or near the site of generation for percolation into the groundwater to conserve it for future uses and to mitigate adjacent flooding. Such retention may occur through “Low Impact Development” or other Best Management Practice measures.
	OS 4.7	Encourage storm water management and urban runoff reduction as an enhanced aesthetic and experience design element. Many design practices exist to accomplish this depending on site conditions, planned use, cost-benefit, and development interest.
	OS 4.8	Use natural approaches to managing streams, to the maximum extent possible, where groundwater recharge is likely to occur.
	OS 4.9	Discourage development within watercourses and areas within 100 feet of the outside boundary of the riparian vegetation, the top of the bank, or the 100-year floodplain, whichever is greater.
March JPA General Plan		
Land Use Element	Goal 13: Secure adequate water Supply System capable of meeting normal and emergency demands for existing and future land uses.	
	13.1	Only approve development which can demonstrate an adequate and secure water supply for the proposed use.
	13.2	Enhance local groundwater supplies through development designs which promote and on-site recharge and minimize impermeable ground coverage with landscaped areas, open space or recreation areas.
	13.3	Design and operate March JPA facilities in compliance with established water conservation practices and programs.
Resource Management Element	Goal 1: Conserve and protect surface water, groundwater, and imported water resources.	
	1.1	Where possible, retain local drainage courses, channels, and creeks in the natural condition.
	1.2	Protect groundwater and surface water resources from depletion and sources of pollution.
	1.3	Cooperate with federal state and County governments and other agencies on the maintenance and improvement of the quality and quantity of local and regional groundwater resources.
	1.4	Require development to conserve water resources, including the use of water efficient plumbing fixtures and irrigation systems.
	1.5	Conserve imported water by requiring water conservation techniques, water-conserving and recycling processes, drought-resistant landscaping, and reclaimed water for irrigation, when applicable and appropriate.
	1.6	Promote the use of drought tolerant landscaping in development, and encourage the use of reclaimed water for irrigation in parks, golf courses, and industrial uses, as well as for other urban uses, whenever feasible and where legally permitted.
	1.7	Assist responsible agencies in eliminating the discharge of toxic materials and untreated sewage into the March JPA drainage and groundwater system.
	1.8	Assure that development projects comply with regulatory agency requirements, including federal, state, and regional regulations.
Safety/Risk Management	Goal 5: Reduce the potential for hazardous material exposure or contamination in the Planning Area	
	5.1 – 5.6	Collectively, these policies reduce threats to the public and the environment from the release of hazardous materials.

Table 2-10
Summary of General Plan and Community Plan Land Use Policies Relevant to Groundwater Sustainability in the Plan Area

Element	Policy	Description
City of Perris General Plan		
	Goal V: Provide an adequate water supply to support existing and future land uses, as anticipated in the Land Use Element.	
	Policy V.A	Coordinate land-planning efforts with local water purveyors.
	Policy V.A.1	Work with Eastern Municipal Water District to ensure that development does not outpace projections consistent with the Water District's Urban Water Management Plan.
	Policy V.A.2	Require use of new technologies and water conserving plant materials for landscaping.
	Policy V.A.3	Participate with the Eastern Municipal Water District to develop and implement water conservation programs and to encourage use of water conserving technologies.
	Goal VI: Achieve regional water quality objectives and protect the beneficial uses of the region's surface and groundwater.	
	Policy VI.A	Comply with requirements of the National Pollutant Discharge Elimination System (NPDES).
	Goal VIII: Create a vision for energy and resource conservation and the use of green building design for the City, to protect the environment, improve quality of life, and promote sustainable practices.	
	Policy VIII.A	Adopt and maintain development regulations that encourage water and resource conservation.
	Policy VIII.A.1	Use indigenous and/or drought resistant planting materials and efficient irrigation systems in residential projects as a means of reducing water demand, including smart irrigation systems.
	Policy VIII.A.2	Use indigenous and/or drought resistant planting and efficient irrigation systems with smart controls in all new and refurbished commercial and industrial development projects. Also, restrict use of turf to 25% or less of the landscaped areas.
	Policy VIII.A.3	Use water conserving appliances and fixtures (low-flush toilets, and low-flow shower heads and faucets) within all new residential developments.
	Policy VIII.A.4	Use gray water, and water conserving appliances and fixtures within all new commercial and industrial developments.
	Policy VIII.A.5	Use permeable paving materials within developments to deter water runoff and promote natural filtering of precipitation and irrigation waters.
	Policy VIII.A.7	Create and maintain reclaimed water systems to provide reclaimed water for irrigation of municipal and commercial landscaping.
	Policy VIII.A.8	Explore the use of private water well systems for all potable and/or landscaping water use for larger commercial and industrial projects.
City of Moreno Valley General Plan		
Conservation Element	Objective 7.2: Maintain surface water quality and the supply and quality of groundwater.	
	7.2.1	New development may use individual wells only where an adequate supply of good quality groundwater is available.
	7.2.2	The City shall comply with the provisions of its permit(s) issued by the Regional Water Quality Control Board for the protection of water quality pursuant to the National Pollutant Discharge Elimination System.
	7.2.3	In concert with the water purveyor identify aquifer recharge areas and establish regulations to protect recharge areas and regulate new individual wells.
	Objective 7.3: Minimize the consumption of water through a combination of water conservation and reuse.	

Table 2-10
Summary of General Plan and Community Plan Land Use Policies Relevant to Groundwater Sustainability in the Plan Area

Element	Policy	Description
	7.3.1	Require water conserving landscape and irrigation systems through development review. Minimize the use of lawn within private developments, and within parkway areas. The use of mulch and native and drought tolerant landscaping shall be encouraged.
	7.3.2	Encourage the use of reclaimed wastewater, stored rainwater, or other legally acceptable non-potable water supply for irrigation.
	Conservation Element Program 7.3: Advocate for natural drainage channels to the Riverside County Flood Control District, in order to assure the maximum recovery of local water, and to protect riparian habitats and wildlife.	
	Conservation Element Program 7.4: Maintain a close working relationship with EMWD to ensure that EMWD plans for and is aware of opportunities to use reclaimed water in the City.	
	Conservation Element Program 7.5: Provide guidelines for preferred planting schemes and specific species to encourage aesthetically pleasing landscape statements that minimize water use.	
Community Development	Objective 2.11: Maintain a water system that is capable of meeting the daily and peak demands of Moreno Valley residents and businesses, including the provision of adequate fire flows.	
	2.11.1	Permit new development only where and when adequate water services can be provided.
	2.12: Maintain a wastewater collection, treatment, and disposal system that is capable of meeting the daily and peak demands of Moreno Valley residents and businesses.	
	2.12.1	Prior to the approval of any new development application ensure that adequate septic or sewer service capacity exists or will be available in a timely manner.
City of Menifee General Plan		
Land Use	Goal LU-3: A full range of public utilities and related services that provide for the immediate and long-term needs of the community.	
	Policy LU-3.2	Work with utility provides to increase service capacity as demand increases.
	Policy LU-3.4	Require that approval of new development be contingent upon the project's ability to secure appropriate infrastructure services.
Open Space & Conservation Element	Goal OSC-7: A reliable and safe water supply that effectively meets current and future user demands.	
	Policy OCS-7.1	Work with the Eastern Municipal Water District to ensure that adequate, high-quality potable water supplies and infrastructure are provided to all development in the community.
	Policy OCS-7.2	Encourage water conservation as a means of preserving water resources.
	Policy OCS-7.3	Coordinate with the Eastern Municipal Water District to educate the public on the benefits of water conservation and promote strategies residents and businesses can employ to reduce their water usage.
	Policy OCS-7.4	Encourage the use of reclaimed water for the irrigation of parks, golf courses, public landscaped areas, and other feasible applications as service becomes available from the Eastern Municipal Water District.
	Policy OCS-7.5	Utilize a wastewater collection, treatment, and disposal system that adequately serves the existing and long-term needs of the community.
	Policy OCS-7.6	Work with the Eastern Municipal Water District to maintain adopted levels of service standards for sewer service systems.
	Policy OCS-7.7	Maintain and improve existing level of sewer service by improving infrastructure and repairing existing deficiencies.

Table 2-10
Summary of General Plan and Community Plan Land Use Policies Relevant to Groundwater Sustainability in the Plan Area

Element	Policy	Description
	Policy OCS-7.8	Protect groundwater quality by decommissioning existing septic systems and establishing connections to sanitary sewer infrastructure.
	Policy OCS-7.9	Ensure that high quality potable water resources continue to be available by managing stormwater runoff, wellhead protection, and other sources of pollutants.
	Policy OCS-7.10	Preserve natural floodplains, including Salt Creek, Ethanac Wash, Paloma Wash, and Warm Springs Creek, to facilitate water percolation, replenishment of the natural aquifer, proper drainage, and prevention of flood damage.
	Policy OCS-7.11	Ensure that natural and cultural resources are protected and avoided while still maintaining important water goals.

2.1.3.3 Other Planning/Land Use Considerations

2.1.3.3.1 California Environmental Quality Act

All discretionary projects proposed within the Plan Area under County and/or state jurisdiction are required to comply with CEQA. In 2019, the Governor's Office of Planning and Research released an update to the CEQA Guidelines that included a new requirement to analyze projects for their compliance with adopted GSPs. Specifically, the new applicable significance criteria include the following:

- Would the program or project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?
- Would the program or project conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

Therefore, to the extent general plans allow growth that could have an impact on groundwater supply, such projects would be evaluated for their consistency with adopted GSPs and for whether they adversely impact the sustainable management of the Plan Area. Under CEQA, potentially significant impacts identified must be avoided or substantially minimized, unless significant impacts are unavoidable. In the event that significant impacts are unavoidable, the lead agency must adopt a statement of overriding considerations.

2.1.3.3.2 Well Permitting (Construction, Repair, Reconstruction, Destruction)

Statewide standards for the construction, repair, reconstruction or destruction of wells are found in DWR Bulletin 74-81 and 74-90 (i.e., California Well Standards) (DWR 1981, 1991).

California's Water Well Standards include requirements to avoid sources of contamination or cross-contamination, proper sealing of the upper annular space (i.e., first 50 feet), disinfection of the well following construction work, use of appropriate casing material, and other requirements.

The Riverside County DEH is responsible for permitting the design, construction, modification, and destruction of water wells throughout Riverside County and is the local primacy agency for the regulatory oversight of public water systems that have between 15 and 199 connections, as well as those serving restaurants, schools and industry. In accordance with Ordinance No. 682.3, Riverside County DEH requires permits for the construction and/or abandonment of all water wells including, but not limited to driven wells, monitoring wells, cathodic wells, extraction wells, agricultural wells, and community water supply wells. The County incorporates the standards contained in DWR Bulletin No. 74-81, Chapter II, and Bulletin No. 74-90, as amended by the State. The County requires wells, among other things, to meet certain setback criteria (e.g., septic system setback) and specific construction and sealing requirements. The wells are inspected during different stages of construction to help verify standards are being met. All drinking water wells are evaluated once they complete installation to ensure they comply with State well standards and meet minimum drinking water standards. If found in compliance, the homeowner is issued a clearance letter authorizing their use. In addition, bacterial and chemical sampling of water can be provided upon request.

The Riverside County DEH monitors and enforces these standards by requiring drilling contractors with a valid C-57 license to submit permit applications for the construction, reconstruction, or destruction of any well within its jurisdiction. The processing and issuance of a water well permit is currently considered a ministerial action, meaning permits are issued to drillers meeting California Water Well Standards and County sealing requirements, and notwithstanding errors in the application. In addition to unincorporated areas, Riverside County DEH serves as the permitting authority for groundwater wells in areas under March JPA jurisdiction, as well as the incorporated cities within the Plan Area. The West San Jacinto GSA is currently coordinating with Riverside County DEH to receive and review well permits prior to their approval. This will allow the GSA to evaluate whether new groundwater wells or expansion of existing groundwater wells is consistent with this GSP.

Proper well abandonment is of particular importance to groundwater quality due to the potential for improperly abandoned wells to serve as a migration pathway for COCs. EMWD, as part of its AB3030 groundwater management plan, has been implementing a well Inactive Well Capping/Sealing Program since 2000 (EMWD 2019a). Under the program, inactive wells and open casings (i.e., wells not equipped for pumping) are capped and/or sealed by EMWD field staff at no expense to the well owner. The capped wells may be subsequently used as monitoring wells to collect water level and/or water quality samples. A total of 65 wells in the Plan Area have been capped under the Inactive Well Capping and Sealing Program since the program began (EMWD 2019a).

2.1.3.3.3 Land Use Plans Outside the Plan Area

Development outside the Plan Area could result in an increase in pumping from municipal supply wells within the Plan Area if EMWD meets the water demand of the new development using groundwater produced from supply wells in the Plan Area. EMWD maintains a database of proposed development projects within its service area to plan for growth in water demand within its service area. As part of its GMP, EMWD forecast demand by separating projects into two broad categories: active construction and planned construction (EMWD 2019a). Projects are in active construction beginning when they have survey staking and continuing through completion. Planned construction includes projects in planning and design. EMWD undertakes extensive water supply planning activities to ensure continuity of service within its service area. It is expected that the sustainability criteria established in this GSP will be used to assist EMWD with water supply planning activities, including periodic updates to its UWMP, provision of WSAs and written verifications.

2.1.4 Additional GSP Components

Each GSP is required to include a description of additional elements in CWC 10727.4 that the GSA determines to be appropriate (23 CCR 354.8 (g)). These additional elements are listed below:

- Control of saline water intrusion – not applicable to the San Jacinto Groundwater Basin
- Wellhead protection – Section 2.1.3.2 Municipal General Plans (Table 2-10); and Section 2.1.3.3 Well Permitting
- Migration of contaminated groundwater – Section 2.1.2.3 Water Quality
- Well abandonment and well destruction program –- Section 2.1.3.3 Well Permitting
- Replenishment of groundwater extractions – Section 2.5 Water Budget
- Conjunctive use and underground storage – Sections 2.1.2.3 Groundwater Quality and 2.1.2.5 Operational Flexibility and Conjunctive Use Programs
- Well construction policies – Section 2.1.3.3 Other Planning / Land Use Considerations
- Groundwater contamination cleanup, recharge, diversions to storage, conservation, water recycling, conveyance, and extraction projects – Section 2.1.2.3 Groundwater Quality
- Efficient water management practices – Section 2.1.3.2 Municipal General Plans (Table 2-10)
- Relationships with state and federal regulatory agencies – Section 2.1.1.1 Land Use Jurisdictions withing the Plan Area and Section 2.1.2 Water Resources Monitoring and Management Programs
- Land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity – Section 2.1.3.2 Municipal General Plans

- Impacts on groundwater dependent ecosystems – Sections 2.4.6 Groundwater Surface Water Connections and 2.4.7 Groundwater Dependent Ecosystems

2.1.5 Notice and Communication

Notification and communication regarding the development of this GSP has taken place in the following phases:

1. GSA Formation
2. Initial Notification
3. GSP Development
4. Draft GSP Review and Comment

EMWD notified DWR of its intent to become the groundwater sustainability agency for the western portion of the San Jacinto Groundwater Basin, within EMWD's sphere of influence on January 24, 2017.

Following the notification of intent to form a GSA, EMWD submitted a Notice of Intent to develop a GSP for the San Jacinto Groundwater Basin to DWR on August 29, 2018. The GSP Development phase included extensive outreach and engagement with the stakeholders, including beneficial users, as described in more detail in Section 2.1.5.2, Public Meetings Summary, and Section 2.1.5.5, Communication.

The Draft GSP Review and Comment phase included a formal public comment period for the Draft GSP and response to comments, as discussed in Section 2.1.5.3, Summary of Comments and Responses.

The last notification and communication phase for the preparation of this GSP will begin once the West San Jacinto GSA submits the final GSP to DWR. This phase will include engagement with the public and beneficial users regarding the progress of monitoring and reporting updates on the GSP to DWR, establishment of fees, should they become necessary, and the development and implementation of management strategies, including projects as needed.

2.1.5.1 Summary of Beneficial Uses and Users

The primary beneficial uses of groundwater in the SJGB are agricultural and M&I uses. Beneficial users of groundwater and property interests potentially affected by the use of groundwater include municipal well operators, and public and private water purveyors, agricultural users, local land use planning agencies, environmental users, the Federal Government, the Soboba Band of Luiseño Indians, and disadvantaged communities. The Soboba Band of Luiseño Indians Reservation overlaps with the Hemet-San Jacinto Management Area in the SJGB. There are no federally recognized tribal lands within the Plan Area. Additionally, the disadvantaged communities of San

Jacinto, Hemet, East Hemet, Valle Vista and portions of Green Acres and Winchester are in the Hemet-San Jacinto Management Area of the SJGB.

Beneficial users of groundwater and property interests potentially affected by the use of groundwater within the Plan Area include municipal well operators, public and private water purveyors, agricultural users, local land use planning agencies, environmental users, the Federal Government, and disadvantaged communities (Table 2-11). Disadvantaged communities within the Plan Area include portions of Mead Valley, Romoland, Homeland, Winchester, and Lakeview. The beneficial users of groundwater within the Plan Area are described in more detail in the following paragraphs.

Municipal Well Operators and Public and Private Water Purveyors. There are six public or private water agencies that operate groundwater wells in the Plan Area (see Section 2.1.1.2 Water Agencies Relevant to the Plan Area). These agencies are:

- DWR
- EMWD
- WMWD
- City of Perris/ Liberty Utilities
- Nuevo Water Company
- Box Springs Mutual Water Company

Representatives from each agency were invited to join the Technical Advisory Committee (TAC) during the preparation of this GSP. These agencies participated in TAC meetings and were also invited to the general stakeholder meetings at which further input and advice were solicited.

Agricultural Users. Agricultural users have been identified as key stakeholders in the SJGB. EMWD maintains a database of well owners, including agricultural well owners. Email addresses in the database were added to the list of interested parties who receive electronic communications regarding the status and development of this GSP.

Local Land Use Planning Agencies. EMWD staff members have reached out to local land use planning agencies with jurisdiction over the Plan Area, including the County of Riverside, MARB, the City of Moreno Valley, the City of Perris, and the City of Menifee. EMWD has established working relationships with the land use planning agencies.

Environmental Users. There are limited environmental users of groundwater in the Plan Area (see Section 2.4.7 Groundwater Dependent Ecosystems). EMWD has taken steps to incorporate the interests of environmental users in the development of the GSP through a review and documentation of the potential interconnectedness of surface and groundwater in the Plan Area.

The Federal Government. As discussed in Section 2.1.1.1, Land Use Jurisdictions within the Plan Area, the federal government is a landowner and groundwater user in the Plan Area through its groundwater contamination cleanup operations at MARB. Representatives from the U.S. Air Force have been coordinating with EMWD staff regarding the development of the GSP, have participated in TAC meetings, and are on the list of interested parties who receive electronic communications regarding the status and development of this GSP.

Disadvantaged Communities. Disadvantaged Communities (DACs) within the Plan Area overlie areas where the groundwater may require treatment prior to consumption and, therefore, receive water from cities, mutual water companies, or EMWD. EMWD invites comments from DAC community members at public meetings and DAC community representatives are on the list of interested parties and the stakeholder advisory group (SAG) list of invitees.

EMWD has established partnerships with the cities of Perris and Moreno Valley, as well as various community groups within the cities including the Chamber of Commerce, Hispanic Chamber of Commerce, Rotary Club, and Libraries. Amongst the community groups are also members of congregations, school districts, and various other groups that provide a greater reach to the community at large.

Throughout the unincorporated areas of Mead Valley, Winchester, and Homeland, EMWD regularly engages with stakeholders at the Municipal Advisory Council meetings on a monthly/bi-monthly basis. In addition, staff has connected with local community/resource centers, libraries, and school districts within these areas to provide additional outreach. Additionally**,** DAC community members are invited to participate in quarterly SAG meetings. Meeting materials are posted to the EMWD SGMA webpage for public review and comments.

Table 2-11
Stakeholder Categories in the Plan Area

Category of Interest	Examples of Stakeholder Groups	Engagement Purpose
General Public	General Public	Inform to improve public awareness of sustainable groundwater management
Land Use	County of Riverside City of Perris City of Moreno Valley City of Menifee	Consult and involve to ensure land use policies are supporting GSP and vice-versa

Table 2-11
Stakeholder Categories in the Plan Area

Category of Interest	Examples of Stakeholder Groups	Engagement Purpose
Urban/ Agriculture users/ Golf Courses	EMWD WMWD DWR City of Perris City of Moreno Valley City of Menifee	Collaborate to ensure sustainable management of groundwater
Environmental and Ecosystem	California Department of Fish and Wildlife	Inform and involve to sustain a vital ecosystem
Economic Development	-	Inform and involve to support a stable economy
Human right to water	Disadvantaged and Severely Disadvantaged Communities	Inform and involve to provide a safe and secure groundwater supplies to DACs
Integrated Water Management	Regional water management groups (IRWM regions)	Inform, involve, and collaborate to improve regional sustainability

2.1.5.2 Public Meetings Summary

EMWD has been discussing the development of a GSP since 2015. Public meetings in which the participants discussed SGMA, the West San Jacinto GSA, or took action on the GSP are listed below:

- June 17, 2015 – EMWD Board Meeting
- December 7, 2016 – EMWD Board Meeting
- June 7, 2017 – EMWD Board Meeting
- June 21, 2017 – EMWD Board Meeting
- September 20, 2017 – EMWD Board Meeting
- June 20, 2018 – EMWD Board Meeting
- July 18, 2018 – EMWD Board Meeting
- December 19, 2019 – EMWD Board Meeting
- April 17, 2019 – EMWD Board Meeting
- June 26, 2019 –SAG Meeting
- August 21, 2019 – EMWD Board Meeting
- September 24, 2019 – SAG Meeting
- October 16, 2019 – EMWD Board Meeting

- November 20, 2019 – EMWD Board Meeting
- January 14, 2020 – SAG Meeting
- February 19, 2020 – EMWD Board Meeting
- June 17, 2020 – EMWD Board Meeting
- July 14, 2020 – SAG Meeting
- October 14, 2020 – SAG Meeting
- March 17, 2021 – EMWD Board Meeting
- March 24, 2021 – SAG Meeting
- May 19, 2021 – SAG Meeting
- August 25, 2021 – SAG Meeting
- September 15, 2021 – EMWD Board Hearing

EMWD Board meetings will continue to occur throughout the GSP implementation process. These meetings are publicly noticed and open to the public. If projects or management actions are required in the future to maintain sustainable management of the groundwater resources in the Plan Area additional public outreach and noticing will occur and will be specific to the project or management action being considered. The West San Jacinto GSA will evaluate the GSP every 5-years and stakeholder engagement opportunities will continue during the 5-year evaluation process.

2.1.5.3 Summary of Comments and Responses

The West San Jacinto GSA released a public draft of the GSP on April 16, 2021. A public workshop was held on May 19, 2021, to present the Public Draft GSP, answer questions, and solicit comments. The comment period was open between April 16, 2021 and July 15, 2021. Formal comments were accepted in writing only. The comments were submitted electronically via email to grayr@emwd.org. One comment letter and one email were received. Before completing this Final GSP, the public comments received on the Draft GSP were reviewed and, where appropriate, incorporated into this Final GSP. Public comments on the Draft GSP are included in Appendix E.

2.1.5.4 Summary of Initial Information on Relationships between State and Federal Regulatory Agencies

EMWD has not entered into any formal agreements with the federal government regarding preparation or administration of this GSP or groundwater management pursuant to SGMA, Section 10720.3(c). The U.S. Air Force is a current beneficial user of water within the Plan Area and has initiated informal coordination with EMWD staff, including participation on the TAC. There are no federally recognized Indian Tribes within the Plan Area.

EMWD recognizes the need for both formal and informal consultation with state and federal regulatory agencies throughout the implementation of the GSP. EMWD includes the following state and federal regulatory agencies on its list of interested parties:

- Santa Ana Regional Water Quality Control Board
- California Department of Fish and Wildlife
- California Department of Water Resources

2.1.5.5 Communication

A Public Outreach and Engagement Plan was developed for this GSP (Appendix F). The purpose of the Public Outreach and Engagement Plan was to create a common understanding and transparency throughout the groundwater sustainability planning process, including fulfilling the requirements of SGMA as described in 23 CCR §354.10.d. The Public Outreach and Engagement Plan discusses the EMWD decision-making process; identifies opportunities for public engagement and provides a discussion of how public input and response will be used; describes how EMWD encourages the active involvement of diverse social, cultural, and economic elements of the population within the Plan Area; and describes the method EMWD shall follow to inform the public about progress implementing the public outreach and engagement plan, including the status of projects and actions.

EMWD has provided ongoing and innovative opportunities for stakeholders to engage in the GSP development process. Opportunities for public comment were provided at EMWD Regular Board Meetings, and SAG Meetings. Meeting agendas, presentations, and minutes were made available on the EMWD website. Additional technical information about the GSP development was made available on the EMWD website including the Public Draft GSP, SAG Meeting Materials. The Public Draft GSP was available online for more than [NUMBER] days, including an official [NUMBER]-day public comment period. EMWD encouraged active participation from stakeholders through the GSP development process.

2.2 BASIN SETTING

2.2.1 Geography

The SJGB, which underlies portions of the cities of Moreno Valley, Perris, Menifee, Hemet, San Jacinto, and surrounding unincorporated communities, agricultural land, and open space, is located in western Riverside County (Figures 2-1 and 2-2). Land surface elevations within the SJGB range from approximately 1,400 to 2,000 feet above mean sea level (ft msl). The San Jacinto Mountain Range rises to a height of 10,805 ft msl on Mount San Jacinto, to the east of the SJGB. To the north, south, and west the SJGB is bounded by lower relief hills that rise approximately 500 to

1,000 feet above the valley floor. The bedrock hills that surround the SJGB prevent hydraulic communication between the SJGB and other nearby groundwater basins. As a result, the SJGB is a closed groundwater basin (EMWD 2016b).

2.2.2 Surface Water and Drainage Features

The SJGB lies within the San Jacinto Watershed, an approximately 780 square mile watershed that includes the reservoirs of Lake Elsinore, Canyon Lake and Lake Perris (Figure 2-10). The San Jacinto River and its tributaries are ephemeral streams that contribute recharge to the SJGB as surface water infiltrates through the streambed and migrates in the subsurface to the groundwater table. Surface water flows in the San Jacinto River typically infiltrate southeast of the City of San Jacinto during periods of average and below average precipitation. During periods of above average precipitation, surface flow in the San Jacinto River can travel northwest into the Plan Area, filling Mystic Lake and then southwest through the Perris Valley before leaving the Plan Area and discharging to Lake Elsinore, via Railroad Canyon and Canyon Lake (Figure 2-10; EMWD et al. 2007). As a result, Mystic Lake is also ephemeral; it is present only during periods of above average precipitation, or wetter months of the year and dries up at other times of the year and during periods of drought.

The other primary drainages in the SJGB are the Salt Creek flood control channel, which traverses the southern portion of the Plan Area, conveying stormwater from the Cities of Hemet and Menifee to Canyon Lake, and the Perris Valley Storm Drain, which conveys storm water from the City of Moreno Valley, the City of Perris, and MARB to the San Jacinto River channel south of San Jacinto Avenue (Figure 2-10).

Flow in the drainages of the Plan Area is measured at stream monitoring sites operated and maintained by the USGS in cooperation with Riverside County Flood Control District (Figure 2-5). Stream gauge 11070210, located on the San Jacinto River at the Ramona Expressway, has the lowest average flows of all the gauges in the Plan Area (Table 2-12A; Figure 2-11A; Figure 2-12A). Except for 2001, the gauge is dry each summer, with no flow recorded between May and September in the majority of the years on record (Table 2-12A). Even in months when flow reaches this gauge, the flows are typically one to two orders of magnitude lower than flows recorded at other gauges in the Plan Area (Tables 2-12A through 2-12D). The flows at this gauge reflect the disconnect between surface water and groundwater in the Plan Area, where there is rarely sufficient flow in the San Jacinto River to provide recharge, and groundwater does not contribute baseflow to the River.

Table 2-12A
Monthly Total Streamflow at USGS Gauge 11070210: San Jacinto River at Ramona Expressway

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total*
Units (AF)													
2000	-	-	-	-	-	-	-	124	414	37	51	51	**676**
2001	84	102	61	64	50	46	59	26	0	0	0	1	**492**
2002	3	0.04	0.14	5	0.04	0	0	0	0	18	2	0	**28**
2003	0	1	49	0	0	0	0	0	0	0	0	0	**50**
2004	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2005	117	210	213	52	8	0	0	0	0	0	0	0	**600**
2006	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2007	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2008	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2009	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2010	2	0	0	0	0	0	0	0	0	0	0	0.02	**2**
2011	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2012	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2013	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2014	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2015	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2016	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2017	70	49	5	0	0	0	0	0	0	0	0	0	**124**
2018	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Summary Statistics (AF)													
Av.	**15**	**20**	**18**	**7**	**3**	**3**	**3**	**8**	**22**	**3**	**3**	**3**	**104**
Max.	**117**	**210**	**213**	**64**	**50**	**46**	**59**	**124**	**414**	**37**	**51**	**51**	**676**
Min.	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Sources: USGS: https://waterdata.usgs.gov/nwis.
Notes: (*) Total of monthly streamflow for the calendar year, January to December

Stream gauge 11070270, located on the Perris Storm Drain at Nuevo Road has the longest record of flow in the Plan Area (Table 2-12B; Figure 2-11B; Figure 2-12B). The highest average flows measured at this gauge occur during the months of December, January, and February. Flow measured at this gauge reflects both stormwater flows in the winter months and flows from urban runoff in the summer months.

Table 2-12B
Monthly Total Streamflow at USGS Gauge 11070270: Perris Storm Drain at Nuevo Road

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total*
Units (AF)													
1990	241	615	43	32	65	5	0	0	0	0	23	0	**1,024**
1991	755	1,484	4,348	0	0	0	0	0	0	0	0	239	**6,826**
1992	1,004	3,538	1,303	1	0	0	5	0	0	61	0	2,159	**8,072**
1993	10,281	4,861	252	0	6	23	0	0	0	1	92	62	**15,577**
1994	312	1,183	985	290	32	2	3	0	0	2	59	110	**2,977**
1995	5,098	1,512	3,311	121	37	103	0	0	6	0	0	2	**10,191**
1996	334	1,491	371	2	0	0	0	6	0	103	587	232	**3,126**
1997	1,547	22	0	0	0	0	0	0	250	0	0	0	**1,820**
1998	-	-	-	-	-	-	-	-	-	-	-	-	**-**
1999	194	107	36	223	9	38	114	0	0	1	4	0	**727**
2000	28	1,304	520	149	3	2	1	11	0	103	10	3	**2,134**
2001	1,004	1,177	206	157	4	4	2	2	0	0	199	123	**2,879**
2002	10	6	28	20	0	1	0	1	1	0	124	628	**820**
2003	4	3,282	2,100	706	28	11	21	10	4	2	187	238	**6,591**
2004	63	1,429	384	146	4	6	7	13	23	4,266	592	1,763	**8,695**
2005	6,416	8,773	575	457	342	7	9	19	8	528	7	19	**17,161**
2006	228	720	694	558	26	8	10	6	6	1	2	49	**2,307**
2007	16	14	17	59	4	6	5	3	2	5	619	508	**1,256**
2008	1,233	221	84	5	608	1	3	2	0	0	300	1,881	**4,339**
2009	2	870	0	1	1	0	0	0	0	0	0	801	**1,675**
2010	5,451	832	43	206	0	0	0	0	1	14	45	8,192	**14,784**
2011	38	1,485	855	54	20	0	41	3	3	14	372	80	**2,966**
2012	47	138	366	316	1	0	27	667	0	0	3	1,032	**2,597**
2013	219	313	251	0	7	0	0	396	0	145	450	45	**1,828**
2014	0	378	354	63	0	0	0	545	0	0	10	1,212	**2,562**
2015	65	100	64	7	124	0	669	0	213	5	0	28	**1,276**
2016	1,772	5	91	274	42	0	0	8	2	26	278	2,385	**4,882**
2017	5,466	1,444	5	0	4	0	0	183	0	0	0	15	**7,117**
2018	1,061	21	266	0	0	0	0	1	3	266	395	732	**2,745**
Summary Statistics (AF)													
Av.	**1,532**	**1,333**	**627**	**137**	**49**	**8**	**33**	**67**	**19**	**198**	**156**	**805**	**4,791**
Max.	**10,281**	**8,773**	**4,348**	**706**	**608**	**103**	**669**	**667**	**250**	**4,266**	**619**	**8,192**	**17,161**
Min.	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**820**

Sources: USGS: https://waterdata.usgs.gov/nwis.
Notes: (*) Total of monthly streamflow for the calendar year, January to December

Stream gauge 11070365, located on the San Jacinto River near Sun City has similar winter flow volumes to those recorded at gauge 11070270 on the Perris Storm Drain. (Table 2-12C; Figure 2-11C; Figure 2-12C). Gauge 11070365 is downstream of location where the Perris Storm Drain discharges to the San Jacinto River (Figure 2-5). The similarity in flow measured at these two gauges shows that the Perris Storm Drain conveys the majority of the water in the Plan Area, while the San Jacinto River remains dry for much of its reach within the Plan Area.

Table 2-12C
Monthly Total Streamflow at USGS Gauge 11070365: San Jacinto River Near Sun City

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total*
Units (AF)													
2001	1,199	1,591	307	199	0	0	0	0	0	0	91	77	**3,463**
2002	0	0	171	857	0	0	0	0	0	0	88	688	**1,804**
2003	0	4,618	3,511	1,099	11	0	0	0	0	0	141	193	**9,573**
2004	67	1,489	345	55	0	0	0	0	0	5,116	687	1,303	**9,062**
2005	11,843	18,560	657	253	156	1	0	11	0	319	0	0	**31,800**
2006	123	510	697	396	0	0	0	0	0	17	67	35	**1,844**
2007	9	11	40	55	0	0	0	361	1,473	339	520	1,382	**4,190**
2008	1,295	170	55	0	774	0	0	0	0	0	235	2,212	**4,742**
2009	0	752	0	0	0	0	0	0	0	0	0	557	**1,310**
2010	6,757	743	30	143	0	0	56	207	340	266	19	7,897	**16,457**
2011	49	1,184	602	17	0	0	6	5	0	0	215	57	**2,135**
2012	5	108	244	199	1	0	0	100	9	0	0	831	**1,498**
2013	122	163	187	0	0	0	0	232	19	63	291	11	**1,088**
2014	0	208	583	10	0	0	0	414	0	0	0	1,203	**2,418**
2015	34	41	27	0	30	0	785	0	167	0	0	0	**1,085**
2016	1,564	0	24	124	15	0	0	0	0	0	179	2,027	**3,932**
2017	5,572	803	19	0	0	0	0	48	0	0	0	0	**6,443**
2018	999	0	160	0	0	0	0	0	1,525	156	261	679	**3,780**
Summary Statistics (AF)													
Av.	**1,647**	**1,720**	**425**	**189**	**55**	**0**	**47**	**77**	**196**	**349**	**155**	**1,064**	**5,923**
Max.	**11,843**	**18,560**	**3,511**	**1,099**	**774**	**1**	**785**	**414**	**1,525**	**5,116**	**687**	**7,897**	**31,800**
Min.	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,085**

Sources: USGS: https://waterdata.usgs.gov/nwis.
Notes: (*) Total of monthly streamflow for the calendar year, January to December

Measured flows at stream gauge 11070465, located on Salt Creek at Murrieta Road are lower than those measured on the Perris Storm Drain, or on the San Jacinto River near Sun City and are higher than those measured on the San Jacinto River at Ramona Expressway (Table 2-12D; Figure 2-11D; Figure 2-12D). Similar to the Perris Storm Drain, Salt Creek is a flood control channel. Therefore, the highest flows are recorded between December and February of each water year with no flow recorded during many of the summer months.

Table 2-12D
Monthly Total Streamflow at USGS Gauge 11070465: Salt Creek at Murrieta Road

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total*
Units (AF)													
2001	257	614	98	16	6	0	0	0	0	0	20	19	**1,030**
2002	5	1	2	2	0	0	0	0	0	0	1	151	**163**
2003	0	1,154	680	325	19	0	1	0	0	0	77	50	**2,307**
2004	2	519	82	32	0	25	0	29	0	1,289	234	583	**2,796**
2005	3,781	3,274	241	118	35	2	123	1	5	125	3	3	**7,710**
2006	122	188	407	362	6	7	65	15	2	0	0	20	**1,194**
2007	0	18	0	34	0	0	0	0	0	0	266	693	**1,012**
2008	1,350	136	0	0	76	0	0	0	0	0	163	871	**2,595**
2009	1	743	3	4	0	0	0	0	0	0	0	310	**1,060**
2010	2,975	601	18	32	0	0	0	9	0	245	64	4,493	**8,438**
2011	91	921	502	0	3	0	0	0	0	0	131	137	**1,785**
2012	0	208	194	93	0	0	6	19	6	0	0	258	**785**
2013	8	10	133	0	12	0	0	0	0	6	14	23	**206**
2014	0	200	1,019	1	0	0	0	56	0	0	0	1,357	**2,633**
2015	11	14	80	0	52	0	357	0	93	0	0	0	**607**
2016	1,051	3	7	1	67	0	0	0	0	10	185	1,447	**2,771**
2017	2,680	501	45	0	0	0	0	15	0	0	0	0	**3,241**
2018	754	10	47	0	0	0	0	0	0	101	28	249	**1,189**
Summary Statistics (AF)													
Av.	**727**	**506**	**198**	**57**	**15**	**2**	**31**	**8**	**6**	**99**	**66**	**592**	**2,307**
Max.	**3,781**	**3,274**	**1,019**	**362**	**76**	**25**	**357**	**56**	**93**	**1,289**	**266**	**4,493**	**8,438**
Min.	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**163**

Sources: USGS: https://waterdata.usgs.gov/nwis.
Notes: (*) Total of monthly streamflow for the calendar year, January to December

2.2.3 Historical, Current, Projected Climate

Riverside County Flood Control District operates and maintains eight precipitation stations within the SJGB. Of these stations, station 186, which is located within the Hemet-San Jacinto Management Area of the SJGB, has the longest continuous record of precipitation in the SJGB (Figure 2-13). The mean water year precipitation recorded at this station between 1916 and 2018 was 12.52 inches. The cumulative departure from the mean annual precipitation measured at Station 186 is typical of inland Southern California groundwater basins. There are several periods of drought, defined here as three or more consecutive years of below average precipitation, (1917 to 1919, 1923 to 1925, 1946 to 1951, 1953 to 1957, 1959 to 1965, 1970 to 1972, 1984 to 1990, 1999 to 2002, 2006 to 2010, and 2012 to 2016), interspersed with prolonged periods of above average precipitation (1937 to 1941, 1943 to 1945, 1973 to 1983, and 1991 to 1993). The longest droughts in the record occurred from 1959 to 1965, and 2012 to 2018. The average precipitation during this drought was 8.80 inches, which is 3.72 inches below the long-term mean precipitation for the region. Between 2012 and 2018, the average precipitation recorded at Station 186 was 8.27 inches which is also below the long-term mean precipitation recorded at the station and reflects the severity of the recent drought conditions in the area.

There are six precipitation stations in the Plan Area (Figure 2-5). The Moreno Valley East station (station 124) is the northern most station. The Lake Perris (station 151), San Jacinto Valley (station 161), and Lakeview stations (station 134) are located in the central part of the Plan Area. The Sun City (station 212) and Winchester stations (station 248) are located in the southern portion of the Plan Area. The length and completeness of each of the records at these precipitation stations varies (Figure 2-14). For the periods of time over which each station recorded data, the mean annual precipitation ranged from 9.92 inches at the San Jacinto Valley Station to 11.96 inches at the Lakeview Station (Figure 2-14). The trends in water year type relative to the mean precipitation are similar across the different stations in the Plan Area.

Future climate conditions in the SJGB are projected to be warmer and drier than they have been historically (Cayan et al. 2010; Allen and Anderson 2018). In order to better quantify the potential effects of climate change within each groundwater basin in California, DWR provided climate change datasets at an approximately 6 km grid-scale that were originally developed for the Water Storage Investment Program (DWR 2018). These datasets were derived from a collection of 20 global climate projections. The central tendency of each of the 20 projections was used to develop climate scenarios for the projected 2030 and 2070 conditions.

Within the SJGB, the 2030 and 2070 datasets consist of monthly change factors for precipitation and ET that, when multiplied by the historical precipitation or ET provide an estimate of future climate conditions. Overall, ET is projected to increase by approximately 5% relative to historical rates in the 2030 scenario. In the 2070 scenario, ET is projected to increase by approximately 7% relative to historical rates. Higher ET rates reflect projected increases in temperature for the SJGB in each of these scenarios.

Precipitation in the SJGB is projected to decrease by approximately 3% overall in the 2030 scenario for the SJGB. In the 2070 scenario, overall precipitation is projected to decrease by approximately 6% relative to the historical record. At the Lake Perris precipitation gauge, this decrease in precipitation translates to a reduction in the mean annual precipitation of approximately 0.15 inches in the 2030 scenario and approximately 0.47 inches in the 2070 scenario. The climate change factors provided by DWR have been incorporated into two numerical groundwater simulations of future conditions in the Basin in order to assess the impacts of potential future climate scenarios on groundwater conditions (see Section 2.5.6.3 Projected Water Budget).

In addition to the central tendency climate change scenarios, DWR has developed monthly precipitation and ET change factors that represent wetter mild warming (WMW) and drier extreme warming (DEW) future conditions. These change factors were developed by DWR using simulation results from a single global climate model that employed the IPCC RCP 4.5 (intermediate emissions) and RCP 8.5 (high emissions) scenarios. The most extreme warming conditions in the San Jacinto Basin are captured using the DEW scenario change factors.

Under the DEW conditions, precipitation is expected to decrease by approximately 13% relative to historical rates. At the Lake Perris precipitation gauge, this translates to a reduction in the mean annual precipitation of approximately 1.5 inches per year. These projected extreme warming conditions would also result in a 17% increase in ET across the SJGB. Groundwater conditions in the SJGB under this climate scenario were not directly assessed using numerical model results, but the potential effects of the DEW conditions on groundwater in the Plan Area is described in Section 2.5.8.1.

2.3 HYDROGEOLOGIC CONCEPTUAL MODEL

2.3.1 Geology

The SJGB is located within the Peninsular Range geomorphic province, which is bounded by the Transverse Range geomorphic province to the north, the Colorado Desert geomorphic province to the east, and the Pacific Ocean to the west (Morton and Miller 2006). Within the Peninsular Range geomorphic province, the SJGB is located entirely within the Perris Block, which is bounded to the west by the Elsinore Fault from the Santa Ana Mountains Block, and by the San Jacinto Fault Zone to the east from the San Jacinto Mountains Block (Morton and Miller 2006).

The SJGB is located between primarily granitic and other intrusive crystalline bedrocks of all ages to the north, west, and south, and coarse-grained Tertiary-age formations of sedimentary origin to the east across the Claremont Fault of the San Jacinto Fault Zone (Figure 2-15). Isolated areas of Pre-Cretaceous and Cretaceous metamorphic formations of sedimentary and volcanic origin occur to the south and west of the SJGB boundary within intrusive crystalline bedrocks. The intrusive crystalline, Pre-Cretaceous and Cretaceous metamorphic formations, and Tertiary-age bedrock formations combine to define the boundaries of the SJGB and effectively establish it as a closed groundwater basin with no significant groundwater flow between it and other nearby groundwater basins (EMWD 2016b). The SJGB does receive subsurface recharge from the surrounding bedrock hills (EMWD 2016b).

Isolated hill and mountain bedrock surfaces occur within the SJGB (Woodford, Doehring, and Morton 1971). These hills and mountains include the Bernasconi Hills and Mt. Russell Range located around Lake Perris, and the Lakeview Mountains which are composed of intrusive granitic bedrocks (Figure 2-15). Hills and mountains southwest of the Lakeview Mountains near Menifee are generally composed of intrusive crystalline bedrock and Pre-Cretaceous (Triassic) metamorphic formation.

Alluvial Deposits

Alluvial deposits have been divided into four general age groups by Morton and Matti (2001), Morton and Miller (2006), Matti et al. (2010), and the California Geological Survey (CGS 2012). These age groups from youngest to oldest are: 1) very young alluvial deposits, which are of Late Holocene age; 2) young alluvial deposits, Holocene to Late Pleistocene; 3) old alluvial deposits of Late to Middle Pleistocene; and 4) very old alluvial deposits of Middle to Early Pleistocene. Each of these groups is discussed below.

Very Young Alluvial Deposits

Very young alluvial deposits are Late Holocene age unconsolidated sediments that were deposited less than about 500 years before present (ybp) under current climatic and landscape conditions (Matti et al. 2010; CGS 2012). These very young alluvial deposits include alluvial wash (Qw), alluvial fan (Qf), alluvial valley (Qa), and lacustrine (Ql) deposits (Figure 2-15). These alluvial deposits are unconsolidated sediments that formed under current climatic and landscape conditions (Matti et al. 2010). Geologically active alluvial wash deposits (Qw) are confined to the San Jacinto River channel on the western boundary of the Plan Area. These deposits are generally sand and silt that are active during major flood events and lack any soil development. Very young alluvial fan deposits (Qf) are chiefly unconsolidated cobbly and gravelly sand formed on active alluvial fans where cobbly alluvium is especially abundant in the upper parts of the fans (Morton and Matti 2001). Very young alluvial fan deposits are located along the San Jacinto Fault Zone (Figure 2-15). Very young alluvial valley deposits (Qv) are active and recently active fluvial (river) deposits on the valley floor along the San Jacinto River channel (Figure 2-15). Very young lacustrine (Ql) deposits include fluvial deposits and are clay, silt and fine-grained sand mixed in varying proportions (Morton and Matti 2001). These are deposited in the ephemeral Mystic Lake area during high rainfall events by the San Jacinto River and by sediment derived from the distal part of the alluvial fan flanking the San Timoteo Badlands east of Mystic Lake (Figure 2-15; Morton and Matti 2001).

Young Alluvial Deposits

Young alluvial deposits range from Holocene to Late Pleistocene in age, typically are less than 15,000 years to about 500 ybp (Matti et al. 2010; CGS 2012). Young alluvial deposits consist of alluvial fan (Qyf), and alluvial valley (Qya) deposits (Figure 2-15). Young alluvial deposits accumulated during the latest global climatic transition from glacial to interglacial and can be distinguished on the basis of slight differences in the consolidation, cobble preservation, and pedogenic-soil profile characteristics (Matti et al. 2010). Many of the younger alluvial fan deposits on the east side of the West San Jacinto GSA Area are gray-hued cobble- and gravelly-sand deposits derived from lithicly diverse sedimentary units in the San Timoteo Badlands area (Figure

2-15; Morton and Matti 2001). The large alluvial fan on the north side of the Lakeview Mountains is mainly brown and brownish-gray sand derived entirely from the Lakeview Mountain intrusive granitic rocks (Morton and Matti 2001). Younger alluvial valley (Qya) deposits are gray unconsolidated alluvium, consisting of fine- and very fine-grained sand and silt that covers parts of the broad alluvial area east of the Lakeview Mountains (Figure 2-15; Morton and Matti 2001).

Old Alluvial Fan Deposits

Old alluvial fan deposits range from Late Pleistocene to Middle Pleistocene age, between 15,000 and 500,000 ybp (Matti et al. 2010; CGS, 2010). The old alluvial fan deposits are moderately to well-developed argillic or calcareous soil profiles that are dissected but not extensively so that their original landforms and physiographic relations can still be deciphered from geomorphic and geological evidence (Matti et al. 2010). Old alluvial fan deposits (Qof) occur extensively to the north, west and southwest of the Lakeview Mountains with minor occurrences in the northeastern part of the SJGB (Figure 2-15). The old alluvial fan deposits also include very old alluvial-valley deposits that are too finely mixed to differentiate at the scale mapped (Matti et al. 2010).

Very Old Alluvial Fan Deposits

Very old alluvial fan deposits are of Middle to Early Pleistocene age, and are from about 500,000 and 750,000 ybp (Matti et al. 2010; CGS 2012). These deposits are moderately to well-consolidated with either well-developed argillic or calcareous soil profiles, or their soil profiles have been completely removed by long-continued erosion (Matti et al. 2010). Very old alluvial fan deposits (Qvof) occur mainly within the Lake Perris area and to the northwest of the Mount Russell Range, but minor occurrences are found in both the northeastern and southwestern parts of the SJGB, as well as on the north side of the Lakeview Mountains (Figure 2-15).

Bedrock Units

As indicated above, the SJGB is bounded by intrusive crystalline bedrock, and isolated areas of Pre-Cretaceous and Cretaceous metamorphic formations of sedimentary and volcanic origin (Figure 2-15). Intrusive crystalline bedrock on the western boundary of the SJGB is primarily the Cretaceous Val Verde Tonalite, an intrusive igneous (plutonic) rock, also called quartz diorite (EMWD 2016b). Tonalites and other igneous intrusive rocks also occur along the northern boundary of the SJGB. The southern and southwestern boundary is generally a mix of intrusive igneous rocks and metamorphic rocks, such as quartzite, phyllite, schist, and gneiss, but east of the Claremont Fault are sandstones and conglomerates of the Pliocene San Timoteo Beds (Morton and Matti, 2006; Matti et al., 2010; EMWD 2016b).

Faults

The Claremont Fault, which is an east-dipping strand of the regionally extensive, San Jacinto Fault zone forms the eastern boundary of the SJGB. Motion along the Claremont Fault includes both a right lateral strike-slip (horizontal displacement) component and a reverse-slip (vertical displacement) component.

In the southern part of the SJGB, within the Hemet-San Jacinto Management Area, the Casa Loma Fault also experiences right-lateral strike slip motion. However, vertical displacement on the Casa Loma fault is normal-slip, not reverse-slip as it is on the Claremont Fault. The Casa Loma fault, which is also a strand of the San Jacinto Fault, dips to the east (Morton and Matti 2001). The motion along the Casa Loma and Claremont Faults has created the narrow deep "San Jacinto Basin" which is an approximately 3 to 4 km wide tectonic basin within the SJGB (Morton and Matti 2001). To the north, the Casa Loma Fault terminates near Mystic Lake. Fissures are present in the vicinity of Mystic Lake due to a combination of tectonic movement and subsidence due to historical groundwater withdrawal (Morton and Matti 2001).

2.3.2 Principal Aquifers and Aquitards

The SJGB contains alluvial deposits that have filled incised canyons in the crystalline basement and tectonic valleys formed as a result of motion along strands of the San Jacinto Fault (see Section 2.3.1 Geology). There is no distinct hydrologic barrier in the subsurface that separates the deposits in the Plan Area from the deposits in the Hemet-San Jacinto Management Area. Groundwater flows both into and out of the Plan Area along its boundary with the Hemet-San Jacinto Management Area (see Section 2.5 Water Budget).

Within the Plan Area, the alluvial deposits are laterally discontinuous, primarily consisting of interbedded and intermixed, unconsolidated to consolidated, sand, gravel, cobbles, silt, clay, and boulders. The heterogeneous sediments can have locally high concentrations of fine-grained material that can persist both spatially and with depth. As discussed in Section 2.3.1, Geology, some units show well-developed argillic or calcareous soil profiles while others show no soil development, generally depending on their age. Although there are localized areas of confined groundwater conditions, particularly in the vicinity of Mystic Lake, the sedimentary units have not been separated into distinct aquifers. Therefore, the term "water-bearing units" is used to distinguish alluvial sediments with different characteristics in this GSP. For the purpose of reporting water levels and water quality, however, all of the water bearing units in the Plan Area are treated as a single principal aquifer.

Water-bearing units

The primary groundwater-bearing materials in the Plan Area are the alluvial deposits above the bedrock units. Depth to bedrock in the Plan Area ranges from near ground surface adjacent to internal and boundary hills and mountains to depths of greater than 2,000 feet below land surface in the northeastern part of the Plan Area (Figure 2-16; EMWD 1967). The thick alluvial deposits on the east side of the Plan Area, in the vicinity of Mystic Lake, result from faulting along the Claremont and Casa Loma Faults with significant vertical displacement between the two faults (EMWD 1967). In addition to the eastern part of the Plan Area, there are distinct bedrock troughs with over 500 feet of overlying sediment that follow the central axes of the valley floors in the Moreno Valley, Perris, Nuevo/Lakeview, and Menifee areas (Figure 2-16). These elongated reaches of thicker sediment correspond with higher producing areas of the primary aquifer in the Plan Area.

Eight generalized cross-sections (A-A' through H-H' on Figures 2-17 through 2-24), were adapted for this GSP from the cross-sections developed for the San Jacinto Flow Model (SJFM-2014; EMWD 2016b). Lithologic logs, downhole geophysical logs, well construction logs, water quality, water levels, areal geophysics, photographic review, literature review, and field observations were used to delineate water-bearing deposits (Appendix G – San Jacinto Flow Model 2014 Documentation; EMWD 2016b). The focus of this effort was to evaluate the economically viable groundwater resources within the SJGB, which were historically identified as occurring at depths of less than 1,500 feet below ground surface (ft. bgs). The location of cross-sections A-A' through H-H' are shown on Figure 2-15.

Confining, or clay-rich, layers within the Plan Area tend to be laterally discontinuous and of limited aerial extent, consistent with the depositional environment (Figures 2-17 through 2-24). Historical groundwater elevations from wells screened at multiple depths within the Plan Area also show that groundwater within the Plan Area is generally unconfined (Figures 2-17 through 2-24). However, fine-grained layers within the alluvial sequence can create local areas of semi-confined or confined groundwater conditions (Figures 2-18, 2-19, 2-20, and 2-22).

The eastern part of the Plan Area, near the San Jacinto Fault, is the only area in which thick, laterally continuous layers of fine-grained material likely create confined groundwater conditions (Figures 2-19, 2-22, and 2-24). These fine-grained units are generally clay or silt-rich layers that restrict the vertical flow of groundwater and produce areas where the unconfined aquifer becomes semi-confined or confined.

General water-bearing deposits for each of the groundwater production areas in the Plan Area are discussed below. The groundwater production areas in the Plan Area are areas in which groundwater production has occurred or is planned in the next 5 years (Figures 2-25 and 2-26). In general, the water-bearing deposits in each of the groundwater production areas differ somewhat due to age of deposition and sources of depositional material.

In the eastern part of the Nuevo/ Lakeview Production Area, the alluvial material is significantly finer grained, with mostly clays in the subsurface (EMWD 2016b). The fine-grained sediments form a clay "cap," in the southeast corner of the Nuevo/ Lakeview groundwater production area. Historically, this region had artesian conditions and pockets of natural gas (EMWD 2016b). The clay soils and subsurface materials here are the result of lower energy lacustrine depositional environments from San Jacinto River flows that now generally terminate in Mystic Lake. This area is a draining depression that continues to subside largely due to tectonic activity (EMWD 1967).

In the western part of the Nuevo/Lakeview Production Area, surface waters from the San Jacinto River and the generally flat topography have resulted in a low energy depositional environment in which fine-grained materials are deposited. These low energy deposits, however, are adjacent to, and interlayer with, higher energy large alluvial fan complexes deposited on the north side of the Lakeview Mountains.

In the Moreno Valley and North Perris Production Areas, very old alluvial fan and valley deposits are covered by younger alluvial fan and alluvial valley deposits from sedimentary units in the San Timoteo Badlands. The overlapping depositional fans and valley deposits fill a complex bedrock trough with interbedded and intermixed sand, gravel, silt, and clay from both fan and valley fill deposits. Finer-grained deposits occur near the northern boundary with the Nuevo/Lakeview Production Area.

Depositional environments in the South Perris Production Area were similar to those in the Nuevo/Lakeview Production Area in that surface waters from the San Jacinto River and the generally flat topography along the northern part of the production area have resulted in a low energy depositional environment producing fine-grained materials. As with the Nuevo/Lakeview groundwater production area, the South Perris groundwater production area has old alluvial fan and valley deposits that are interlayered with San Jacinto River derived deposits and with Salt Creek-derived deposits in the southern part of the South Perris groundwater production area.

In the Menifee groundwater production area old alluvial fan, and possibly valley, deposits are interbedded and intermixed with young alluvial valley sand, gravel, silt, and clay deposits from Salt Creek.

2.3.3 Recharge Areas

The heterogeneous alluvial deposits observed in the subsurface are reflected in the distribution of surface soil textures observed in the Plan Area (Figure 2-27). Soils with a vertical hydraulic conductivity of greater than 28 μm/s were used to delineate areas of potential recharge within the Plan

Area. These soils represent approximately the highest third (35%) of the vertical hydraulic conductivity rates in the Plan Area. Many of these soils are located in existing urban areas. However, there are extensive coarse sandy loam and sandy loam deposits in the Nuevo/ Lakeview, South Perris, and Menifee production areas that are favorable areas for distributed aerial recharge (Figure 2-27).

Based on the documented surface and subsurface hydrogeologic features, and work done in conjunction with the development and analysis of the SJFM-2014, the current understanding of the hydrogeologic conceptual model for the Plan Area is presented in Figure 2-28.

2.4 CURRENT AND HISTORICAL GROUNDWATER CONDITIONS

2.4.1 Groundwater Elevation Data

Groundwater elevations have been measured in the SJGB since the early 1900s. These early measurements were collected from wells that have since been destroyed. Of the current wells in the Plan Area, the USGS Gilman Springs/Virginia well (well ID 21015) in the Nuevo/ Lakeview production area has the longest record, with groundwater measurements dating back to 1941 (Appendix H – Groundwater Elevation Hydrographs). The majority of the current wells in the Plan Area have groundwater elevation records that begin in the mid-1990s, coinciding with EMWD’s adoption of the GMP for the SJGB in 1994.

Groundwater elevation hydrographs for all wells in the Plan Area are presented in Appendix H. Select hydrographs are discussed below, by production area, in order to illustrate general trends in groundwater elevation over time within the Plan Area. The locations of the wells discussed in Section 2.4.1.1 are shown on Figure 2-29.

Groundwater elevation trends in the Hemet-San Jacinto groundwater management area are not discussed in this GSP. The annual change in groundwater elevation and minimum and maximum groundwater elevations measured at each well in the Hemet-San Jacinto Management Area are provided in the Hemet/San Jacinto Groundwater Management Area annual reports (EMWD 2019b).

Current groundwater elevations, groundwater flow directions, and gradients for the Plan Area are discussed by groundwater production area in Section 2.4.1.2.

2.4.1.1 Historical Groundwater Elevation Trends

Groundwater elevations in the SJGB are influenced by both groundwater production and climatic conditions, which influence the amount of recharge. Within the Plan Area, the North Perris, South Perris, and Nuevo/Lakeview production areas experienced groundwater declines prior to 1970, with groundwater elevations in 1974 falling below 1200 ft msl to the west and south of the present location of Lake Perris[27] (Figure 2-30; Appendix H). Since that time, groundwater elevations throughout much of the Plan Area have been rising. By 1993, groundwater elevations were above 1200 ft msl in the Nuevo/Lakeview production area, and above 1250 ft msl in the North Perris Production Area (Figure 2-31). This recovery in groundwater elevations occurred despite prolonged periods of drought that occurred between 1984 and 1991, 1998 and 2002, and 2005 and 2018 (Figure 2-13).

Historical groundwater elevation trends are discussed in more detail, by production area, in the following sections.

Moreno Valley Groundwater Production Area

Groundwater elevations in the Moreno Valley Production Area vary with geographic location. They are highest in the northeastern part of the production area and lowest adjacent to the Bernasconi Hills (Figures 2-32 and 2-29). Two wells in the production area (wells 12007 and 12091) have historical groundwater elevations dating back to the 1930s and 1940s (Figure 2-32). The groundwater elevation in these wells was stable through the 1970s and 1980s when the groundwater elevation records in each of these wells ends. Groundwater elevations declined approximately 75 feet in the UCR Coray and UCR Scott wells between 1977 and 2000. Since 2000, groundwater elevations in these wells have recovered and are currently 60 feet higher than they were in 1977 (Figure 2-32). The rising water levels observed in the UCR Coray and UCR Scott wells between 2000 and 2018 are consistent with observations from all other wells in the production area, except well EMWD 42 Reche Canyon in the northeast corner of the production area. Groundwater elevations in wells MVRG West, EMWD 45 New Maxwell, and EMWD 46 Edgemont 02 were 50 to 80 feet higher in 2018 than they were in 2000 (Figure 2-32). EMWD 42 Reche Canyon is the only well in the production area with a distinct climatic response. Groundwater elevations in this well were highest in 1998 after a period of prolonged above average precipitation and have declined approximately 50 feet since 1998.

North Perris Groundwater Production Area

Groundwater elevations in the North Perris Production Area declined between 1940 and 1970 (Figure 2-33). Since 1970, however, groundwater elevations in the North Perris Production Area have recovered and are currently higher than they were in the 1940s. High groundwater in this area has been a concern for several years, and projects have been developed to address the rising groundwater levels in the Perris North Production Area (see Section 2.5.6.3.1 Projected Water Budget Assumptions).

[27] Construction of the Lake Perris dam was constructed between 1970 and 1974.

South Perris Groundwater Production Area

Groundwater elevations in the South Perris Production Area declined during the early 1900s in wells 12463 and 12467, which provide the oldest groundwater elevation records in the Plan Area (Figure 2-34). A decline in groundwater elevation of approximately 100 feet was observed in the City of Perris Bob Long Memorial Park well between 1940 and 1970 (Figure 2-34). Between 1977 and 2007, however, groundwater elevations in the City of Perris Bob Long Memorial Park well rose approximately 150 feet and are currently higher than then were in 1940. The increase in groundwater elevations observed in the City of Perris Bob Long Memorial Park well was also observed in wells EMWD Skiland 05 and EMWD A1. Since 2007, groundwater elevations have remained constant in response to increased groundwater production from the South Perris Production Area. EMWD undertook projects in this area to address both the rising groundwater levels and TDS and nitrate concentrations above the Basin Plan Objectives in this area. The stable groundwater elevations in these wells during the present drought conditions reflects EMWD's proactive management of the water levels in the production area.

Menifee Groundwater Production Area

Groundwater elevation trends in the Menifee Production Area differ with geographic location (Figure 2-35). Groundwater elevations in the EMWD 54 Menifee Test West, EMWD 72 Menifee 02, EMWD 74 Menifee 04, and Agri Leon Holland wells have been rising since 2005. Groundwater elevations in these wells are presently 30 to 50 feet higher than they were in 2005, despite the long decline in the cumulative departure from the mean curve between 2005 and 2018. These wells are all in the southern part of the production area. In contrast, groundwater elevations in well EMWD A3, to the north and west of wells EMWD 54, EMWD 72, EMWD 74, and Agri Leon Holland, have declined by approximately 15 feet since 2005. The differences in groundwater elevation response in these two areas reflect local variations in groundwater production and surface features, with EMWD A3 located closer to production wells in the Perris South Production Area, and adjacent to the Sun City Golf Course.

Nuevo/Lakeview Groundwater Production Area

Groundwater elevation trends in the Nuevo/Lakeview GPA depend on geographic location within the production area. Groundwater elevations in the USGS Gilman Springs well, which is east of the Claremont Fault, have been rising since the 1940s, and are currently 35 feet higher than they were in 1941 (Figure 2-36). Groundwater elevations in the area of the Nuevo/Lakeview Production Area to the west of the Claremont Fault have, in general, been rising since 1996 (Figure 2-36). The rise in groundwater levels followed an extended period of groundwater elevations decline between 1940 and 1995 (Figure 2-36). The current groundwater elevation in the Motte East well remained 75 feet lower in 2018 than it was in 1967.

2.4.1.2 Current Groundwater Conditions

For this GSP, current groundwater conditions were reviewed over two periods of time. The first is the spring and fall groundwater elevations measured in 2018. Spring 2018 groundwater elevations were defined as any groundwater elevation measured between March 1 and March 30, 2018 (Figure 2-37). Fall 2018 groundwater elevations were defined as any groundwater elevation measurement collected between November 1 and November 31, 2018 (Figure 2-38). The majority of the fall 2018 measurements were measured later in the year than previous years. Moving forward these measurements will continue to be measured between October 1 and October 31 (see Section 3.5.4.1 Groundwater Elevation Monitoring Schedule). The second period of time over which current groundwater conditions were evaluated was the average spring and fall groundwater elevations for the period from 2013 to 2018. The average 2013 to 2018 spring groundwater elevation was calculated for each well in the Plan Area with at least one groundwater elevation measurement in the spring (March 1 to March 30) for 2013 through 2018 (Figure 2-39). The average fall (October 1 to October 31) groundwater elevations were calculated the same way for fall groundwater elevation measurements collected between 2013 and 2018 (Figure 2-40). The average spring and fall groundwater elevations were calculated in order to provide additional spatial coverage for groundwater elevation measurements in the Plan Area, and to understand these groundwater elevations in the context of the current water budget, which was calculated for the period from 2013 through 2018 (see Section 2.5.6.2 Current Water Budget).

Moreno Valley Groundwater Production Area

Spring 2018 groundwater elevations within the Moreno Valley Production Area ranged from 1,451 to 1,811 feet msl (Figure 2-37). Fall 2018 groundwater elevations ranged from 1,450 to 1,804 feet msl (Figure 2-38). These elevation ranges are similar to the averaged spring and fall groundwater elevations which ranged from 1,445 to 1,810 feet msl and 1,445 to 1,803 feet msl, respectively. There is little difference in the range between the spring and fall groundwater elevations, either as measured directly in 2018 or averaged over the period from 2013 to 2018. This is reflected in the groundwater elevation hydrographs which do not indicate large seasonal variations in water levels in the Moreno Valley Production Area.

Groundwater flows from areas where groundwater elevations are high to areas where groundwater elevations are low. Groundwater levels were highest in the northeastern part of the production area, northwest of the intersection of State Route 60 and Redlands Boulevard, and lowest in the southern part of the production area, adjacent to the North Perris Production Area (Figures 2-37 through 2-40). The Moreno Valley Production Area receives mountain front recharge in the northeast, which contributes to the higher groundwater levels in this part of the production area. Groundwater levels are lower to the south as a result of active production wells in the North Perris Production Area (Figure 2-6). The hydraulic gradient from north to south across the western part of the production area was approximately 0.005 feet/feet in the fall of 2018 and 0.004 feet/feet in the spring of 2018. The hydraulic gradient from north to south across the eastern part of the production area was approximately 0.015 feet/feet in both the fall and spring of 2018.

North Perris Groundwater Production Area

Groundwater elevations within the North Perris Groundwater Production Area ranged from 1,383 to 1,447 feet msl in the spring of 2018 (Figure 2-37). In the fall of 2018, groundwater elevations ranged from 1,375 to 1,442 feet msl (Figure 2-38). The groundwater elevation differences are similar across the averaged spring and fall groundwater measurements for 2013 through 2018 (Figures 2-39 and 2-40). As observed in the Moreno Valley Production Area, the range in groundwater elevations in the spring is similar to the range of groundwater elevations in the fall. The North Perris Groundwater Production Area does not experience large seasonal changes in groundwater elevation.

The groundwater flow near Lake Perris is generally to the west. The highest groundwater elevations were approximately 0.3 miles west of the Perris Dam, while the lowest elevations were measured approximately 2.5 miles southwest of the Perris Dam (Figures 2-37 through 2-40). The hydraulic gradient from east to west was approximately 0.003 feet/feet in both the spring and fall of 2018. Additionally, groundwater levels are higher in the Moreno Valley GPA and lower in the South Perris GPA, indicating that, in the absence of the influence of Lake Perris in the central part of the production zone, there is a component of flow across the production area from north to south.

South Perris Groundwater Production Area

Groundwater elevation within the South Perris Groundwater Production Area ranged from 1,351 to 1,460 feet msl in the spring of 2018 (Figure 2-37). Fall 2018 groundwater levels ranged from 1,419 to 1,527 feet msl (Figure 2-38). The largest seasonal difference occurred in the north-central production area, where groundwater elevations in several wells decreased by 10 to 25 ft decrease from the spring to the fall.

Groundwater in the South Perris Production Area flows in from the south, southeast, and north toward the northeast and into the Nuevo/Lakeview Production Area. Groundwater elevations throughout the central and western portions of the production area are similar, with a hydraulic gradient of approximately 0.001 feet/feet from both the north and south towards the Lakeview Production Area. Similar to the Moreno Valley Groundwater Production area, the hydraulic gradient in the central and western portions of the production area does not vary significantly from season to season. In the southeastern part of the production area northwest of the Double Butte Mountains, where groundwater elevations are over 50 feet higher than they are in the rest of the production area, the hydraulic is approximately 0.006 feet/feet to the west.

Menifee Groundwater Production Area

Groundwater elevations within the Menifee Groundwater Production Area ranged from 1,331 to 1,455 feet msl in the spring of 2018 (Figure 2-37). In the fall of 2018, groundwater elevations ranged from 1,334 to 1,446 feet msl (Figure 2-38). The groundwater elevations decreased, on average, approximately 5 feet from spring to fall. There is little seasonal change in the range of observed groundwater elevations.

Groundwater elevations are highest in the northeastern part of the production area, southwest of Double Butte, and lowest in the southern part of the production area, east of Highway 215. This southern area has a cluster of extraction wells (Figure 2-6) that lower the groundwater elevations in the adjacent aquifer and induce groundwater to flow from north to south in this part of the production area. The hydraulic gradient is approximately 0.008 feet/feet. The influence of the southern production wells is limited by the bedrock outcropping in the central part of the production area. As a result, to the north and west of the bedrock outcropping, groundwater flows toward the north, into the South Perris Production Area. The hydraulic gradient is approximately 0.002 feet/feet from the west-central part of the Menifee Production Area toward the South Perris Production Area.

Nuevo/Lakeview Groundwater Production Area

Groundwater elevations within the Nuevo/Lakeview Groundwater Production Area ranged from 1,193 to 1,464 feet msl in the spring of 2018 (Figure 2-37). In the fall of 2018, groundwater elevations ranged from 1,173 to 1,568 feet msl (Figure 2-38). Seasonal differences in the groundwater elevation were generally less than 20 feet throughout the production area. The highest groundwater elevations in the production area between 2013 and 2018 were adjacent to the Moreno Valley Production Area. The lowest groundwater elevations were measured adjacent to the boundary with the Hemet-San Jacinto Management Area.

Groundwater flows from the Moreno Valley Production Area, into the Nuevo/ Lakeview Production Area with a hydraulic gradient of approximately 0.009 feet/feet. Groundwater elevations in the eastern half of the Nuevo/Lakeview GPA are, however, strongly influenced by the San Jacinto Fault Zone, with differences in groundwater elevations of 200 feet between wells within 0.25 miles of each other. As a result, there are local hydraulic gradients in this part of the production area that do not follow the general direction of flow from north to south. While these local gradients indicate a potential to induce groundwater flow, there are extensive clay layers in the subsurface in this part of the production area that limit groundwater movement (see Section 2.3.1 Geology).

In the southwestern part of the production zone, adjacent to the South Perris Production Area, groundwater elevations are higher than they are farther east. Therefore, groundwater flows from the South Perris Production Area into the Nuevo/ Lakeview Production Area. The hydraulic gradient from the southwest to the southeast approximately 0.0034 feet/feet in the spring of 2018.

2.4.2 Estimated Change in Storage

Annual estimates of the change in groundwater in storage were computed using simulation results from the SJFM-2014, a MODFLOW numerical groundwater flow model developed for the San Jacinto Groundwater Basin (see Section 2.5 Water Budget; EMWD, 2016b). The SJFM-2014 simulated historical conditions in the Basin between calendar years 1984 and 2012. For this GSP, SJFM-2014 was extended to simulate current conditions in the Basin from January 1, 2013 through December 31, 2018 (Section 2.5.6.2). Estimates of the water year changes in groundwater in storage were extracted from the model results using the Plan Area boundary. As discussed in Section 2.5, Water Budget, the SJFM-2014 model domain encompasses approximately, 80% of the Plan Area. Regions of the Plan Area that are not represented in the SJFM-2014 numerical model are shown as the yellow-filled regions in Figure 2-41.

Figures 2-42 and 2-43 show annual and cumulative change in storage, as well as annual groundwater usage, in the Plan Area for the historical (water years 1985 through 2012) periods. Municipal and agricultural groundwater extractions are the primary outflows from the Plan Area. The primary inflows are mountain front recharge and aerial recharge (see detailed discussion in Section 2.5 Water Budget).

Since 1985, inflows have exceeded groundwater use in the Plan Area. This occurs independent of the volume of local precipitation received, or water-year type (Figures 2-42 and 2-43; see Section 2.5 Water Budget). The SJFM-2014 estimates that between water years 1985 and 2012, groundwater in storage increased by an average rate of approximately 15,600 AFY (see Section 2.5.3.2 Change in Annual Volume of Groundwater in Storage). This resulted in a cumulative increase of groundwater in storage of approximately 440,000 AF between water years 1985 and 2012 (see Section 2.5.3.2 Change in Annual Volume of Groundwater in Storage). Between water years 2013 and 2018, the SJFM-2014 estimates that groundwater in storage increased by approximately 6,100 AFY (see Section 2.5.6.2 Current Water Budget).

2.4.3 Seawater Intrusion

The SJGB is more than 30 miles from the Pacific Ocean at its closest point. Therefore, seawater intrusion is not an applicable sustainability indicator for this basin.

2.4.4 Groundwater Quality

Groundwater quality within the Plan Area has been monitored since at least the mid-1950s, with the coverage and frequency of monitoring increasing substantially beginning in the mid-1990s, as

EMWD began implementation of its groundwater management plan (EMWD 1995). Previously, groundwater quality data was collected by DWR, EMWD, and the USGS in conjunction with specific studies and projects but was not collected on a regular sampling schedule (EMWD 1995). Although approximately 300 wells were sampled for groundwater quality before 1995, most (62%) were only sampled once. As a result, only one to three wells per GMZ[28] have a continuous or semi-continuous record of groundwater quality dating back before the 1990s (EMWD 1995).

Since 1995, water quality samples from all available municipal and private (agricultural) wells within the Plan Area have been collected at least once a year, usually in the summer. The standard suite of water quality constituents tested comprises major cations and anions (including nitrate as nitrogen[29]), nitrogen, metals (boron, copper, iron, manganese, and zinc), alkalinity, total dissolved solids (TDS), and physical parameters (electrical conductance, temperature at collection, and pH). Additional constituents are analyzed from specific wells based on need, location, and local water quality concerns.

As of 2018, EMWD's groundwater quality monitoring network consists of over 100 wells within the Plan Area, with the highest coverage in the Perris South (45 wells), Lakeview (28 wells), and Perris North (17 wells) GMZs; the San Jacinto Lower Pressure GMZ has 6 wells in the network and the Menifee GMZ has five wells in the network as of 2018 (Appendix C; EMWD 2019a). The number of wells sampled varies year to year based on a number of factors, such as adequate access/permission or operational constraints, particularly for private wells not owned/operated by EMWD (EMWD 2019a). Other federal, state, or municipal agencies within the Plan Area that also participate in EMWD's groundwater quality monitoring network include the Nuevo Water Company, the City of Perris, and CDFW.

In addition to implementation of EMWD's groundwater management plan, salinity (expressed as TDS) and nitrate concentrations in groundwater are analyzed every three years as part of amendments to the Basin Plan in 2004 (RWQCB Resolution No. R8-2004-0001; SAWPA 2017). The Santa Ana Watershed Project Authority (SAWPA), its member agencies, and the Basin Monitoring Program Task Force produce information on ambient water quality in each GMZ within the Santa Ana River Basin to periodically update the assimilative capacity for TDS and nitrate and evaluate progress and continuing challenges toward meeting the applicable

[28] Throughout the groundwater quality sections of this GSP, wells are discussed by Groundwater Management Zone (GMZ) rather than production zone. The GMZs are defined in the Water Quality Control Plan: Santa Ana River Basin (RWQCB 2019), which established water quality standards for the region, including the Plan Area. See Section 2.1.2 for additional information.

[29] Note that, by convention, this GSP expresses nitrate in terms of nitrate as nitrogen. "Nitrate," "nitrate-N," "nitrate-nitrogen," and "NO3-N" all refer to nitrate as nitrogen, with a maximum contaminant level (MCL) of 10 milligrams per liter (mg/L).

groundwater quality objectives in the Basin Plan (Table 2-5). EMWD provided its water quality dataset for the recomputation of ambient water quality completed by SAWPA.

EMWD also complies with the requirements of the SWRCB DDW, which, in addition to requiring that treated water supplies be sampled to demonstrate compliance with drinking water quality standards, also requires EMWD and other water purveyors in the Plan Area to collect and analyze raw water samples from their drinking water systems (including groundwater wells).

2.4.4.1 Summary of Groundwater Quality Standards

Groundwater quality within the Plan Area is measured against two major standards. The first is Basin Plan water quality objectives, which establish both narrative and numeric groundwater quality standards aimed at preserving existing and potential beneficial uses (see Section 2.1.2.3 Water Quality). The second set of standards consists of California drinking water maximum contaminant levels (MCLs)[30] administered and enforced by the SWRCB DDW under the California SDWA, as codified in the California Code of Regulations (CCR) Title 23.

For many constituents, the Basin Plan incorporates state drinking water standards (described below) as the appropriate water quality objective for groundwater. For TDS and nitrate, the Basin Plan establishes water quality objectives in the Plan Area that are largely based on historical concentrations of TDS and nitrate- nitrogen from 1954 through 1973.

The California SDWA prescribes enforceable primary MCL standards for five major categories of drinking water contaminants consisting of microorganisms, disinfectants and disinfection byproducts, inorganic chemicals, organic chemicals, and radionuclides (i.e., radioactive forms of elements).[31] In addition, secondary MCLs have been established for non-health concerns, based on aesthetic issues, such as taste, odor, or color in the water. The SWRCB and EPA have established secondary MCLs for at least 15 contaminants. For chemical contaminants that do not have established MCLs, the SWRCB establishes notification and response levels, which are health-based advisory concentrations and concentrations above which the SWRCB recommends removal of a drinking water source from service to protect public health, respectively. The SWRCB has established notification levels and response levels for at least 30 constituents.

2.4.4.2 Groundwater Quality Summary

Both natural conditions and anthropogenic activities impact the concentration of constituents detected in the groundwater of the Plan Area. The primary natural conditions that impact water

[30] A maximum contaminant level is the maximum concentration of a contaminant allowed in water delivered to a user of any public water system.

[31] Note that primary drinking water standards established by the SWRCB under the California SDWA are equivalent or more stringent than those set by the EPA under the federal SDWA

quality are the location of the SJGB in a semi-arid environment and lack of groundwater interchange with adjacent basins, both of which contribute to areas of naturally brackish groundwater in the Plan Area (EMWD 2019a). Additionally, groundwater flow along the San Jacinto Fault Zone (including the Casa Loma Fault), moves boron and fluoride from deeper formations into the water bearing strata in the Plan Area, and can cause locally elevated groundwater temperatures (EMWD 2019a).

Anthropogenic activities have exacerbated naturally occurring water quality issues and introduced additional COCs through release of pollutants from both point and non-point sources. Historical and on-going agricultural land use is the principal non-point source of groundwater quality degradation within the Plan Area. Agricultural practices have resulted in elevated concentrations of salt and nutrients (nitrogen and phosphorous), particularly in the Perris South GMZ, the southern part of the Perris North GMZ, and the western part of the Lakeview GMZ (Figure 2-44). Installation of new monitoring wells associated with the Perris North Groundwater Contamination Prevention and Remediation Program, will further refine the understanding of the distribution of non-point source COCs in the Perris North GMZ (Figure 2-44; EMWD 2018).

The groundwater quality of the Plan Area has also been affected by use of imported surface water from both the Sacramento-San Joaquin Delta as well as the Colorado River. Water originating from the Colorado River typically contains high TDS and low levels of nutrients, whereas water originating from the State Water Project has low TDS and higher concentrations of nutrients. During droughts, an increased percentage of water delivered to the Plan Area is from the Colorado River, and the water delivered by the SWP becomes increasing saline. Salt and nutrient accumulation in the groundwater has been a focus of management and regulatory actions in the Plan Area over the last 30 years (RWQCB 2019, EMWD 2019a, DWR 2003).

In addition to regional sources of water quality degradation, point source contaminants from industrial, service commercial (e.g., gas stations, dry cleaners, etc.) and military facilities have locally affected water quality with specific contaminants such as fuels, perchlorate, and PFAS/PFOS (Figure 2-45). Historical activities at MARB, which is the largest and most consequential environmental cleanup site in the Plan Area, have resulted in the detection of elevated concentrations of fuels, oils and solvents; volatile organic compounds (VOCs); polycyclic aromatic hydrocarbons (PAH); per- and polyfluoroalkyl substances (PFAS); and perfluorooctane sulfonate and perfluorooctanoic acid (PFOS/PFOA). However, while the elevated concentrations of PFOS and PFOA were determined to have originated from MARB by the RWQCB, a final delineation of the vertical and horizontal extent is still underway (RWQCB 2020). Figure 2-43 shows the active cleanup cases affecting groundwater that are overseen by the federal government (i.e., MARB), RWQCB and/or the DTSC.

2.4.4.3 Groundwater Quality by Constituent and GMZ

TDS and Nitrate

Of the potential COCs measured in the groundwater of the Plan Area, TDS and nitrate are the only two for which groundwater quality objectives have been developed in the Basin Plan. This means that the Basin Plan has defined concentrations of these constituents in the groundwater for the "reasonable protection of beneficial uses of water" (RWQCB 2019). Other COCs have regulatory thresholds that are applied after the groundwater has been extracted and before it can be served as drinking water. Therefore, the remainder of this section focuses on the concentration of TDS and nitrate in each GMZ within the Plan Area.

The range of TDS and nitrate concentrations detected between 2013 and 2018 by groundwater wells and GMZs are shown in Figures 2-46 and 2-47, respectively. Appendix I has groundwater quality hydrographs for TDS and nitrate concentrations within the Plan Area.

Perris North GMZ. TDS concentrations detected in the Perris North GMZ between 2013 and 2018 ranged from 220 mg/L in EMWD 45 New Maxwell, to 2160 mg/L in EMWD Perris Iris (Table 2-13; Figure 2-46). The TDS objective for Perris North is 570 mg/L (Table 2-14; RWQCB 2019). Between 2012 and 2015, the ambient TDS concentration in the Perris North GMZ decreased from 760 mg/L in to 720 mg/L (SAWPA 2017). There is no assimilative capacity in the Perris North GMZ because the ambient concentration exceeds the Basin Plan objective concentration for this GMZ.

Nitrate concentrations detected in the Perris North GMZ between 2013 and 2018 ranged from 0.4 mg/L in EMWD 45 New Maxwell, to 240 mg/L in EMWD Perris Iris (Figure 2-47). The nitrate objective for the Perris North GMZ is 5.2 mg/L (Table 2-14; RWQCB 2019). Between 2012 and 2015, the ambient nitrate concentration increased from 7.3 mg/L to 7.4 mg/L (SAWPA 2017). There is no assimilative capacity for nitrate in the Perris North GMZ because the ambient concentration exceeds the Basin Plan objective concentration for this GMZ.

Perris South GMZ. TDS concentrations detected in the Perris South GMZ between 2013 and 2018 ranged from 230 mg/L in the Smith C Mapes well to 15,000 mg/L in well EMWD Skiland 02 (Table 2-13; Figure 2-46). The TDS objective for Perris South is 1260 mg/L (Table 2-14; RWQCB 2019). Between 2012 and 2015, the ambient TDS concentration in the Perris South GMZ decreased from 2400 mg/L in to 2340 mg/L (SAWPA 2017). There is no assimilative capacity for TDS in the Perris South GMZ because the ambient concentration exceeds the Basin Plan objective concentration for this GMZ (SAWPA 2017).

Nitrate concentrations detected in the Perris North GMZ between 2013 and 2018 ranged from 0.4 mg/L in three wells (Pico Peister, Winchester Ponds 04, EMWD Skiland 05) to 154.7 mg/L in the

Perris Properties Kmart well (Table 2-13; Figure 2-47). The nitrate objective for the Perris South GMZ is 2.5 mg/L (Table 2-14; RWQCB 2019). Between 2012 and 2015, the ambient nitrate concentration increased from 5.8 mg/L to 6.0 mg/L (SAWPA 2017). There is no assimilative capacity for nitrate in the Perris South GMZ because the ambient concentration exceeds the Basin Plan objective concentration for this GMZ.

Table 2-13
Groundwater Quality Monitoring Results (2013 - 2018)

Groundwater Management Zone	Year	No. of Samples	TDS (mg/L)		Nitrate as N (mg/L)		Perchlorate (µg/L)			Iron (µg/L)			Manganese (µg/L)		
			Max	*Min*	*Max*	*Min*	*No. of Samples*	*Max*	*Min*	*No. of Samples*	*Max*	*Min*	*No. of Samples*	*Max*	*Min*
Lakeview	2013	21	3,100	270	12.0	<0.2	1	<4	<4	22	36,900	<5	22	1,040	<1
	2014	21	3,300	280	19.0	<0.2				21	2,540	<5	21	360	<1
	2015	13	3,200	360	11.0	<0.1	1	<4	<4	13	126,000	<5.9	13	820	<2.5
	2016	27	3,300	310	18.0	<0.1				27	3,280	<5	27	180	<5
	2017	24	3,000	270	14.0	<0.1	10	<4	<1	128	5,340	<5	128	400	<1.4
	2018	28	2,730	268	20.3	<0.4	12	<4	0.13	171	66,800	<10	174	925	<0.4
Perris North	2013	18	1,800	220	21.0	<0.2	1	4.5	4.5	18	16,600	6	18	150	<1
	2014	18	1,800	240	22.0	<0.2				18	11,700	<5	18	230	<1
	2015	14	1,800	310	17.0	<0.1	2	7.5	<4	14	6,290	<5	14	440	<2.5
	2016	15	2,100	230	53.0	<0.1				15	2,800	<5	15	180	<2.5
	2017	12	1,900	330	20.0	<0.1	3	<4	<1	11	580	<5	11	240	<1
	2018	17	2,160	352	42.6	<0.4	3	3.9	1.9	18	1,180	<10	18	220	<0.4
Perris South	2013	47	9,600	230	22.0	<0.2	10	6.9	<4	48	64,000	<5	48	5,900	<1
	2014	47	15,000	290	13.0	<0.2				47	110,000	<5	47	4,530	<1
	2015	45	15,000	410	16.0	<0.1	10	<4	<4	45	93,900	<5	45	4,700	<2.5
	2016	37	13,000	390	35.0	<0.1				36	44,200	11	36	5,450	<5
	2017	45	12,000	420	27.0	<0.1	35	7.8	<1	366	30,100	<5	366	5,980	<1
	2018	45	11,700	446	12.0	<0.4	29	43	<1	385	51,700	<10	394	6,120	0.4
San Jacinto Lower Pressure	2013	6	1,100	360	8.1	<0.2				6	10,600	460.0	6	1,430	29
	2014	5	1,100	290	8.3	<0.2				5	6,760	51.0	5	1,610	10
	2015	4	2,000	360	8.5	<0.1				4	59,800	660.0	4	610	54
	2016	6	3,100	350	8.0	<0.1				6	22,500	28.0	6	1,580	11
	2017	4	1,600	350	8.1	<0.1				4	111,000	48.0	4	1,620	33
	2018	6	920	384	9.4	<0.4				6	31,800	20.0	6	1,470	46

Table 2-13
Groundwater Quality Monitoring Results (2013 - 2018)

Groundwater Management Zone	Year	No. of Samples	TDS (mg/L)		Nitrate as N (mg/L)		Perchlorate (µg/L)			Iron (µg/L)			Manganese (µg/L)		
			Max	*Min*	*Max*	*Min*	*No. of Samples*	*Max*	*Min*	*No. of Samples*	*Max*	*Min*	*No. of Samples*	*Max*	*Min*
Menifee	2013	10	2,900	830	9.8	<0.2				10	12,800	10.0	10	1,350	<2
	2014	10	2,800	970	14.0	3.7				10	3,400	8.5	10	1,580	<2
	2015	4	2,800	1,100	9.7	<0.1				4	21,000	5.0	4	1,300	<5
	2016	6	2,300	890	9.8	2.0				6	3,510	12.0	6	790	<5
	2017	2	1,200	150	4.0	<0.1				2	6,190	5.6	2	170	9
	2018	5	2,950	900	8.5	0.7				5	4,300	10.0	5	1,360	<5
Hemet South (partial)	2013	1	670	670	16.0	16.0				1	150	150.0	1	3.2	3.2
	2014	3	610	500	16.0	9.3				3	180	37.0	3	4.9	<2
	2015	2	640	510	15.0	8.7									
	2016	4	720	510	16.0	11.0									
	2017	2	590	550	12.0	12.0				2	19	15.0	2	<3	<3
	2018	4	918	700	26.7	19.0				4	140	10.0	4	8.0	<5

Table 2-14
Ambient TDS and Nitrate (as N) Concentrations and Assimilative Capacity

Groundwater Management Zone	Water Quality Objective	Historical Ambient	1997 Ambient	2003 Ambient	2006 Ambient	2009 Ambient	2012 Ambient	2015 Ambient	Difference from 2012 to 2015	Assimilative Capacity
Total Dissolved Solids Concentration (mg/L)										
Perris North	570	568	750	780	730	770	760	720	–40	–150
Perris South	1,260	1,258	3,190	2,200	2,600	2,470	2,400	2,340	–60	–1,080
Lakeview/Hemet-North*	520	519	830	840	880	890	860	850	–10	–330
Menifee	1,020	1,021	3,360	2,220	2,140	2,050	2,030	1,970	–60	–950
San Jacinto-Lower Pressure	520	520	730	950	810	800	800	780	–20	–260
Nitrate as Nitrogen Concentration (mg/L)										
Perris North	5.2	5.2	4.7	6.7	6.5	7.4	7.3	7.4	0.1	–2.2
Perris South	2.5	2.5	4.9	5.9	5.5	5.8	5.8	6.0	0.2	–3.5
Lakeview/Hemet-North*	1.8	1.8	2.7	3.4	2.7	2.6	2.5	2.6	0.1	–0.8
Menifee	2.8	2.8	5.4	6.0	4.7	4.4	4.6	4.5	–0.1	–1.7
San Jacinto-Lower	1.0	1.0	1.9	1.8	1.2	1.1	1.1	1.5	0.4	–0.5

Source: SAWPA 2017 (Tables 3-1 and Table 3-2).

* Lakeview/Hemet North crosses the adjudication boundary, and thus TDS/Nitrate information for this GMZ is not solely representative of the GSP plan area.

Lakeview/Hemet-North GMZ. TDS concentrations detected in the Lakeview portion of the Lakeview/Hemet-North GMZ between 2013 and 2018 ranged from 268 mg/L in the Fish & Game West well to 3,300 mg/L in well NWC 11 (Table 2-13; Figure 2-46). The TDS objective for the Lakeview/Hemet-North GMZ is 520 mg/L[32] (Table 2-14; RWQCB 2019). Between 2012 and 2018, the ambient TDS concentration decreased from 860 mg/L to 850 mg/L (SAWPA 2017). There is no assimilative capacity for TDS in the Lakeview/Hemet-North GMZ because the ambient concentration exceeds the Basin Plan objective concentration for this GMZ.

Nitrate concentrations detected in the Lakeview/Hemet-North GMZ between 2013 and 2018 ranged from 0.2 mg/L in the Motte East and Motte West wells to 366.9 mg/L in the Smith C Nuevo/Olivas well (Table 2-13; Figure 2-47). The nitrate objective for Lakeview/Hemet-North is 1.8 mg/L (Table 2-14; RWQCB 2019). Between 2012 and 2015, the ambient nitrate concentration increased from 2.5 mg/L to 2.6 mg/L (SAWPA 2017). There is no assimilative capacity for nitrate in the Lakeview/ Hemet North GMZ because the ambient concentration exceeds the Basin Plan objective concentration for this GMZ.

While the center and southwestern parts of the Lakeview/Hemet-North GMZ exceed DDW requirements, the northeastern part of the GMZ has production wells that meet DDW requirements for Nitrate and TDS.

Menifee GMZ. TDS concentrations detected in the Menifee GMZ between 2013 and 2018 ranged from 150 mg/L in well EMWD 53 Menifee Test East to 2,950 mg/L in the Wilderness Lakes well (Table 2-13; Figure 2-46). The TDS objective for the Menifee GMZ is 1020 mg/L (Table 2-14; RWQCB 2019). Between 2012 and 2015, the ambient TDS concentration decreased from 2030 mg/L to 1970 mg/L (SAWPA 2017). There is no assimilative capacity for TDS in the Menifee GMZ because the ambient concentration exceeds the Basin Plan objective concentration.

Nitrate concentrations detected in the Menifee GMZ between 2013 and 2018 ranged from 0.4 mg/L in the Bouris Newport East of Menifee and EMWD 53 Menifee Test East wells to 62 mg/L in the Agri Leon/Holland well (Table 2-13; Figure 2-47). The nitrate objective for the Menifee GMZ is 2.8 mg/L (Table 2-14; RWQCB 2019). Between 2012 and 2015, the ambient nitrate concentration decreased from 4.6 mg/L to 4.5 mg/L (SAWPA 2017). There is no assimilative capacity for Nitrate in the Menifee GMZ because the ambient concentration exceeds the Basin Plan objective concentration.

San Jacinto-Lower Pressure GMZ. TDS concentrations detected in the San Jacinto-Lower Pressure GMZ between 2013 and 2018 ranged from 290 mg/L to 3100 mg/L, both measured in the Fish & Game Mystic Lake OC well (Table 2-13; Figure 2-46). The TDS objective for San

[32] There is a single Basin Plan objective for the entire Lakeview/Hemet-North GMZ, although only the Lakeview portion of the Lakeview/Hemet-North GMZ is within the Plan Area.

Jacinto-Lower is 520 mg/L (Table 2-14; RWQCB 2019). Between 2012 and 2015, the ambient TDS concentration decreased from 800 mg/L to 780 mg/L (SAWPA 2017). There is no assimilative capacity for TDS in the San Jacinto-Lower Pressure GMZ because the ambient TDS concentration exceeds the Basin Plan objective concentration.

Nitrate concentrations detected in the San Jacinto-Lower Pressure GMZ between 2013 and 2018 ranged from 0.4 mg/L in multiple wells to 41.5 mg/L in well EMWD 42 Reche Canyon well (Table 2-13; Figure 2-47). The nitrate objective for the San Jacinto-Lower Pressure GMZ is 1.0 mg/L (Table 2-14; RWQCB 2019). Between 2012 and 2015, the ambient nitrate concentration increased from 1.1 mg/L to 1.5 mg/L (SAWPA 2017). There is no assimilative capacity for nitrate in the San Jacinto-Lower Pressure GMZ because the ambient nitrate concentration exceeds the Basin Plan objective concentration.

2.4.5 Subsidence

The area near Mystic Lake is the only part of the Plan Area that has experienced historical subsidence due to groundwater withdrawal. Fissures located east of the Bernasconi Mountains and west of Mystic Lake (Figure 2-12) are a result of both tectonic subsidence and historical groundwater withdrawal within the San Jacinto Valley, a tectonic pull-apart valley that formed between strands of the San Jacinto Fault, on the east side of the SJGB (see Section 2.3.1 Geology). The fissures occurred around 1953 and were linked to groundwater withdrawals, primarily within the Hemet-San Jacinto Management Area. The rate of subsidence linked to groundwater withdrawals was estimated to be approximately 1.4 to 1.6 inches per year (3.5 to 4 cm/year) in the 1970s (Morton 1977).

Currently, land surface elevation changes in the SJGB are measured by one GPS station and through InSAR (Interferometric Synthetic Aperture Radar) surveys conducted by DWR (Figure 2-48). The GPS Plate Boundary Observatory station (ID: PPBF), is used to measure three-dimensional deformation of tectonic plates (UNAVCO 2020). As a result, the PPBF station is located adjacent to a bedrock outcropping on the western edge of the Bernasconi Mountains where there would be limited to no expected vertical motion associated with groundwater withdrawal.

In contrast, InSAR surveys of the SJGB do not include the bedrock areas outside the basin boundaries, and instead focus on vertical motion of the land surface overlying the groundwater aquifer. The motion observed in the InSAR data is a combination of motion that results from tectonic forces and potential motion associated with groundwater withdrawal. InSAR surveys of the SJGB indicate that the majority of the Plan Area did not experience any subsidence between 2015 and 2019 (Figure 2-47). In the area near Mystic Lake, land surface continued to subside at a rate of approximately 0.04 to 1.2 inches/year (1.2 to 3.0 cm/year). These rates are lower than the historically estimated rate of subsidence (Morton 1977). Based on the lack of current groundwater production in this area (Figure 2-26) and the location adjacent to the San Jacinto Fault Zone (Figure 2-15), the subsidence in this area is attributed to ongoing tectonic activity rather than groundwater withdrawal. Based on the InSAR data, groundwater level information, previous studies, GPS data and borehole extensometer data, DWR determined that future subsidence is considered a low risk across the Plan Area (DWR 2014).

2.4.6 Groundwater-Surface Water Connections

Surface water is conveyed through the Plan Area via the San Jacinto River, Perris Valley Storm Drain, and Salt Creek flood control channel (Figure 2-10; Section 2.2.2 Surface Water and Drainage Features). In addition, the California Department of Fish and Wildlife manages the SJWA, which contains approximately 900 acres of restored wetlands north and east of the unincorporated area of Lakeview (Section 2.1.1 Summary of Jurisdictional Areas and Other Features).

The San Jacinto River is ephemeral and surface water flow does not reach the Plan Area during years with normal and below-normal water year precipitation (see Section 2.2.2 Surface Water and Drainage Features). Groundwater underlying the San Jacinto River is typically encountered at depths that exceed 100 feet bgs (Figures 2-49 and 2-50). The thick vadose zone that separates the bottom of the San Jacinto River from the underlying groundwater table indicates that the San Jacinto River is not an interconnected groundwater-surface water system within the Plan Area.

Surface water runoff generated within the City of Moreno Valley, City of Perris, and MARB is conveyed through the Plan Area via the Perris Valley Strom Drain (Table 2-12B). The highest average flows are measured during the winter months of December, January, and February. Groundwater in the vicinity of the Perris Valley Storm Drain is typically at depths that exceed 40 feet bgs (e.g., Appendix H, Casing Name: Bean Rider West OC).

Simulation results from the SJFM-2014 suggest that there may be a continuous hydraulic connection between surface water and groundwater near the intersection of the Perris Drain and Ramona Expressway (Figures 2-49 and 2-50. In this area of the model domain, the SJFM-2014 over-estimates groundwater elevations by approximately 20-30 feet (Figure 2-51; Bean Rider West OC hydrograph). These simulation results indicate that there is uncertainty in the simulated groundwater-surface water interactions along the Perris Drain. While there is limited data to characterize this interaction, there are no potential or identified groundwater dependent ecosystems (GDEs) along the Perris Drain (Figure 2-52; see section 2.4.7 Groundwater Dependent Ecosystems)

Groundwater elevations underlying the Salt Creek Flood Control Channel are generally shallower than groundwater conditions encountered near the San Jacinto River and Perris Valley Storm Drain. Static groundwater levels underlying the most western branch of Salt Creek within the Plan Area indicate that groundwater can be found at a depth of 30 to 40 feet bgs (Figure 2-38; Appendix J). The Salt Creek Channel may have a continuous hydraulic connection between the channel bottom and the underlying groundwater at times of above average precipitation. Groundwater elevations in the vicinity of the Salt Creek Channel, however, do not contribute to baseflow in the channel and there are no potential or identified GDEs along the Salt Creek Channel as it passes through the Plan Area (Figure 2-52; see Section 2.4.7 Groundwater Dependent Ecosystems)

Simulation results from the SJFM indicate that groundwater and surface water may be in continuous hydraulic connection along the southeastern edge of the Plan Area, near the boundary with the Hemet-San Jacinto Management Area (Figures 2-49 and 2-50). Groundwater elevations in this region of the Plan Area are influenced by recycled water storage in the Winchester Ponds (Figure 2-27) and may be influenced by underflows from Diamond Valley Lake (Figure 2-10). Simulation results in this area of the model domain are not well-constrained by measured groundwater elevation and may overestimate the degree of connectivity between the Salt Creek and underlying groundwater. Because surface water-groundwater interactions along this stretch of the Salt Creek are not well constrained, the characterization of Salt Creek as an interconnected surface water body in this location of the Plan Area is a data gap. Although there are no mapped GDEs along this stretch of the Salt Creek (Figure 2-52), further characterization of this segment of Salt Creek may be warranted if future production is expanded in this area.

CDFW maintains approximately 900 acres of wetlands that utilize recycled water for wetland maintenance in the SJWA. The SJWA is underlain by thick clay deposits that limit the vertical migration of surface water into the principal aquifer (EMWD 2011b). These clay deposits act as a physical barrier between groundwater and surface water in this region.

As described above, groundwater elevation, streamflow, and lithologic data indicate that groundwater and surface water are not connected within the Plan Area. Infiltration of surface water flow through the San Jacinto River, Perris Valley Storm Drain, and Salt Creek Flood Control Channel is not impacted by groundwater production and management within the Plan Area.

2.4.7 Groundwater Dependent Ecosystems

The SJGB contains a diverse community of vegetation and wetland habitats that are sustained by recycled water, precipitation, infiltrating surface water, and underlying groundwater. The Natural Communities Commonly Associated with Groundwater (NCCAG) dataset identified 235 unique vegetation community indicators commonly associated with phreatophytes and 83 unique wetland indicators commonly associated with the surface expression of groundwater in the SJGB. Of the 235 vegetation community indicators, 79 are located in the Plan Area. Of the 83 wetland community indicators, 28 are located in the Plan Area. The Plan Area flora and fauna identified in the California Freshwater Species Database (version 2.0.9) are listed in Table 2-15 below.

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Table 2-15
Flora and Fauna in the Plan Area

Scientific Name	Common Name	Species	Legal Protected Status			Watershed					
			Federal	*State*	*Other*	*Mount Rudolph-San Jacinto River*	*San Jacinto Valley*	*Menifee Valley*	*Moreno Valley*	*Perris Reservoir*	*Perris Valley-San Jacinto River*
Actinemys marmorata	Western Pond Turtle	Herps		Special Concern	ARSSC	P	P	P	P	P	P
Actitis macularius	Spotted Sandpiper	birds				P	P		P	P	
Aechmophorus clarkia	Clark's Grebe	birds				P				P	
Aechmophorus occidentalis	Western Grebe	birds				P	P			P	P
Agelaius tricolor	Tricolored Blackbird	birds	Bird of Conservation Concern	Special Concern	BSSC - First priority	P	P			P	P
Aix sponsa	Wood Duck	birds				P				P	
Alopecurus saccatus	Pacific Foxtail	plants					P	P			
Ammannia coccinea	Scarlet Ammannia	plants				P					P
Ammannia robusta	Grand Redstem	plants				P		P			P
Anas acuta	Northern Pintail	birds				P	P	P	P	P	P
Anas americana	American Wigeon	birds				P	P	P	P	P	P
Anas clypeata	Northern Shoveler	birds				P	P	P	P	P	P
Anas crecca	Green-winged Teal	birds				P	P	P	P	P	P
Anas cyanoptera	Cinnamon Teal	birds				P	P	P	P	P	P
Anas discors	Blue-winged Teal	birds				P	P	P			P
Anas platyrhynchos	Mallard	birds				P	P	P	P	P	P
Anas strepera	Gadwall	birds				P	P	P	P	P	P
Anaxyrus boreas	Boreal Toad	Herps				P	P	P	P	P	P
Anaxyrus boreas halophilus	California Toad	Herps			ARSSC				P	P	
Anemopsis californica	Yerba Mansa	plants				P					P
Anser albifrons	Greater White- fronted Goose	birds				P				P	
Ardea alba	Great Egret	birds				P	P	P	P	P	P
Ardea Herodias	Great Blue Heron	birds				P	P		P	P	P
Argia vivida	Vivid Dancer	insect & other inverts						P			
Arundo donax	NA	plants				P			P		
Aythya affinis	Lesser Scaup	birds				P	P		P	P	
Aythya americana	Redhead	birds		Special Concern	BSSC - Third priority	P	P		P	P	P
Aythya collaris	Ring-necked Duck	birds				P	P	P	P	P	
Aythya marila	Greater Scaup	birds				P			P	P	
Aythya valisineria	Canvasback	birds		Special		P	P			P	
Azolla filiculoides	NA	plants				P					
Baccharis salicina		plants			Not on any status lists	P	P	P	P	P	P
Bergia texana	Texas Bergia	plants				P					P
Bolboschoenus glaucus	NA	plants			Not on any status lists	P	P				
Bolboschoenus maritimus paludosus	NA	plants			Not on any status lists	P				P	P
Bolboschoenus robustus		plants			Not on any status lists	P					
Botaurus lentiginosus	American Bittern	birds				P				P	
Branchinecta lynchi	Vernal Pool Fairy Shrimp	crustaceans	Threatened	Special	IUCN -Vulnerable		P				

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Bucephala albeola	Bufflehead	birds				P	P	P	P	P	
Bucephala clangula	Common Goldeneye	birds				P			P	P	
Butorides virescens	Green Heron	birds				P	P		P	P	P
Calidris alpine	Dunlin	birds				P				P	
Calidris mauri	Western Sandpiper	birds				P	P			P	P
Calidris minutilla	Least Sandpiper	birds				P	P			P	P
Callitriche marginate	Winged Water- starwort	plants					P		P	P	
Chen caerulescens	Snow Goose	birds				P			P	P	P
Chen rossii	Ross's Goose	birds				P				P	
Chlidonias niger	Black Tern	birds		Special Concern	BSSC -Second priority	P					
Chroicocephalus philadelphia	Bonaparte's Gull	birds				P				P	
Cistothorus palustris	Marsh Wren	birds				P	P			P	P
Crassula aquatica	Water Pygmyweed	plants					P				
Crassula solieri	NA	plants			Not on any status lists		P				
Crypsis vaginiflora	NA	plants				P					P
Cygnus columbianus	Tundra Swan	birds				P					
Cyperus acuminatus	Short-point Flatsedge	plants									P
Cyperus erythrorhizos	Red-root Flatsedge	plants				P				P	
Cypseloides niger	Black Swift	birds	Bird of Conservation Concern	Special Concern	BSSC - Third priority	P					
Dendrocygna bicolor	Fulvous Whistling- Duck	birds		Special Concern	BSSC - First priority	P					
Downingia cuspidate	Toothed Calicoflower	plants					P	P			P
Echinochloa oryzoides	NA	plants									P
Echinodorus berteroi	Upright Burhead	plants				P					P
Egretta thula	Snowy Egret	birds				P	P	P	P	P	P
Eleocharis acicularis	Least Spikerush	plants				P		P			
Eleocharis engelmannii	Engelmann's Spikerush	plants			Not on any status lists			P			
Eleocharis macrostachya	Creeping Spikerush	plants					P		P		P
Empidonax traillii	Willow Flycatcher	birds	Bird of Conservation Concern	Endangered		P					
Empidonax traillii brewsteri	Willow Flycatcher	birds	Bird of Conservation Concern	Endangered						P	
Epilobium campestre	NA	plants			Not on any status lists	P	P	P			P
Fulica americana	American Coot	birds				P	P	P	P	P	P
Gallinago delicata	Wilson's Snipe	birds				P	P			P	P
Gallinula chloropus	Common Moorhen	birds				P					
Gelochelidon nilotica vanrossemi	Gull-billed Tern	birds	Bird of Conservation Concern	Special Concern	BSSC - Third priority	P					
Grus canadensis	Sandhill Crane	birds				P					
Haliaeetus leucocephalus	Bald Eagle	birds	Bird of Conservation Concern	Endangered		P	P			P	P
Himantopus mexicanus	Black-necked Stilt	birds				P	P	P	P	P	P

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Icteria virens	Yellow-breasted Chat	birds		Special Concern	BSSC - Third priority	P			P		
Ischnura cervula	Pacific Forktail	insect & other inverts				P					
Ischnura denticollis	Black-fronted Forktail	insect & other inverts				P					
Ixobrychus exilis hesperis	Western Least Bittern	birds		Special Concern	BSSC -Second priority	P					
Juncus macrophyllus	Longleaf Rush	plants								P	
Juncus xiphioides	Iris-leaf Rush	plants						P		P	
Lasthenia glabrata coulteri	Coulter's Goldfields	plants		Special	CRPR - 1B.1	P	P	P			P
Lemna gibba	Inflated Duckweed	plants					P				
Lemna minuta	Least Duckweed	plants				P					
Limnodromus scolopaceus	Long-billed Dowitcher	birds				P	P			P	P
Limosella aquatica	Northern Mudwort	plants									P
Lophodytes cucullatus	Hooded Merganser	birds				P				P	
Ludwigia peploides	NA	plants			Not on any status lists	P					
Lythrum californicum	California Loosestrife	plants									P
Marsilea vestita	NA	plants			Not on any status lists	P	P			P	P
Megaceryle alcyon	Belted Kingfisher	birds				P	P		P	P	P
Mergus merganser	Common Merganser	birds				P			P	P	
Mergus serrator	Red-breasted Merganser	birds				P				P	
Mimulus cardinalis	ScarletMonkeyflower	plants				P				P	
Mimulus guttatus	Common Large Monkeyflower	plants					P	P			P
Mimulus pilosus		plants			Not on any status lists		P	P		P	
Myosurus minimus	NA	plants					P			P	
Navarretia fossalis	Spreading Navarretia	plants	Threatened	Special	CRPR - 1B.1	P	P	P		P	P
Numenius americanus	Long-billed Curlew	birds				P				P	P
Numenius phaeopus	Whimbrel	birds				P					
Nycticorax nycticorax	Black-crowned Night-Heron	birds				P	P		P	P	
Orcuttia californica	California Orcutt Grass	plants	Endangered	Endangered	CRPR - 1B.1		P	P			
Oxyura jamaicensis	Ruddy Duck	birds				P	P	P	P	P	P
Paspalum distichum	Joint Paspalum	plants									P
Pelecanus erythrorhynchos	American White Pelican	birds		Special Concern	BSSC - First priority	P	P			P	
Persicaria lapathifolia		plants			Not on any status lists	P				P	P
Phacelia distans	NA	plants				P	P		P	P	P
Phalacrocorax auratus	Double-crested Cormorant	birds				P	P	P	P	P	P
Phalaropus tricolor	Wilson's Phalarope	birds				P	P				
Pilularia americana	NA	plants					P				
Pipilo aberti	Abert's Towhee	birds							P		
Plagiobothrys acanthocarpus	Adobe Popcorn- flower	plants					P				

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Plagiobothrys leptocladus	Alkali Popcorn- flower	plants				P	P	P	P	P	P
Plantago elongate	Slender Plantain	plants				P	P				
Platanus racemose	California Sycamore	plants							P	P	P
Plegadis chihi	White-faced Ibis	birds		Watch list		P	P			P	P
Pluvialis squatarola	Black-bellied Plover	birds				P	P				
Podiceps nigricollis	Eared Grebe	birds				P	P			P	P
Podilymbus Podiceps	Pied-billed Grebe	birds				P	P		P	P	
Porzana Carolina	Sora	birds				P				P	
Pseudacris cadaverina	California Treefrog	Herps			ARSSC	P	P	P	P	P	P
Pseudacris regilla	Northern Pacific Chorus Frog	Herps							P	P	
Psilocarphus brevissimus	Dwarf Woolly-heads	plants					P	P	P		P
Rallus limicola	Virginia Rail	birds				P				P	
Rana draytonii	California Red- legged Frog	Herps	Threatened	Special Concern	ARSSC	P	P		P		
Recurvirostra americana	American Avocet	birds				P	P	P	P	P	P
Riparia riparia	Bank Swallow	birds		Threatened		P				P	
Rorippa curvipes	Rocky Mountain Yellowcress	plants				P					
Rumex conglomeratus	NA	plants				P		P			
Rumex violascens	Violet Dock	plants				P					P
Rynchops niger	Black Skimmer	birds				P					
Salix exigua	Narrowleaf Willow	plants				P			P		P
Salix gooddingii	Goodding's Willow	plants				P	P	P	P		P
Salix laevigata	Polished Willow	plants					P	P		P	P
Salix lasiolepis	Arroyo Willow	plants						P	P	P	P
Setophaga petechia	Yellow Warbler	birds			BSSC -Second priority	P	P	P	P	P	P
Spea hammondii	Western Spadefoot	Herps	Under Review in the Candidate or Petition Process	Special Concern	ARSSC	P	P	P	P	P	P
Streptocephalus woottoni	Riverside Fairy Shrimp	crustaceans	Endangered	Special	IUCN - Endangered			P			
Sympetrum corruptum	Variegated Meadowhawk	insect & other inverts				P		P			
Tachycineta bicolor	Tree Swallow	birds				P	P	P		P	P
Thamnophis hammondii	Two-striped Gartersnake	Herps		Special Concern	ARSSC	P	P	P	P	P	P
Thamnophis sirtalis	Common Gartersnake	Herps				P	P	P	P	P	P
Tringa melanoleuca	Greater Yellowlegs	birds				P	P		P	P	P
Tringa semipalmata	Willet	birds				P					
Tringa solitaria	Solitary Sandpiper	birds				P					
Typha latifolia	Broadleaf Cattail	plants					P				
Veronica catenate	NA	plants			Not on any status lists			P			
Veronica peregrina	NA	plants					P	P			P

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Vireo bellii	Bell's Vireo	birds				P				P	P
Vireo bellii pusillus	Least Bell's Vireo	birds	Endangered	Endangered		P			P	P	
Wolffia columbiana	Columbian Watermeal	plants				P					
Xanthocephalus xanthocephalus	Yellow-headed Blackbird	birds		Special Concern	BSSC - Third priority	P			P	P	

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The natural communities underlying each mapped indicator identified in the NCCCAG dataset were characterized as either GDEs, ecosystems that may be groundwater dependent (potential GDEs), or ecosystems that are not groundwater dependent. Classification of each community was based on a review of local groundwater elevations, lithology, groundwater production, aerial photographs, and satellite data[33]. Because groundwater management in the Hemet-San Jacinto Management Area is overseen by the Hemet-San Jacinto Watermaster, as defined in the Stipulated Judgement Case No. 1207274, characterization of groundwater dependent ecosystems and the associated impacts that groundwater extraction may have on habitat health was limited to the Plan Area. A detailed discussion of the characterization of each of the 107 habitats located in the Plan Area is provided in Appendix J.

2.4.7.1 GDEs

Three vegetation communities located west of MARB and adjacent to the Riverside National Cemetery were classified as GDEs and are likely supported by shallow groundwater (Figure 2-52). These vegetation communities, which range in size from 1.1 to 2.5 acres, consist of both Red Willow (*Salix Laevigata*), which has rooting depths that are documented between two to nine feet (Lite and Stromberg 2005), and Common Elderberry (*Sambucus nigra*), which has an average rooting depth of approximately three feet (Fryer 2008). The Red Willow and Common Elderberry communities located near the Former Camp Haan and MARB BRAC sites are located outside of EMWD's service area. Current groundwater management in this region is led by the Air Force and Air Reserve Base, with oversight from the US EPA and State of California. Groundwater extractions near these habitats are coordinated in an effort to mitigate the migration of contaminated groundwater towards regions of potable aquifer that serve the Basin (see Section 2.1.2 Water Resources Monitoring and Management Programs; AFCEC 2019b).

Groundwater in the vicinity of these communities, measured in conjunction with groundwater remediation activities at Site "Y" at Camp Hann, ranged from six feet to 34 feet below ground surface between 2005 and 2015 (Figure 2-52; ACOE 2015). Willows may become stressed when groundwater levels are deeper than 15 feet bgs (City of San Diego 2013). Groundwater elevations in the vicinity of the vegetation communities has historically varied to be within the rooting depth range at times and below it at times (Figure 2-52).

Because each of these vegetation communities is small (less than 2.5 acres in area), and groundwater elevations in the vicinity of these communities is not always within the traditional rooting depth, the health of these communities is degraded. Additionally, these vegetation

[33] Landsat data was analyzed by The Nature Conservancy to quantify temporal fluctuations in the Normalized Derived Vegetation Index (NDVI) and Normalized Derived Moisture Index (NDMI). TNC calculated NDVI and NDMI for the months of July-September to quantify habitat health during periods where each habitat is most likely to rely on groundwater.

communities do not contain legally protected species and are not considered critical habitat for threatened and endangered species by the U.S. Fish and Wildlife Service[34]. Therefore, the three existing GDEs within the Plan Area are of low ecological value.

2.4.7.2 Potential GDEs and Wetlands

Within the Plan Area, there are 29 mapped vegetation communities identified in the NCCAG dataset that may be groundwater dependent (Figure 2-52). These habitats are largely located along the margins of the Plan Area, within or adjacent to the foothills that surround the SJGB. Dominant species within these habitats include Mule Fat (*Baccharis salicifolia*), California Sycamore (*Platanus racemosa*), Red Willow (*Salix laevigata*), Common Elderberry (*Sambucus nigra*), Scalebroom (*Lepidospartum squamatum*), and Tamarisk (*Tamarix* spp.). Aerial photographs of the areas identified in the NCCAG dataset demonstrate that vegetation currently persists in these areas. With the exception of the large potential GDE mapped in the City of Moreno Valley (labeled X0, Figure 2-52), there are no groundwater elevation measurements collected in the vicinity of these vegetated areas that could be used to identify whether the vegetation relies on groundwater or infiltrating surface water. Lack of groundwater elevation data prohibits characterization of the underlying groundwater conditions. Groundwater is extracted from privately owned wells within 0.5 miles of the potential GDEs in the northern part of the Plan Area (Figure 2-52). However, groundwater extraction rates and static groundwater levels are not reported from these wells. Further characterization of these habitats and their potential groundwater dependence will be warranted if additional groundwater extractions are planned within 0.5 miles of these vegetation communities.

The potential GDE in the City of Moreno Valley (Figure 2-52, labeled X0) consists of approximately 40.5 acres of Mule Fat, California Sycamore, and Red Willow that grow along an unlined drainage channel that conveys surface water runoff to Poorman's Reservoir. Groundwater occurs under perched conditions near this habitat and was most recently measured in October 2015 at depths that range from 42.76 ft. bgs to 27.31 ft. bgs (Geotracker, 2020). Groundwater was monitored near this habitat over a 10-year span as part of a Leaking Underground Storage Cleanup (LUST) project. Throughout the ten years that this site was monitored, groundwater was only encountered once in the principal aquifer that underlies the locally perched conditions (Geotracker, 2020). This habitat was characterized as a potential GDE because the degree of connectivity between the principal aquifer and the locally perched water table is not well constrained.

Future groundwater extractions in the Plan Area are anticipated to cause groundwater elevation declines in this area of Moreno Valley. The projected extraction rates and corresponding groundwater elevation declines are required to ensure operation of the Perris North Groundwater Contamination

[34] Environmental Conservation Online System (ECOS): https://ecos.fws.gov/ecp/report/table/critical-habitat.html

Prevention and Remediation Program, a project designed to protect potable aquifer by containing and remediating co-mingled VOC, nitrate, and perchlorate plumes in the Perris North GMZ.

2.5 WATER BUDGET

This section presents the historical, current, and projected water budget analyses for the SJGB. The historical water budget was prepared for the 28-year period from water year 1985 through water year 2012; the current water budget was prepared for the six-year period from water years 2013 through water year 2018; and the projected water budget was prepared for the 52-year period from water year 2019 to through water year 2070 (23 CCR §354.18 (c) (2) (B)). Water years are defined as October 1 through September 30 of the following year (e.g., the 2018 water year begins October 1, 2017 and ends September 30, 2018). Individual components of the water budget are described in units of acre-feet (AF) or acre-feet per year (AFY).

Estimates of the individual water budget components for the historical conditions in the Basin are based on results from the San Jacinto Flow Model (SJFM-2014) (EMWD 2016b). The SJFM-2014 is a MODFLOW numerical groundwater flow model of the entire SJGB, including the Hemet-San Jacinto Groundwater Management Area (Figure 2-41). The SJFM-2014 represents the SJGB aquifer using three to four model layers that extend vertically from land surface to bedrock. The thickness and lateral extent of each layer was constrained using driller's logs, geophysical logs, well construction information, groundwater elevation data, and groundwater quality data (EMWD 2016b). The multi-layer approach was incorporated to vertically delineate between brackish and fresh-water zones across the SJGB that change with depth and to better represent three-dimensional bedrock relief (EMWD 2016b). The SJFM-2014 simulates groundwater conditions across the Basin assuming that each layer can convert between confined and unconfined conditions based on the simulated groundwater elevations. Although the SJFM-2014 incorporates multiple vertical layers, measured groundwater elevations indicate that the aquifer is only confined locally and that within the SJGB the groundwater aquifer consists of single principal aquifer unit that extends from land surface to bedrock (see Section 2.3.2 Principal Aquifers and Aquitards).

The SJFM-2014 was designed and calibrated to simulate groundwater conditions in the SJGB between January 1, 1984 and December 31, 2012 (EWMD 2016b) and was extended as part of this GSP development to simulate conditions from January 1, 2012 through December 31, 2070. Components of the water budget for the Plan Area, Hemet-San Jacinto Groundwater Management Area, and Basin as a whole were extracted from the model output based on the boundaries of each respective management area. To account for uncertainty in the modeled estimates of water budget components, simulation results from the SJFM-2014 were rounded to the nearest 100 AF.

The SJFM-2014 was developed to simulate historical groundwater conditions throughout the SJGB (EMWD 2016) and updated to simulate current and future conditions in the Plan Area. These updates included incorporating future projects, projected groundwater extractions, projected retail water sales, and future climate conditions (see Section 2.5.6 Quantification of Current, Historical, and Projected Water Budget). Accordingly, water budgets for the current and future conditions in the Plan Area are based on simulation results from SJFM-2014.

Because management of the Hemet-San Jacinto Management Area is overseen by the Hemet-San Jacinto Watermaster, future water budgets for the portion of the SJFM-2014 within the Hemet-San Jacinto Management Area were estimated using a combination of Watermaster reports, SJFM-2014 results, and assumptions regarding climate and hydrology that were applied to the entire basin. Water budgets for the Hemet-San Jacinto Management Area, are prepared annually by the Watermaster (e.g., see EMWD 2019b), as required by the Stipulated Judgement (Case No. RIC 1207274). These reports are submitted to both the court and to DWR under the requirement of CWC §10720.8 for adjudicated areas under SGMA. The Watermaster has prepared six annual reports that characterize annual water supplies, recharge programs, carry-over accounts, and management plan implementation. Additional details on the water budget for the Hemet-San Jacinto Groundwater management Area can be found in the 2018 Hemet-San Jacinto Groundwater Management Area Annual Report (EMWD 2019b).

The SJFM-2014 does not cover the entire spatial extent of the Plan Area (Figure 2-41). The SJFM-2014 covers approximately 80% of the Plan Area and 90% of the Hemet-San Jacinto Management Area. The SJFM-2014 covers approximately 85% of the SJGB. The SJFM-2014 was designed to model the principal aquifer system and characterize groundwater conditions in the nine GMZs in the SJGB (EMWD 2016b). The model area was limited to portions of the aquifer with saturated thicknesses greater than 40 ft at the beginning of the model period. Since development of the SJFM-2014, DWR has updated the extent of the Basin boundary (see Section 1.3 Agency Information). Regions of the Plan Area west and northwest of MARB, along the foothills of the Box Springs Mountains, within the Lake Perris Reservoir, and along the margins of the unincorporated area of Lakeview, City of Menifee, and City of Perris are not directly modeled in the SJFM-2014. The net interaction between areas and groundwater stored within the modeled portions of the Plan Area are accounted for through boundary conditions that were adjusted during model calibration (EMWD 2016b).

Sections 2.5.1 and 2.5.2 provide an overview of the sources of groundwater recharge and discharge in the Basin. These sections also describe the SJFM-2014's representation of the individual recharge/discharge components in the Plan Area and provide estimates of average annual quantities throughout the historical period. Historical changes in the annual volume of groundwater in storage are discussed in Section 2.5.3. The change in annual volume of groundwater in storage from Section 2.5.3 is used in Section 2.5.4 to show that the Plan Area is not in a state of overdraft. The sustainable yield of the Plan Area and the SJGB is estimated in Section 2.5.5. Detailed water budgets that describe surface water availability, recharge, discharge, and corresponding changes in groundwater storage by water year type for the historical, current, and projected conditions in the Plan Area are provided in Section 2.5.6.

2.5.1 Inflows to Groundwater System

The SJGB is recharged via a combination of native and non-native water supplies. Native supplies include the deep percolation of rainfall, infiltration of surface water through local stream channels, and surface runoff from the surrounding mountains. Non-native sources include incidental recharge of recycled water, managed recharge of surface water and imported water, and return flows from the application of retail water sales for agricultural, domestic, and municipal and industrial usages.

The native water supplies to the Basin are primarily derived from precipitation in the San Timoteo Badlands and San Jacinto Mountains, which border the eastern edge of the Basin (Figure 2-15). Precipitation in the San Jacinto Mountains and San Timoteo Badlands has historically averaged approximately 11.4 inches per year (Figure 2-15; Station 124: Moreno Valley East) and 12.5 inches per year (Figure 2-13; Station 186: San Jacinto), respectively (Table 2-4). Precipitation derived from these ranges contributes to surface runoff and subsurface flows that enter the Basin boundaries. Precipitation in the San Jacinto Mountains produces surface water flows that enter the southeastern boundary of the Basin via the San Jacinto River.

Lake Hemet Municipal Water District (LHMWD) and EMWD hold water rights to San Jacinto River water that provide them the ability to divert surface water flows in the Hemet-San Jacinto management area. LHMWD holds pre-1914 water rights for the diversion and storage of surface water from the San Jacinto River and its tributaries. EMWD holds a license to divert up to 5,760 AFY of San Jacinto River water (EMWD 2016). Per the Stipulated Judgement and diversion license No. 10667, EMWD is required to stored diverted San Jacinto River water in the Basin (EMWD 2019b); EMWD achieves this by spreading diverted San Jacinto River water at the Grant Avenue Ponds located in the Valle Vista Area (EMWD 2019b).

In addition to surface water spreading, the Grant Avenue Ponds are used to recharge SWP water imported by EMWD as part of the Soboba Settlement Agreement. Under the Soboba Settlement Agreement MWD will deliver an average of 7,500 AF of SWP water per year to EMWD for 50 years from the date of judgement, June 7, 2006. EMWD has implemented the Physical Solution[35] via recharge of SWP water at the Integrated Recharge and Recovery Ponds (IRRP) and Grant Avenue Ponds. Annual accounting of SWP deliveries, recharge, and carry-over accounts are reported in the Hemet-San Jacinto Groundwater Management Area Annual Reports (e.g., EMWD 2019b).

35 The Physical Solution set forth in the Stipulated Judgement identified the preferred method of accomplishing the Soboba Settlement Agreement requirement as groundwater recharge to the Basin.

The Basin is indirectly recharged via the application of potable and non-potable water supplies for landscaping, agricultural irrigation, and industrial supplies. Potable water is provided throughout the Basin by EMWD, LHMWD, the City of Hemet, the City of San Jacinto, Nuevo Water Company and the City of Perris. EMWD provides non-potable water, in the form of recycled water and imported raw water, to agricultural and industrial consumers for outdoor applications. A portion of the potable and non-potable water supplies utilized for outdoor purposes will infiltrate beyond the root zone, recharging the Basin. EMWD's recycled water reclamation facilities discharge excess treatment water to the Temescal Creek and unlined storage ponds distributed throughout the Basin. A portion of the recycled water stored in unlined ponds evaporates, and the remainder infiltrates into the underlying aquifer, resulting in incidental recharge to the Basin.

The Basin receives additional recharge via underflows of surface water stored in the Lake Perris Reservoir, Diamond Valley Lake, and infiltration of surface water runoff through the unlined portion of the Perris Valley Storm Drain.

Recharge in the Hemet-San Jacinto Management Area via the IRRP and Grant Avenue Ponds indirectly affects groundwater storage in the Plan Area by providing a source of groundwater supply that might otherwise be met by groundwater stored in the Plan Area. The Plan Area and Hemet-San Jacinto management area are in direct hydraulic communication along the jurisdictional boundaries located in the unincorporated area of Winchester and along the intersection of Bridge St. and the Ramona Expressway (Figure 2-2). Groundwater that flows across the management boundary is accounted for as either an inflow or outflow to the Plan Area[36], but does not impact total groundwater storage in the Basin.

A description of each water source, along with average annual budget estimates for the Plan Area, is described in detail below. Average annual estimates for each inflow to the groundwater system are calculated between water years 1985 and 2012. Average annual estimates for each water budget component do not incorporate simulations results from water year 1984 because these data only represent groundwater conditions during the last nine months of the water year. Table 2-16 provides estimates of groundwater inflows to the Plan Area between water years 1984 and 2012.

2.5.1.1 Recharge from Rainfall Infiltration

Rainfall that reaches the ground surface within the Plan Area is either lost to ET, runs-off to storm channels, or infiltrates through the root zone into the underlying aquifer system. Infiltration beyond the root zone, referred to as deep percolation, is a major source of recharge to groundwater in the basin.

[36] Groundwater flows in both directions across the jurisdictional boundary between the Plan Area and Hemet-San Jacinto Management Area, but the net flow is from the Plan Area to the Hemet-San Jacinto Management Area.

The volume of rainfall that reaches groundwater in the Plan Area depends on land surface properties, such as pervious land coverage, soil texture, and plant coverage, as well as climatic conditions, such as temperature, relative humidity, and wind speed. These properties vary across time and location, and their impact on local rates of deep percolation are difficult to measure. Thus, estimates of deep percolation are subject to uncertainty.

Deep percolation of rainfall in the Plan Area was estimated using the SJFM-2014. The SJFM-2014 represents deep percolation using the MODFLOW recharge (RCH) package, which applies a specified flux of deep percolation recharge to the groundwater table through the simulation period.

The rate at which deep percolation recharges groundwater in the SJFM-2014 was estimated using: (1) precipitation measurements collected at the San Jacinto, Lake Perris, Winchester, and Moreno Valley stations (Figure 2-5); (2) land usage data provided by the Riverside County Assessor's Office, the Western Riverside Agriculture Coalition, and EMWD; and (3) soil drainage properties provided by the National Resources Conservation Service. Precipitation measurements were distributed across the computational domain using Theissen Polygons and then multiplied by land usage and soil drainage factors that converted the distributed precipitation values to initial estimates of rainfall that infiltrates beyond the root zone (EMWD 2016b). These initial estimates of deep percolation were adjusted during model calibration (EMWD 2016b). The calibrated estimates of deep percolation are provided in Table 2-16.

The SJFM-2014 estimates that an average of approximately 8,700 AFY of deep percolation recharged the groundwater stored in the Plan Area between water years 1985 and 2012 (Table 2-16). This accounted for approximately 22% of the total average recharge to groundwater in the Plan Area over this time period.

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Table 2-16
Historical Inflows into the Plan Area

Water Year	Water Year Type	Inflows (Acre-Feet)											Total Inflow (AF)
		Return flows from retail water sales			*Reclaimed Ponds*	*Deep percolation of precipitation*	*Stream Leakage*[c]		*Mountain Front Recharge*	*Underflows from HSJ South of San Jacinto River*	*Underflows from HSJ North of San Jacinto River*	*Lake Perris Seepage*	
		Non-agricultural potable water sales[b]	*Agricultural Irrigation*	*Recycled Water Sales*			*Perris Valley Drain*	*San Jacinto River*					
1984[a]	Normal	1,800	1,300	0	900	1,700	200	0	6,100	1,000	200	5,400	**18,600**
1985	Normal	2,000	1,600	200	1,200	7,000	300	0	10,800	1,100	300	7,200	**31,700**
1986	Normal	1,900	1,500	200	1,000	10,100	300	0	12,100	1,200	300	7,200	**35,800**
1987	Normal	2,200	1,500	300	1,000	6,300	300	0	9,800	1,100	300	7,200	**30,000**
1988	Normal	2,500	1,500	400	1,200	9,200	300	0	11,500	1,000	300	7,200	**35,100**
1989	Normal	2,600	1,600	400	1,300	5,900	300	0	9,400	1,100	400	7,200	**30,200**
1990	Dry	3,000	1,400	700	1,500	4,800	300	0	10,200	1,100	300	7,200	**30,500**
1991	Normal	2,700	1,300	700	1,400	9,700	300	0	12,200	1,000	200	7,200	**36,700**
1992	Normal	2,800	1,400	600	1,500	11,600	300	0	13,900	900	100	7,200	**40,300**
1993	Wet	2,800	1,600	800	2,900	20,700	300	100	18,800	900	100	7,200	**56,200**
1994	Normal	2,900	2,000	1,200	3,700	7,800	300	0	10,700	900	300	7,200	**37,000**
1995	Wet	2,900	2,200	800	4,000	15,300	300	100	16,000	900	200	7,200	**49,900**
1996	Dry	3,100	2,400	1,200	4,300	6,300	300	0	9,900	900	200	7,200	**35,800**
1997	Normal	3,200	2,800	1,200	4,600	7,700	300	0	11,500	1,000	300	7,200	**39,800**
1998	Wet	2,800	2,200	900	5,400	15,600	300	100	16,700	1,000	200	7,200	**52,400**
1999	Dry	3,200	2,300	1,200	6,000	4,800	300	0	10,000	1,100	200	7,200	**36,300**
2000	Dry	3,900	2,500	1,300	6,300	6,400	300	0	9,300	800	300	7,200	**38,300**
2001	Normal	3,800	2,100	1,200	6,600	8,000	300	0	10,100	700	300	7,200	**40,300**
2002	Dry	4,100	1,800	1,900	6,900	3,200	300	0	8,100	700	300	7,200	**34,500**
2003	Normal	3,900	1,400	1,200	7,100	12,500	300	0	12,400	700	200	7,200	**46,900**
2004	Dry	4,600	1,400	1,100	7,400	6,700	300	0	9,400	700	200	7,200	**39,000**
2005	Wet	4,400	1,000	1,100	7,500	19,800	300	0	17,200	800	200	7,200	**59,500**
2006	Dry	4,900	1,000	1,200	7,500	5,600	300	0	10,400	900	200	7,200	**39,200**
2007	Dry	4,600	900	1,500	7,500	2,000	300	0	7,700	800	200	7,200	**32,700**
2008	Normal	4,000	800	1,300	7,500	6,800	300	0	11,100	800	200	7,200	**40,000**
2009	Dry	3,700	400	1,400	7,500	5,600	300	0	9,900	800	200	7,200	**37,000**
2010	Normal	3,400	500	1,200	7,500	8,200	300	0	11,300	900	100	7,200	**40,600**
2011	Wet	3,400	400	1,700	7,500	11,600	300	0	13,500	900	100	7,200	**46,600**
2012	Dry	3,600	500	2,100	7,500	5,100	300	0	10,100	800	100	7,200	**37,300**
1985-2012 Average		3,300	1,500	1,000	4,800	8,700	300	0	11,600	900	200	7,200	**39,600**
Dry Water Year Average		3,900	1,500	1,400	6,200	5,100	300	0	9,500	900	200	7,200	**36,100**
Normal Water Year Average		2,900	1,500	800	3,500	8,500	300	0	11,300	1,000	300	7,200	**37,300**
Wet Water Year Average		3,300	1,500	1,100	5,500	16,600	300	100	16,400	900	200	7,200	**52,900**

[a] Results for water year 1984 only represent the last nine months of the water year (e.g., January 1984 through September 1984)
[b] Return flows from EMWD, WMWD, Nuevo Water Company, City of Perris, and Box Springs Water Company sales to customers for non-agricultural irrigation
[c] Results from the SJFM-2014 indicate that surface water conveyed through the Salt Creek flood control channel recharge the Basin upstream of the Plan Area

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2.5.1.2 Mountain Front Recharge

The Plan Area is recharged by local runoff from the adjacent mountains and rainfall that infiltrates into groundwater stored in alluvium that extends outside the Plan Area boundaries (Figure 2-41). Inflows from these two processes to the Plan Area are referred to as mountain front recharge. Mountain front recharge is not gauged and was estimated in the SJFM-2014 using the MODFLOW specified flux well (WEL) package. The MODFLOW WEL package applies a user-defined flux of water to cells located along the model boundaries throughout the simulation period. Initial estimates of mountain front recharge were based on the 2002 San Jacinto Flow and Transport model (EMWD 2002). These initial estimates were adjusted during model calibration.

Regions of the model that extend beyond the Plan Area boundary receive recharge from the adjacent mountains and deep percolation of areal precipitation. The net inflow from these two recharge sources drives groundwater flow into the Plan Area. Inflows from this process are incorporated in the mountain front recharge term presented in Table 2-16. Between water years 1985 and 2012, recharge from regions of the model that extend beyond the Plan Area accounted for an average of approximately 30% of the total mountain front recharge into the Plan Area.

Between water years 1985 and 2012 the SJFM-2014 estimated that mountain front recharge provided an average of approximately 11,600 AFY of recharge to the Plan Area (Table 2-16). This corresponds to approximately 30% of the total recharge to the Plan Area. The majority of this recharge occurred along the eastern boundary of the Plan Area, where runoff from the adjacent San Timoteo Badlands (Figure 2-12) provided an average of 5,000 AFY of recharge to the Plan Area.

2.5.1.3 Recharge from Surface Water Infiltration

Surface water is conveyed through the Plan Area via the San Jacinto River, Perris Valley Storm Drain, and Salt Creek flood control channel (Figure 2-10). The San Jacinto River is unlined throughout the Plan Area and extends from Bridge Street, at the jurisdictional boundary between the Plan Area and the Hemet-San Jacinto Management Area, to Canyon Lake, just west of the Plan Area boundary, near the Perris Valley Airport (Figure 2-5). The Perris Drain conveys surface water runoff through the City of Moreno Valley, MARB, and the City of Perris before discharging into the San Jacinto River (Figure 2-10). The Perris Drain is concrete-lined north of MARB and unlined south of MARB. The Salt Creek flood control channel enters the Plan Area near the intersection of California Highway 79 and Domenigoni Parkway in the unincorporated area of Winchester. The Salt Creek flood control channel is unlined throughout the Plan Area and conveys stormwater from the Cities of Hemet and Menifee to Canyon Lake and the Perris Valley Storm Drain.

Infiltration of surface water through the San Jacinto River and unlined sections of the Perris Drain and Salt Creek to underlying groundwater depends locally on the river stage, hydraulic conductance of the sediments that line the river channels, elevation of the underlying groundwater table, and moisture content of the soils that separate the bottom of the stream channel and groundwater table. These properties vary by location and time; estimates recharge to the groundwater basin from surface water flows are uncertain.

Surface water infiltration through the San Jacinto River and Perris Drain was estimated using the SJFM-2014. This process was simulated in the SJFM-2014 using the MODFLOW stream flow routing (SFR) package. The SFR package simulates flow through an open channel and directly estimates recharge into the underlying aquifer system using pre-defined estimates of streambed conductance and modeled estimates of local stream stage and underlying groundwater elevation. The resulting model estimates of surface water recharge through the San Jacinto River and Perris Valley Drain in the Plan Area are described below and in Table 2-16. Results from the SJFM-2014 indicate that surface water conveyed through the Salt Creek Flood control channel recharges the Basin upstream of the Plan Area.

2.5.1.3.1 San Jacinto River

Between water years 1985 and 2012, the SJFM-2014 estimated surface water infiltration through the San Jacinto River provided that less than 10 AFY of recharge to groundwater in the Plan Area (Table 2-16). This corresponds to less than 1 % of the total average annual recharge to groundwater in the Plan Area.

2.5.1.3.2 Perris Valley Storm Drain

Surface water elevations in the Perris Drain are kept constant in the SJFM-2014. As a result, estimates of surface water recharge through the Perris Drain do not vary annually (Table 2-16). Between water years 1985 and 2012, the SJFM-2014 estimated that approximately 300 AFY of surface water infiltrated through the Perris Drain, recharging groundwater in the Plan Area. This accounted for approximately 1% of the total recharge to groundwater in the Plan Area.

2.5.1.4 Subsurface Inflows from Hemet-San Jacinto

Groundwater in the Plan Area is in direct hydraulic communication with the adjudicated portion of the SJGB. The Plan Area and Hemet-San Jacinto Management Area are hydraulically connected along Bridge Street near the unincorporated area of Nuevo/Lakeview, and just east of Highway 79 in the unincorporated area of Winchester (Figure 2-2).

Groundwater inflows from the Hemet-San Jacinto Management Area were estimated using the SJFM-2014. Between water years 1985 and 2012, the SJFM-2014 estimated that an average of approximately 1,100 AFY of groundwater flowed into the Plan Area from the Hemet-San Jacinto Management Area (Table 2-16).

An average of approximately 900 AFY of groundwater flows into the Plan Area along the northern boundary between the Hemet San-Jacinto Management Area and the Plan Area. Of this 900 AFY, approximately 700 AFY enters the Plan Area along the portion of the boundary that is south of the San Jacinto River, and the other 200 AFY enters the Plan Area along the portion of the boundary that is north of the San Jacinto River. Additionally, an average of approximately 200 AFY of groundwater flows into the Plan Area along the southern border between the Plan Area and the Hemet-San Jacinto Management Area.

2.5.1.5 Retail Water Sales

EMWD, WMWD, Nuevo Water Company, City of Perris, and Box Springs Mutual Water Company sell imported water, locally pumped groundwater, and recycled water to customers in the Plan Area as potable and non-potable supplies. A portion of these retail water sales are used for outdoor purposes, such as landscape irrigation, industrial processing, and agricultural irrigation. Water used for outdoor purposes that does not runoff and is unutilized by ET will infiltrate below the root zone and recharge groundwater in the Plan Area.

Imported water supplies consist of CRA and SWP water that is purchased by EMWD and either served to local customers or sold wholesale to Nuevo Water Company, City of Perris Water Department, and Box Springs Mutual Water Company. A description of CRA and SWP availability between water years 2007 and 2018 is provided in Section 2.1.1.2, Water Agencies Relevant to the Plan Area.

Recycled water supplies consist of tertiary treated water produced at the EMWD-operated Moreno Valley Regional Water Reclamation Facility (RWRF), Perris Valley RWRF, San Jacinto Valley RWRF, and Temecula Valley RWRF (Figures 2-4 and 2-15). The four RWRFs have a combined total treatment capacity of 81,800 AFY. EMWD serves a portion of the produced tertiary treated water to local customers for landscape irrigation and industrial processing water. Treated water that is not served to local customers is either discharged to the Temescal Creek or delivered to unlined storage ponds that provide additional source of incidental recharge to the groundwater basin. Table 2-17 tabulates the total volume of water treated at each RWRF, and the total volume of water served to customers.

Groundwater is extracted from the Plan Area by municipal suppliers and agricultural users. Total groundwater extractions by water use sector is described in Section 2.5.2.2.

Estimates of groundwater recharge resulting from retail water sales to customers for residential, industrial, and agricultural usage of locally pumped groundwater, imported water, and recycled water were computed using the SJFM-2014. The SJFM-2014 assumed that approximately 75% of all water sales were used for outdoor applications. This volume of water was then converted to local estimates of return flows by multiplying the local sale volume by percolation factors generated using local land usage and soil drainage properties (see discussion of methodology in Section 2.5.1.1 for estimating deep percolation of precipitation). As with the estimates of precipitation recharge, the initial estimates of applied water return flows generated using this approach were adjusted during model calibration.

Table 2-16 tabulates the total volume of return flows that recharged the basin throughout the historical period. These return flows are broken down by water usage for non-agricultural supplies, agricultural supplies, and recycled water supplies.

Table 2-17
Recycled water production and use in the San Jacinto Basin

Water Year	Recycled Water Produced at RWRFs and used for Non-potable Use in the Basin					Recycled Water used for Agriculture and Landscaping in the Basin		
	Moreno Valley RWRF	*Perris Valley RWRF*	*San Jacinto Valley RWRF*	*Temecula Valley RWRF*	*Total*	*HSJ*	*Plan Area*	*SJ Basin*
2013[a]	7,379	11,031	13,913	14,710	47,033	13,551	37,266	50,817
2014	7,461	11,568	13,449	14,680	47,158	18,439	50,991	69,430
2015	7,572	11,270	12,654	14,415	45,912	16,862	46,622	63,484
2016	7,800	11,171	12,163	14,054	45,187	20,093	46,094	66,187
2017	8,179	11,073	12,743	14,614	46,609	17,069	44,158	61,228
2018	8,328	10,928	12,724	14,082	46,062	19,527	44,114	63,641
2019[b]	2,116	2,795	3,089	3,599	11,599	3,356	10,627	13,983

[a] Data does not represent entire water year usage. Data represents usage between Jan. 2013 and Sept. 2013

[a] Data does not represent entire water year usage. Data represents usage between Oct. 2018 and Dec. 2018

2.5.1.5.1 Recharge of Non-Agricultural Potable Water Supplies

Recharge from non-agricultural usage of potable water supplies include agricultural and municipal uses of imported water and locally pumped groundwater. Between water years 1985 and 2012, the SJFM-2014 estimates that an average of approximately 3,300 AFY of retail potable water supplies recharged the Plan Area as a result of non-agricultural outdoor water usage. This accounts for approximately 8% of the total average annual recharge to the Plan Area (Table 2-16).

Recharge from non-agricultural usage of imported water and groundwater increased by approximately 80% between 1985 and 2012. In water year 1985, this source of water provided approximately 2,000 AF of recharge to groundwater in the Plan Area, while in 2012, it provided approximately 3,600 AF of recharge to the Plan Area. The SJFM-2014 estimates that groundwater recharge from non-agricultural usage of imported water and groundwater was highest in 2006, where non-agricultural supplies provided approximately 4,900 AF of recharge to the basin.

2.5.1.5.2 Recharge from Agricultural Irrigation

A combination of potable, raw water, and recycled water is used for agricultural irrigation in the Plan Area. Recharge to the Plan Area from agricultural irrigation has varied throughout the historical period and have provided up to 7% of the total recharge to the Plan Area (Table 2-16).

In water year 1985, approximately 1,600 AF of agricultural return flows recharged the Plan Area (Table 2-16). This corresponded to approximately 5% of the total recharge to the Plan Area. Recharge from agricultural return flows increased between 1984 and 1997; in water year 1997 the SJFM-2014 estimates that approximately 2,800 AF of agricultural return flows recharged the Plan Area. The 2,800 AF of recharge from agricultural irrigation accounted for approximately 7% of the total recharge to the Plan Area. Recharge from agricultural irrigation has decreased since 1997 due to a reduction of irrigated acreage in the Plan Area. In water year 2012, the SJFM-2014 estimates that approximately 500 AF of agricultural return flows recharged the basin corresponding to approximately 1% of the total recharge to the Plan Area.

2.5.1.5.3 Recharge from Recycled Water Supplies

The SJFM-2014 estimates that usage of recycled water for landscape irrigation and industrial supplies provided an average of approximately 1,000 AFY of recharge to the Plan Area between water years 1985 and 2012 (Table 2-16). Recharge from municipal and industrial usage of recycled water increased between 1984 and 2012. In water year 1985, the SJFM-2014 estimates that approximately 200 AF of recycled water recharged the basin. In water year 2012, the SJFM-2014 estimates that approximately 2,100 AF of recycled water recharged the Plan Area. In water year 2012, recharge from recycled water supply corresponded to approximately 6% of the total recharge to the Plan Area.

2.5.1.6 Incidental Recharge from Recycled Water Storage

Reclaimed water that is not sold to customers for landscape irrigation and industrial supplies or discharged to Temescal Creek is delivered to unlined storage ponds located in the cities of Perris, Moreno Valley, Menifee, San Jacinto, and unincorporated areas of Nuevo/Lakeview and Winchester. The incidental recharge that results from seepage of recycled water through the unlined storage ponds was estimated using the SJFM-2014, which simulates seepage using the MODFLOW recharge (RCH) package. The MODFLOW recharge package applies a user-specified flux of water to the groundwater table throughout the simulation. Initial estimates of the user-specified recharge rate were based on historical knowledge and operations of the ponds located within the Plan Area and are provided in Table 2-18 (EMWD 2016b). Each recharge rate was multiplied by the ratio of the actual pond area to modeled pond area in order to account for the effects of the spatial discretization of the model when simulating recharge through each pond.

Table 2-18
Recycled Water Storage Ponds in the San Jacinto Basin

Pond Name	Location	Management Area	Total Pond Size [Acres]	Water Source	Operation Period[b] (Months/Year)	Model Area Factor[c]	Recharge Rate [ft/day]	Recharge Rate [AFD]
Alessandro	City of San Jacinto	Hemet San Jacinto Watermaster	27	San Jacinto Valley RWRF	9	0.33	0.01	0.3
Case Road	City of Perris	Plan Area	22	Perris Valley RWRF	9	0.42	0.1	2.2
Landmark	City of Moreno Valley	Plan Area	2	Moreno Valley RWRF	9	1	0.075	0.1
Moreno Valley RWRF	City of Moreno Valley	Plan Area	57	Moreno Valley RWRF	9	0.39	0.075	4.3
North Trumble Road	City of Perris	Plan Area	27	All	9	0.44	0.1	2.7
Perris Valley RWRF	City of Perris	Plan Area	18	Perris Valley RWRF	9	0.39	0.025	0.4
San Jacinto Valley RWRF	City of San Jacinto	Hemet San Jacinto Watermaster	78	San Jacinto Valley RWRF	9	0.45	0.01	0.8
Skiland North	Nuevo	Plan Area	38	All	6	0.53	0.2	7.7
Skiland South	Nuevo	Plan Area	55	All	6	0.53	0.2	10.9
Sun City RWRF[a]	City of Menifee	Plan Area	68	All	9	0.47	0.06	4.1
Trumble Road	City of Perris	Plan Area	25	All	9	0.44	0.1	2.5
Watson Road	City of Perris	Plan Area	9	Perris Valley RWRF	9	0.25	0.075	0.7
Wetlands	City of San Jacinto	Hemet San Jacinto Watermaster	25	San Jacinto Valley RWRF	9	0.44	0.075	1.9
Winchester Pond A	Winchester	Plan Area	43	All	9	0.51	0.035	1.5
Winchester Pond B	Winchester	Plan Area	35	All	9	0.65	0.035	1.2
Winchester Pond C	Winchester	Plan Area	24	All	9	0.61	0.035	0.8

[a] Less than 2 acres of the Sun City RWRF ponds lies within the Plan Area boundary. The remainder lies outside the Plan Area and SJGWB B118 Boundary
[b] Represents the months that recharge is actively applied in the model, not actual operational conditions at each recycled water storage pond
[c] Ratio of the actual pond area to modeled pond area to account for the effects of model discretization

There are limited data characterizing pond operations prior to 1993 (EMWD 2016b). To account for the lack of operational information, a recharge rate adjustment factor was applied in the SJFM-2014 for all ponds within the Plan Area between 1984 and 1993. The recharge rate adjustment factor was generated by calculating the percentage of EMWD water sales in a given calendar year compared to the total volume of EMWD water sales in 1993. For example, in years where EMWD water sales were less than the 1993 water sales, a recharge factor of less than 1 would be multiplied to the recharge rates specified for each storage pond.

Incidental recharge of reclaimed water through the unlined storage ponds increased between water years 1985 and 2012. The SJFM-2014 estimates that an average of approximately 4,800 AFY of recycled water recharged the Plan Area via incidental recharge over this time period (Table 2-16). The magnitude and location of these recharge sources has changed throughout historical management of the Plan Area.

Between 1985 and 1993, there was approximately 300 AFY of incidental recharge of recycled water via seepage through the Trumble Roads pond and Sun City RWRF. During the same time period, incidental recharge from the Moreno Valley RWRF storage ponds increased from approximately 700 AFY to approximately 1,100 AFY. The SJFM-2014 estimates that incidental recharge from the Moreno Valley RWRF has remained constant since water year 1993.

Starting in water year 1993, incidental recharge to the Plan Area increased in response to increasing treatment capacity at the Perris Valley RWRF (EMWD 2020) and construction of the Perris Valley RWRF pond, Skiland North and South ponds, Winchester ponds, Watson pond, and Case Road pond. The construction of these ponds and expanded treatment capacity of the Perris Valley RWRF increased incidental recharge in the City of Perris, city of Menifee, and unincorporated areas of Nuevo and Winchester from approximately 1,700 AFY in water year 1993 to approximately 6,400 AFY by water year 2005. Incidental recharge from these sources has remained constant since 2005.

Total incidental recharge of recycled water to the Plan Area increased from approximately 1,200 AFY in water year 1985 to approximately 7,500 AFY in water year 2012.

2.5.1.7 Underflows from Lake Perris

Surface water stored in the Lake Perris reservoir is naturally contained by the bedrock outcrops on the north, east, and south, and by the Perris Dam on the west side of the reservoir. Surface water elevations in Lake Perris are higher than groundwater elevations in the adjacent groundwater aquifer, which causes surface water to flow under the Perris Dam into the San Jacinto Groundwater Basin.

Groundwater recharge via underflows of Lake Perris SWP water was simulated using the SJFM-2014, which represents these underflows using the MODFLOW specified flux well (WEL) package. The MODFLOW well package applies a user-defined recharge rate to specified cells throughout the simulation period.

The SJFM-2014 simulates approximately 7,200 AFY of SWP water underflows below the Perris Dam (SWRCB 2009). Toe drains located along the downstream side of the Dam removed 3,400 AFY of these underflows throughout the historical period. Removing the 3,400 AF of toe drain extractions yields a net recharge of approximately 3,800 AFY. The SJFM-2014 estimates that these underflows are constant throughout the historical period (Table 2-16).

2.5.2 Outflows from Groundwater System

The SJGB is a closed basin with no subsurface outflows to adjacent groundwater basins or surface water bodies. Groundwater outflows in the Basin consist solely of ET losses from shallow groundwater and groundwater extractions. Groundwater losses due to ET are not explicitly measured or modeled using the SJFM-2014. However, these losses were implicitly accounted for during development of the SJFM-2014 and calibration of the percolation factors used to convert applied water volumes, precipitation, and recycled water storage volumes to estimates of groundwater recharge.

Groundwater is extracted from the Basin to meet agricultural, municipal, and domestic water demands. Municipal extractions also serve to mitigate the migration of low-quality groundwater into areas of potable aquifer. The use of locally extracted groundwater for domestic, industrial, and agricultural supplies results in recharge to the groundwater basin (see Section 2.5.1.5 Retail Water Sales for discussion of return flow estimates).

Groundwater exchange between the Plan Area and Hemet-San Jacinto Management Area results in a net outflow of groundwater from the Plan Area (see Section 2.5.1 Inflow to Groundwater System). This net interaction is accounted for in the water budgets for the individual management areas but does not affect groundwater storage in the Basin as a whole.

2.5.2.1 Groundwater Extractions

The Plan Area contains 54 active extraction wells, 41 of which produced groundwater in water year 2012. Of these, 26 were used for agricultural purposes and 15 were used for municipal supply. Table 2-19 summarizes historical groundwater extractions in the Plan Area, as represented in the SJFM-2014 model. The total groundwater extractions were separated into agricultural, municipal, and unknown usage sectors extractions using EMWD's most recent characterization of water usage by well in the Plan Area (Table 2-19).

Table 2-19
Historical Groundwater Outflows from the Plan Area

Water Year	Water Year Type	Outflows (Acre Feet)							Total Outflow (AF)
		Groundwater Extractions[b]				*Lake Perris Seepage Recovery*	*Underflows from HSJ North of San Jacinto River*	*Underflows from HSJ South of San Jacinto River*	
		Agricultural	*Municipal*	*Unknown Usage Sector*	*Total Groundwater Extractions*	*Toe Drains*			
1984[a]	Normal	9,400	1,700	300	11,400	3,400	2,400	200	**17,400**
1985	Normal	11,700	2,000	300	14,000	3,400	3,300	100	**20,800**
1986	Normal	9,900	1,500	300	11,700	3,400	3,100	200	**18,400**
1987	Normal	9,600	2,300	300	12,200	3,400	3,000	300	**18,900**
1988	Normal	10,300	2,200	300	12,800	3,400	3,000	100	**19,300**
1989	Normal	11,600	2,300	300	14,200	3,400	2,800	200	**20,600**
1990	Dry	10,900	2,300	200	13,400	3,400	2,800	200	**19,800**
1991	Normal	9,300	2,000	100	11,400	3,400	2,800	200	**17,800**
1992	Normal	10,800	2,300	100	13,200	3,400	2,800	200	**19,600**
1993	Wet	11,900	2,300	100	14,300	3,400	2,900	200	**20,800**
1994	Normal	12,100	2,200	100	14,400	3,400	3,100	200	**21,100**
1995	Wet	15,000	2,500	100	17,600	3,400	3,500	200	**24,700**
1996	Dry	16,500	3,800	0	20,300	3,400	3,700	200	**27,600**
1997	Normal	20,100	4,300	100	24,500	3,400	4,100	200	**32,200**
1998	Wet	14,300	3,500	0	17,800	3,400	4,000	200	**25,400**
1999	Dry	16,600	4,300	0	20,900	3,400	4,100	200	**28,600**
2000	Dry	17,500	4,700	100	22,300	3,400	4,100	100	**29,900**
2001	Normal	13,900	4,500	0	18,400	3,400	4,400	0	**26,200**
2002	Dry	14,300	4,600	0	18,900	3,400	4,400	0	**26,700**
2003	Normal	10,800	5,400	0	16,200	3,400	4,300	0	**23,900**
2004	Dry	10,400	7,000	0	17,400	3,400	4,300	0	**25,100**
2005	Wet	7,500	5,800	0	13,300	3,400	4,200	0	**20,900**

Table 2-19
Historical Groundwater Outflows from the Plan Area

Water Year	Water Year Type	Outflows (Acre Feet)							Total Outflow (AF)
		Groundwater Extractions[b]				*Lake Perris Seepage Recovery*	*Underflows from HSJ North of San Jacinto River*	*Underflows from HSJ South of San Jacinto River*	
		Agricultural	*Municipal*	*Unknown Usage Sector*	*Total Groundwater Extractions*	*Toe Drains*			
2006	Dry	8,500	11,800	0	20,300	3,400	4,200	0	**27,900**
2007	Dry	7,700	13,500	0	21,200	3,400	4,400	0	**29,000**
2008	Normal	6,500	11,500	0	18,000	3,400	4,500	0	**25,900**
2009	Dry	3,600	13,000	0	16,600	3,400	4,300	0	**24,300**
2010	Normal	5,000	12,700	0	17,700	3,400	4,100	0	**25,200**
2011	Wet	6,300	12,400	0	18,700	3,400	4,000	0	**26,100**
2012	Dry	5,800	13,000	0	18,800	3,400	4,100	0	**26,300**
1985-2012 Average		11,000	5,700	100	16,800	3,400	3,700	100	**24,000**
Dry Water Year Average		11,200	7,800	0	19,000	3,400	4,000	100	**26,500**
Normal Water Year Average		10,900	4,200	100	15,300	3,400	3,500	100	**22,300**
Wet Water Year Average		11,000	5,300	0	16,300	3,400	3,700	100	**23,600**

[a] Results for water year 1984 only represent the last nine months of the water year (e.g., January 1984 through September 1984)
[b] Groundwater extractions represent pumping in the SJFM-2014, not total pumping in the Plan Area. Discrepancies between modeled and estimated total pumping is described in Section 2.5.2.1 Groundwater Extractions

The SJFM-2014 groundwater extractions in the Plan Area averaged approximately 16,800 AFY (Table 2-19). This is approximately 700 AFY less than EMWD's recordation of groundwater production in the Plan Area throughout the historical period. This discrepancy is largely due to the SJFM-2014's spatial extent in the City of Menifee and on the eastern side of the Bernasconi Hills. In these areas, three wells that are part of EMWD's recordation program are outside of the model domain but remain in the Plan Area boundary. These three wells extract a combined average of approximately 450 AFY throughout the historical record. The remaining discrepancy of approximately 250 AFY is attributed to estimates of private well extractions that were adjusted during calibration. Adjustments to the private well extraction rates were within the uncertainty of the original estimates and do not impact regional groundwater flow in the model.

Between water years 1985 and 2012, agricultural extractions of groundwater accounted for approximately 65% of total groundwater production in the Plan Area (Table 2-19). Agricultural extractions were largest in water year 1997. During this water year, agricultural producers extracted approximately 20,100 AF of groundwater. This accounted for approximately 80% of total groundwater production in the corresponding water year. Agricultural extractions have declined since 1997. In water year 2012, approximately 5,800 AF of groundwater was extracted for agricultural supplies. This corresponded to approximately 30% of the overall groundwater extractions in the Plan Area in water year 2012 (Table 2-19).

Municipal groundwater extractions increased throughout the historical period. Between water years 1985 and 2001, municipal extractions averaged approximately 2,900 AFY, which accounted for approximately 17% of the total extractions in the Plan Area. In water year 2002, EMWD began operation of their desalination program[37], which extracts brackish groundwater from the Cities of Perris and Menifee as a source of municipal supply.

Operation of the desalination program expanded from a single desalter well (EMWD 75 Salt Creek) in 2002, to the current operation of 14 desalter wells distributed across the Cities of Menifee and Perris and extending into the unincorporated area of Nuevo. Between water years 2002 and 2012, extractions from the desalter wells increased from approximately 300 AFY to approximately 7,000 AFY. During this period total municipal extractions increased from approximately 4,600 AFY to approximately 13,000 AFY (Table 2-19). In water year 2012, operations of the EMWD desalter wells accounted for approximately 50% of total municipal extractions in the Plan Area, and municipal extractions accounted for approximately 70% of the total groundwater extractions from the Plan Area.

[37] EMWD's Desalination Program produces brackish groundwater from the cities of Perris and Menifee. Currently, brackish groundwater is sent to two reverse osmosis desalters that treat approximately 8 MGD. A third desalter is currently under construction and is expected to expand EMWD's desalination capacity by 5.4 MGD.

Groundwater extractions to unknown usage sectors accounted for approximately 2% of the total groundwater extractions in the Plan Area between water years 1985 and 2001 (Table 2-19). Since water year 2002, all reported groundwater extractions have been categorized by EMWD as either municipal or agricultural supplies (Table 2-19).

2.5.2.2 Subsurface Outflows to Hemet-San Jacinto

Groundwater outflows to the Hemet-San Jacinto Management Area were modeled using the SJFM-2014. The SJFM-2014 estimates that an average of approximately 3,800 AFY of groundwater flows out of the Plan Area into the Hemet-San Jacinto Management Area[38] (Table 2-19).

An average of approximately 100 AFY of groundwater flows out of the Plan Area south of the San Jacinto River along the jurisdictional boundary at Bridge Street. An average of approximately 3,700 AFY of groundwater flows out of the Plan Area north of the San Jacinto River along the jurisdictional boundary at Bridge Street. An average of less than 10 AFY of groundwater flows out of the Plan Area along the jurisdictional boundary between the Plan Area and the Hemet-San Jacinto Management Area in the unincorporated area of Winchester.

2.5.3 Change in Annual Volume of Groundwater in Storage

Historical change in groundwater storage in the Basin were estimated using the SJFM-2014. Estimates of the changes in groundwater in storage for the Plan Area and Hemet-San Jacinto Management Area were extracted from the SJFM-2014 model results using the jurisdictional boundaries shown in Figure 2-2. Because the SJFM-2014 simulation starts part way through water year 1984 (e.g., in January 1984), the average annual storage change estimates reported below represent averages computed between water years 1985 and 2012.

2.5.3.1 Characterization of Water Year Type

Water year type was characterized using total water year precipitation measured at the Lake Perris rain gauge (station ID: 151). This gauge is located at the border of the Perris North groundwater management zone and Lake Perris (Figure 2-5). Water year type is separated into three different categories: dry, normal, and wet. Table 2-20 presents the water year type categorization criterion in terms of percentage of average annual water year precipitation and corresponding rainfall (in inches) measured at the Lake Perris rain gauge.

[38] Groundwater flows both into and out of the Plan Area along the jurisdictional boundary between the Plan Area and Hemet-San Jacinto Management Area. The interaction between groundwater stored in both management areas results in a net outflow of groundwater from the Plan Area to the Hemet-San Jacinto Management Area.

Table 2-20
Water Year Type

Water Year Type	% of Average Annual Water Year Precipitation[1]	Measured Precipitation [in/Yr.]
Dry	Less than 70%	Less than 6.5
Normal	Between 70 and 125%	Between 6.5 and 11.5
Wet	Greater than 125%	More than 11.5

1 Precipitation measured at the Lake Perris Gauge (ID 151 - Lake Perris)

2.5.3.2 Change in Annual Volume of Groundwater in Storage

The SJFM-2014 was used to estimate annual change in groundwater in storage between water years 1984 and 2012. Between water years 1985 and 2012, the SJFM-2014 estimates that groundwater in storage in the Plan Area increased by an average annual rate of approximately 15,600 AFY (Table 2-21).

Table 2-21
Historical Water Budget for the Plan Area

Water Year	Water Year Type	Historical Water Budget			Cumulative Change in Storage
		Total Inflow	*Total Outflow*	*Change in Storage*	
1984[a]	Normal	18,600	17,400	1,200	**1,200**
1985	Normal	31,700	20,800	10,900	**12,100**
1986	Normal	35,800	18,400	17,400	**29,500**
1987	Normal	30,000	18,900	11,100	**40,600**
1988	Normal	35,100	19,300	15,800	**56,400**
1989	Normal	30,200	20,600	9,600	**66,000**
1990	Dry	30,500	19,800	10,700	**76,700**
1991	Normal	36,700	17,800	18,900	**95,600**
1992	Normal	40,300	19,600	20,700	**116,300**
1993	Wet	56,200	20,800	35,400	**151,700**
1994	Normal	37,000	21,100	15,900	**167,600**
1995	Wet	49,900	24,700	25,200	**192,800**
1996	Dry	35,800	27,600	8,200	**201,000**
1997	Normal	39,800	32,200	7,600	**208,600**
1998	Wet	52,400	25,400	27,000	**235,600**
1999	Dry	36,300	28,600	7,700	**243,300**
2000	Dry	38,300	29,900	8,400	**251,700**
2001	Normal	40,300	26,200	14,100	**265,800**
2002	Dry	34,500	26,700	7,800	**273,600**
2003	Normal	46,900	23,900	23,000	**296,600**
2004	Dry	39,000	25,100	13,900	**310,500**

Table 2-21
Historical Water Budget for the Plan Area

Water Year	Water Year Type	Historical Water Budget			Cumulative Change in Storage
		Total Inflow	*Total Outflow*	*Change in Storage*	
2005	Wet	59,500	20,900	38,600	**349,100**
2006	Dry	39,200	27,900	11,300	**360,400**
2007	Dry	32,700	29,000	3,700	**364,100**
2008	Normal	40,000	25,900	14,100	**378,200**
2009	Dry	37,000	24,300	12,700	**390,900**
2010	Normal	40,600	25,200	15,400	**406,300**
2011	Wet	46,600	26,100	20,500	**426,800**
2012	Dry	37,300	26,300	11,000	**437,800**
1985-2012 Average		39,600	24,000	15,600	
Dry Water Year Average		36,100	26,500	9,500	
Normal Water Year Average		37,300	22,300	15,000	
Wet Water Year Average		52,900	23,600	29,300	

[a] Results for water year 1984 only represent the last nine months of the water year (e.g., January 1984 through September 1984)

Between water years 1985 and 2012, 10 years were characterized as dry water years, 13 years were characterized as normal water years, and 5 years were characterized as wet water years. Dry water years between 1985 and 2012 included: 1990, 1996, 1999, 2000, 2002, 2004, 2006, 2007, 2009, and 2012. Normal water years between 1985 and 2012 included: 1985, 1986, 1987, 1988, 1989, 1991, 1992, 1994, 1997, 2001, 2003, 2008, and 2010. Wet water years between 1985 and 2012 included: 1993, 1995, 1998, 2005, and 2011.

During dry water years, the SJFM-2014 estimates that groundwater in storage increased by an average of approximately 9,500 AFY and ranged between an increase of approximately 3,700 AFY in 2007 and approximately 13,900 AFY in 2004.

During normal water years the SJFM-2014 estimates that groundwater in storage increased by an average of approximately 15,000 AFY and ranged between an increase of approximately 7,600 AFY in 1997 and 23,000 AFY in 2003.

During wet water years the SJFM-2014 estimates that groundwater in storage increased by an average of approximately 29,300 AFY and ranged between an increase of 20,500 AFY in 2011 and 38,600 AFY in 2005.

2.5.4 Quantification of Overdraft

DWR has designated the SJGB as a high-priority basin. The GSP Emergency Regulations require that the water budget "include a quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions" if the Basin is found to be experiencing overdraft (23 CCR 354.18, Water Budget). Groundwater overdraft is defined in DWR Bulletin 118 as:

> *"…the condition of a groundwater basin or subbasin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years, during which the water supply conditions approximate average conditions. Overdraft can be characterized by groundwater levels that decline over a period of years and never fully recover, even in wet years"* (DWR 2003).

The increasing annual change in storage in the Plan Area estimated with the SJFM-2014 and rising water levels observed throughout the Plan Area indicate that the Plan Area is not in overdraft (see Sections 2.4.1 Groundwater Elevation Data, 2.4.2 Estimated Change in Storage, and 2.5.3 Change in Annual Volume of Groundwater in Storage; Appendix H).

The Hemet-San Jacinto groundwater management area was entered into the Stipulated Judgement Case No. RIC 1202724 on April 18, 2013 in response to groundwater overdraft within the Hemet-San Jacinto Management Area. The Stipulated Judgement estimated that the Hemet-San Jacinto groundwater management area was experiencing an overdraft of approximately 10,000 AFY. The Watermaster for the Hemet-San Jacinto Groundwater Management Area was created in April 2013. The Watermaster oversees implementation of the Stipulated Judgement and is the decision-making body for the Hemet-San Jacinto Management Area.

2.5.5 Sustainable Yield Estimate

Each Plan is required to use the water budget to develop an estimate of the sustainable yield (23 CCR 354.18(b)(7)). SGMA defines the sustainable yield of the Basin as, "the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing undesirable results" (CWC §10721 (w)).

The historical sustainable yield was estimated for the Plan Area using the SJFM-2014 simulation results for water years 1985 to 2012. During this period, average annual outflow from the Plan Area was` approximately 24,000 AFY (Table 2-19). Approximately 20,200 AFY of the outflow was from groundwater extractions (both groundwater production and extractions from the toe drains west of the Perris Dam) and the other approximately 3,800 AFY of the outflows was subsurface flow from the Plan Area into the Hemet-San Jacinto Management Area. This 3,800 AFY is accounted for as inflow to the Hemet-San Jacinto Management Area in the Stipulated

Judgement. Over the same time period, the Plan Area experienced an average annual increase of groundwater in storage of approximately 15,600 AFY (Table 2-21). The historical sustainable yield for the Plan Area was estimated by adding the average annual storage increase to the historical groundwater production rate, which results in an estimated historical sustainable yield of approximately 35,800 AFY. However, under SGMA, the true sustainable yield of the SJGB depends not only on the water balance, but also on potential impacts to sustainability indicators. Further discussion of the sustainable yield under future conditions, the sustainability indicators, and the sustainable management criteria is provided in Chapter 3. Future operations of the Plan Area will consider significant and unreasonable loss of storage, related to groundwater elevations, along with significant and unreasonable degradation of water quality related to groundwater extraction, significant and unreasonable groundwater extraction-induced subsidence, and significant and unreasonable loss of groundwater dependent ecosystem habitat.

The safe yield of the Hemet-San Jacinto Management Area was estimated to be between 40,000 AFY and 45,000 AFY (Stipulated Judgement Case No. 1207274).

2.5.6 Quantification of Current, Historical, and Projected Water Budget

Each GSP is required to include an accounting of the total annual volume of surface water and groundwater entering and leaving the basin during historical, current, and projected conditions (23 CCR 354.18). Historical conditions for the Plan Area were defined using data for the period between water years 1985 and 2012. Current conditions for the Plan Area were defined using data for the period between 2013 and 2018. The projected water budgets were prepared for 52-year period from water year 2019 through water year 2070. The historical, current, and projected future baseline water budgets for the Plan Area, the Hemet-San Jacinto Management Area, and the SJGB are presented in Figures 2-53 through 2-55. Descriptions of the historical, current, and projected water budgets are provided in Sections 2.5.6.1, 2.5.6.2, and 2.5.6.3.

2.5.6.1 Historical Water Budget

Between water years 1985 and 2012, 13 years were characterized as normal water years, 10 years were characterized as dry water years, and five years were characterized as wet water years (see Sections 2.5.3.1 Characterization of Water Year Type and 2.5.3.2 Change in Annual Volume of Groundwater in Storage).

Historical Availability and Reliability of Surface Water Supply for Deliveries (23 CCR 354.18(c) 2(a))

Between 2007 and 2012, EMWD imported an average of approximately 57,200 AFY for agricultural irrigation and domestic supplies (Table 2-22). This water is delivered in both the Plan Area and Hemet-San Jacinto Management Area.

Table 2-22
Historical Supply of Imported Water to the Basin

Connection ID	EM-01A	EM-04A	EM-04B	EM-14	EM12A	EM22	EM23	WMWD EM to WR Transfer	EM-14	Total Imported Water Supplies
	Untreated Domestic	*Untreated Domestic*	*Untreated Domestic*	*Untreated Domestic*	*Treated Domestic*	*Untreated Domestic*	*Treated Domestic*	*Treated Domestic*	*Replenishment*	
Water Year	*Dairies*	*PWFP*	*PWFP2*	*HWFP,Ag,LHMWD*	*Mills plant*	*Ramona Express*	*Cactus*	*EM-12A*	*Replenishment*	
2007		955	6,264	10,963	41,682			290		60,153
2008	128	868	12,401	7,345	43,644			703		65,089
2009	449	3,646	6,773	7,529	34,353	1,247	1,688	375		56,060
2010	387	3,267	312	5,893	30,987	8,896	4,033	20		53,794
2011	475	163	894	5,067	31,675	11,083	3,561	0		52,918
2012	412	0	1,251	9,148	33,179	11,432	5,993	130		61,546
2013	559	0	1,381	18,220	33,077	12,551	4,291	0		70,079
2014	672	918	9,437	10,002	26,646	4,170	3,447	0		55,291
2015	812	813	13,333	7,531	23,197	0	2,883	0		48,569
2016	364	77	8,069	10,901	25,959	3,829	1,425	15	6,509	57,147
2017	454	1,511	2,065	5,725	31,893	6,820	2,258	10	20,403	71,139
2018	313	154	2,741	10,597	34,279	9,471	2,217	3	10,214	69,987
2019	203	317	949	3,138	10,539	4,051	1,141	0	1,024	21,361

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LHMWD and EMWD divert flows from the San Jacinto River in the Hemet-San Jacinto Management Area (Table 2-23). LHMWD holds pre-1914 water rights to San Jacinto River water and EMWD holds rights to divert up to 5,760 AFY. Diversions made by EMWD are reported on a diversion year basis, which is a defined as November of the previous year to June of the current year[39]. LHMWD reports diversions on a calendar year basis. EMWD diversions are available for diversion years 2009 through 2019, and diversions by LHMWD are available for calendar years 2013 through 2019 (Table 2-23).

Table 2-23
Historical Surface Water Diversions in the Basin

San Jacinto River Water Diversions [Acre-feet]		
Year	*EMWD*[a]	*LHMWD*[b]
2009	1,772	-
2010	4,423	-
2011	4,704	-
2012[c]	0	-
2013	58	1,036
2014	211	686
2015	223	228
2016	434	859
2017	3,150	4,763
2018	279	253
2019	1,622	8,498

a EMWD Diversions are reported using a "diversion year" accounting which spans from November of the preceding year to June of the current year. For example, diversion year 2012 represents the time period of Nov. 2011 through June 2012
b LHMWD Diversions are tracked and reported here on a calendar year basin; data for LHMWD diversions is only available following 2013 and are reported in the Hemet San Jacinto Watermaster Annual Reports
c Insufficient flows in diversion year 2012 for EMWD to divert San Jacinto River water

Between diversion years 2009 and 2019, the maximum volume of water EMWD diverted from the San Jacinto River was 4,700 AF, in 2011 (Table 2-23). In diversion year 2012, there were insufficient flows in the San Jacinto River to allow and surface water diversions for EMWD.

Data provided by the Hemet-San Jacinto Watermaster for LHMWD diversions between calendar years 2013 and 2019 indicates that the maximum volume of water diverted by LHMWD was 8,500 AF, in 2019 (Table 2-23). Data characterizing LHMWD diversions of San Jacinto River water prior to 2013 was not provided during preparation of this GSP. A graphical representation of diversions between calendar years 1985 and 2004 in the Hemet-San Jacinto Groundwater Management Plan indicates that diversions have ranged from less than 1,000 AFY to more than 6,000 AFY (EMWD et al. 2007).

39 Diversion year 2009 contains the diversions made by EMWD between November 2008 and June 2009.

Assessment of Groundwater Inflows, Outflows, and Storage Changes as a function of Water Year Type (23CCR 354.18(c) 2(b))

(i) Plan Area

During normal water years, the SJFM-2014 estimates that the Plan Area received an average of approximately 37,300 AF of recharge per year (Table 2-21). The largest sources of recharge to the Plan Area during normal water years were mountain front recharge and precipitation, which provided approximately 55% of average annual recharge to the Plan Area. Outdoor applications of imported water, recycled water, and locally pumped groundwater provided approximately 15% of the average annual recharge to the Plan Area during normal water years.

Groundwater extractions during normal water years throughout the historical period averaged approximately 15,300 AFY. Of this, approximately 10,900 AFY was extracted for agricultural applications and 4,200 AFY was extracted for municipal applications (Table 2-19). An average of approximately 3,500 AFY of groundwater flowed from the Plan Area to the Hemet-San Jacinto Management Area during these years.

The SJFM-2014 estimates that groundwater in storage increased by an average of approximately 15,000 AFY during normal water years.

During dry water years, the SJFM-2014 estimates the Plan Area received approximately 36,100 AF of recharge annually (Table 2-21); this is approximately 1,200 AFY less than normal water year conditions. During dry water years, the largest single source of recharge to the Plan Area was applied water return flows. Outdoor application of imported water, recycled water, and locally pumped groundwater provided approximately 20% of the total recharge to the Plan Area. Recharge from rain and mountain front recharge during dry years accounted for approximately 40% of the total recharge to the Plan Area.

Groundwater extractions during dry water years throughout the historical period averaged approximately 19,000 AFY. Of this, approximately 11,200 AFY was extracted for agricultural applications and 7,800 AFY was extracted for municipal applications (Table 2-19). An average of approximately 4,000 AFY of groundwater flowed from the Plan Area to the Hemet-San Jacinto Management Area during these years.

The SJFM-2014 estimated that groundwater in storage increased by approximately 9,500 AFY during dry water years throughout the historical period (Table 2-21).

The SJFM-2014 estimates that the Plan Area was recharged at an average rate of approximately 52,900 AFY during wet water years in the historical period (Table 2-21). This is approximately 15,600 AFY more than the average annual recharge rate of normal water years. Similar to the normal water year conditions, the largest sources of recharge to the Plan Area during wet water years are precipitation and mountain front recharge. Combined, these two sources of recharge provided an average of approximately 33,000 AFY, or 60% of the total recharge to the Plan Area.

Groundwater extractions during wet water years averaged approximately 16,300 AFY (Table 2-19). Of this, approximately 11,000 AFY was extracted for agricultural applications and 5,300 AFY was extracted for municipal applications. An average of approximately 3,700 AFY of groundwater flowed from the Plan Area to the Hemet-San Jacinto during these years.

The SJFM-2014 estimated that groundwater in storage increased by approximately 29,300 AFY during wet water years.

(ii) Hemet-San Jacinto Management Area

The SJFM-2014 estimates that the Hemet-San Jacinto Management Area received an average of approximately 43,300 AF of recharge between water years 1985 and 2012 (Table 2-24). The largest sources of recharge to the Hemet-San Jacinto Management Area were applied water recharge, and infiltration of surface water through the San Jacinto River. These two recharge components provided a combined average of approximately 50% of the total recharge to the Hemet-San Jacinto Management Area throughout the historical period.

Groundwater extractions in the Hemet-San Jacinto Management Area averaged approximately 51,800 AFY. Approximately 90% of this was extracted by municipal water suppliers and the remainder was extracted by private producers and the Soboba Band of Luiseno Indians.

The SJFM-2014 estimates that an average of approximately 1,100 AF groundwater flowed out of the Hemet-San Jacinto Management Area into the Plan Area annually.

Throughout the historical period, total groundwater outflows exceeded total groundwater inflows in the Hemet-San Jacinto Management Area. The net effect of this resulted in an average overdraft of approximately 9,700 AFY between water years 1985 and 2012 (Table 2-24).

Assessment of Historical Operations (354.18(c) 2(c))

(i) Plan Area

Throughout the historical period, average annual groundwater extractions from the Plan Area were approximately 16,800 AFY (Table 2-19). Over the same period of time, groundwater in storage increased by approximately 436,600 AF (Table 2-21).

The continuous increase in groundwater in storage demonstrates that within the Plan Area the rate of groundwater extraction has been less than the historical rate of recharge. This was true in all water year types and did not depend on historical surface water availability.

(ii) Hemet-San Jacinto Management Area

The Stipulated Judgement for Case No. 1207274 estimates that the safe yield of the Hemet-San Jacinto Management Area ranges from 40,000 AFY to 45,000 AFY. Historical average production rates typically exceeded this by 10,000 AFY to 15,000 AFY (Table 2-24).

As defined in the Stipulated Judgement, the Hemet-San Jacinto Management Area has experienced average overdraft conditions of approximately 10,000 AFY. The Hemet-San Jacinto Watermaster was developed following settlement of the Judgement and is responsible for overseeing management actions aimed at offsetting the 10,000 AFY overdraft conditions.

Table 2-24
Historical Water Budget for the Hemet San Jacinto management area of the San Jacinto Basin

Water Year	Water Year Type	All units reported in acre-feet (AF)											
		Inflows to Groundwater System							*Outflows from Groundwater System*				
		Deep percolation of precipitation	*Stream Infiltration*	*Applied water recharge*	*Grant + IRRP Recharge*	*Mountain front Recharge*	*Subsurface flows from Plan Area*	*Total Inflows*	*Groundwater Extractions*	*Subsurface flows to Plan Area*	*Total Outflows*	*Annual Change in Storage*	*Cumulative Change in Storage*
1984[a]	Normal	2,200	7,700	7,300	0	2,600	2,600	**22,400**	38,400	1,200	**39,600**	-17,200	**-17,200**
1985	Normal	7,900	10,400	9,900	0	8,200	3,400	**39,800**	51,100	1,500	**52,600**	-12,800	**-30,000**
1986	Normal	10,500	13,500	10,500	0	10,500	3,300	**48,300**	53,800	1,500	**55,300**	-7,000	**-37,000**
1987	Normal	6,800	2,500	10,300	0	7,000	3,300	**29,900**	52,900	1,400	**54,300**	-24,400	**-61,400**
1988	Normal	10,000	1,000	10,400	0	9,900	3,000	**34,300**	54,100	1,300	**55,400**	-21,100	**-82,500**
1989	Normal	5,500	2,500	11,100	0	5,900	3,000	**28,000**	53,300	1,500	**54,800**	-26,800	**-109,300**
1990	Dry	6,300	500	11,200	0	6,700	3,000	**27,700**	55,800	1,400	**57,200**	-29,500	**-138,800**
1991	Normal	10,000	12,900	10,300	0	9,700	3,000	**45,900**	49,800	1,200	**51,000**	-5,100	**-143,900**
1992	Normal	12,700	5,600	9,900	0	12,400	3,100	**43,700**	50,100	1,100	**51,200**	-7,500	**-151,400**
1993	Wet	21,100	51,000	10,800	0	19,600	3,100	**105,600**	49,000	1,000	**50,000**	55,600	**-95,800**
1994	Normal	7,400	2,300	9,700	0	7,200	3,300	**29,900**	57,000	1,200	**58,200**	-28,300	**-124,100**
1995	Wet	15,900	38,300	10,900	0	15,500	3,700	**84,300**	54,800	1,100	**55,900**	28,400	**-95,700**
1996	Dry	5,800	6,000	10,800	0	5,900	3,900	**32,400**	62,300	1,100	**63,400**	-31,000	**-126,700**
1997	Normal	8,300	8,100	11,400	0	8,500	4,200	**40,500**	63,100	1,300	**64,400**	-23,900	**-150,600**
1998	Wet	17,400	36,600	11,000	0	16,100	4,200	**85,300**	58,100	1,200	**59,300**	26,000	**-124,600**
1999	Dry	5,800	2,400	11,000	0	6,100	4,300	**29,600**	61,700	1,200	**62,900**	-33,300	**-157,900**
2000	Dry	5,400	2,400	12,700	0	5,100	4,100	**29,700**	68,200	1,100	**69,300**	-39,600	**-197,500**
2001	Normal	7,000	2,100	11,700	0	6,400	4,400	**31,600**	60,600	1,000	**61,600**	-30,000	**-227,500**
2002	Dry	2,900	900	12,400	0	3,200	4,500	**23,900**	53,600	1,000	**54,600**	-30,700	**-258,200**
2003	Normal	11,000	7,100	9,600	0	10,300	4,300	**42,300**	45,600	800	**46,400**	-4,100	**-262,300**
2004	Dry	5,500	3,000	11,700	0	5,300	4,300	**29,800**	48,200	800	**49,000**	-19,200	**-281,500**
2005	Wet	20,700	37,200	10,700	0	18,700	4,200	**91,500**	43,100	900	**44,000**	47,500	**-234,000**
2006	Dry	6,800	11,200	11,700	0	7,300	4,200	**41,200**	51,400	1,000	**52,400**	-11,200	**-245,200**
2007	Dry	2,000	900	11,400	0	2,800	4,400	**21,500**	50,500	1,000	**51,500**	-30,000	**-275,200**
2008	Normal	7,300	12,700	10,200	0	8,600	4,500	**43,300**	46,500	1,000	**47,500**	-4,200	**-279,400**
2009	Dry	5,900	4,100	10,100	0	6,600	4,300	**31,000**	41,700	1,000	**42,700**	-11,700	**-291,100**
2010	Normal	8,100	12,100	9,700	0	9,200	4,100	**43,200**	38,600	1,000	**39,600**	3,600	**-287,500**
2011	Wet	11,300	13,000	9,500	0	12,600	4,000	**50,400**	38,300	1,000	**39,300**	11,100	**-276,400**
2012	Dry	5,600	2,900	8,300	0	6,500	4,100	**27,400**	38,200	900	**39,100**	-11,700	**-288,100**
1985-2012 Average		9,000	10,800	10,700	0	9,000	3,800	**43,300**	51,800	1,100	**53,000**	-9,700	
Dry Water Year Average		5,200	3,400	11,100	0	5,600	4,100	**29,400**	53,200	1,100	**54,200**	-24,800	
Normal Water Year Average		8,700	7,100	10,400	0	8,800	3,600	**38,500**	52,000	1,200	**53,300**	-14,700	
Wet Water Year Average		17,300	35,200	10,600	0	16,500	3,800	**83,400**	48,700	1,000	**49,700**	33,700	

[a] Results for Water Year 1984 only represent the last nine months of the water year (e.g., January 1984 through September 1984)

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2.5.6.2 Current Water Budget

Each GSP is required to "quantify inflows and outflows for the basin using the most recent hydrology, water supply, water demand, and land use information" (23 CCR Section 354.18(c) 2(b)).

This section describes current conditions in the Basin. Here, current conditions are defined as the average groundwater supply, demand, and changes in storage between water years 2013 and 2018. During this time period, one year was characterized as a normal water year, and five years were characterized as dry water years. There were no wet water years between 2013 and 2018.

Recent Availability and Reliability of Surface Water Supply for Deliveries

Between 2013 and 2018, EMWD imported an average of approximately 62,000 AFY for agricultural irrigation and domestic supplies in both the Plan Area and the Hemet-San Jacinto Management Area (Table 2-22).

Between 2013 and 2018, LHMWD diverted an average of approximately 1,300 AFY of San Jacinto River water (Table 2-23). LHMWD's surface water diversions between 2013 and 2019 varied depending on water year type and ranged from approximately 230 AF in calendar year 2015 to approximately 4,800 AF calendar year 2017.

Between 2013 and 2018, EMWD's diversions of San Jacinto River water ranged from approximately 60 AF in diversion year 2013 to approximately 3,200 AF in diversion year 2017. Diversions during 2012-2016 drought period averaged approximately 180 AFY.

i. Plan Area

The portion of the SJFM-2014 that overlies the Plan Area was updated as part of the GSP preparation to estimate groundwater inflows, outflows, and changes in storage under current conditions. The SJFM-2014 was updated in the Plan Area for this period using reported groundwater extraction rates, recycled water sales, imported water supplies, retail water sales, and measured hydrology.

Average annual recharge to the Plan Area, excluding the 3,400 AFY of Lake Perris underflows that are captured by existing toe drains, during this period was 32,200 AFY (Table 2-25). The largest components of groundwater recharge during this period were mountain front recharge, precipitation, and incidental recharge of recycled water through unlined storage ponds located in the Plan Area. Combined, these sources provided approximately 65% of the average annual recharge to the Plan Area.

An average of approximately 21,700 AF of groundwater was extracted from the Plan Area annually between water years 2013 and 2018 (Table 2-25). Approximately 60% of this was extracted for municipal supplies and 40% of this was extracted for agricultural supplies. The average annual groundwater extraction rate between 2013 and 2018 was approximately 4,900 AFY greater than the historical average annual groundwater extraction rate.

An average of approximately 4,400 AFY of groundwater flowed from the Plan Area into the Hemet-San Jacinto Management Area between water years 2013 and 2018 (Table 2-25).

The average annual recharge of 32,200[40] AFY and average annual groundwater discharge of 26,100[41] AFY resulted in an average annual increase in groundwater in storage of approximately 6,100 AFY between 2013 and 2018 (Table 2-25).

(i) Hemet-San Jacinto Management Area

Current water budgets for the Hemet-San Jacinto Management Area were estimated using simulation results from the SJFM-2014 for management area hydrology, and data reported in the Hemet-San Jacinto Watermaster Annual Reports for estimates of groundwater supplies and demand. The current period water budget prepared for the Hemet-San Jacinto Management Area conserved groundwater flows across jurisdictional boundaries between the management area and Plan Area.

The current water budget analysis for the Hemet-San Jacinto Management Area estimates that the average annual inflows to the adjudicated portion of the Basin between 2013 and 2018 were approximately 37,400 AFY (Table 2-26). Between water years 2013 and 2018, the largest sources of recharge to the management area were applied water return flows, precipitation, and infiltration of San Jacinto River water. Combined, these three sources provided approximately 65% of the average annual inflows to the management area. An average of approximately 1,700 AFY was recharged to the management area through the Grant and IRRP ponds.

During this period, the Hemet-San Jacinto Watermaster Annual Reports indicate that an average of approximately 41,400 AF of groundwater was extracted from the management area annually (Table 2-26). This average extraction rate is within the range of safe yield presented in the Stipulated Judgement Case No. 1207274.

Between water years 2013 and 2018, groundwater in storage in the Hemet-San Jacinto Management Area declined at an average rate of approximately 5,000 AFY (Table 2-26).

40 Does not include the 3,400 AFY of inflows removed from toe drains at the base of Perris Dam
41 Does not include the 3,400 AFY of groundwater removed from toe drains at the base of Perris Dam

2.5.6.3 Projected Water Budget

Each GSP is required to include projected water budgets in order to estimate, "future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify uncertainties of these projected water budget components" (23 CCR 354.18(c) 3). To assess these future conditions, the projected water budgets are required to utilize a 50-year projection horizon that incorporates the most recent land use and population data, projected water demands and surface water availability, and shall be used to evaluate the potential impacts of climate change on Basin operations.

Future water budgets for the Plan Area were generated using simulation results from the SJFM-2014 for three future scenarios: (1) Future Baseline, (2) Future Baseline with Climate Change I, and (3) Future Baseline with Climate Change II. Each scenario incorporated the same projects and groundwater extraction scenarios, and utilized the synthetic hydrologic conditions created by appending the 17-year hydrologic record between 1996 and 2012 to the 35-year hydrologic record between 1984 and 2018. DWR 2030 Central Tendency Climate Change Factors were applied to the synthetic hydrologic record in scenario (2), and DWR 2070 Central Tendency Climate Change Factors were applied to the synthetic hydrologic record in scenario (3).

The synthetic hydrologic record used in the Future Baseline Scenario resulted in an average annual Basin area-weighted precipitation rate of 12.8 inches per water year. The application of 2030 climate change factors in Scenario (2) reduced the average annual Basin area-weighted precipitation rate by 0.3 inches per water year from the Future Baseline Scenario. The application of 2070 climate change factors in Scenario (3) reduced the average annual Basin area-weighted precipitation rate by 0.6 inches per water year from the Future Baseline Scenario.

The projects implemented in all scenarios aim to decrease the Basin's reliance on imported water supply by: (i) enhancing groundwater quality in the basin, (ii) mitigating the migration of contaminated groundwater throughout the Plan Area, and (iii) maintaining operational flexibility for both municipal and private users of groundwater (EMWD 2018, EMWD 2019c).

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Table 2-25
Current Water Budget for the Plan Area

All values reported in units of acre-feet (AF)																						
		Inflows to Groundwater in the Plan Area; units reported in Acre-Feet (AF)												*Outflows (Acre Feet)*								
		Return flows from retail water sales					*Stream Leakage*[a]							*Groundwater Extractions*				*Lake Perris Seepage Recovery*				
Water Year	**Water Year Type**	*Non-agricultural potable water sales*	*Agricultural Irrigation*	*Recycled Water Sales*	*Reclaimed Ponds*	*Deep percolation of precipitation*	*Perris Valley Drain*	*San Jacinto River*	*Mountain Front Recharge*	*Underflows from HSJ South of San Jacinto River*	*Underflows from HSJ North of San Jacinto River*	*Lake Perris Seepage*	*Total Inflow (AF)*	*Agricultural*	*Municipal*	*Unknown Usage Sector*	*Total Groundwater Extractions*	*Toe Drains*	*Underflows from HSJ North of San Jacinto River*	*Underflows from HSJ South of San Jacinto River*	*Total Outflow (AF)*	*Annual Change in Storage*
2013	Dry	3,100	600	1,000	7,500	4,700	300	0	9,600	800	100	7,200	**35,000**	7,400	13,000	0	20,400	3,400	0	4,200	**28,000**	**7,000**
2014	Dry	3,000	600	1,000	7,500	4,000	300	0	10,000	800	200	7,200	**34,600**	9,400	13,000	0	22,400	3,400	0	4,300	**30,100**	**4,500**
2015	Dry	2,600	600	800	7,500	6,700	300	0	9,800	900	200	7,200	**36,600**	9,000	14,700	0	23,700	3,400	0	4,400	**31,500**	**5,100**
2016	Dry	2,400	600	1,000	7,500	4,700	300	0	9,700	900	200	7,200	**34,500**	8,900	14,600	0	23,400	3,400	0	4,400	**31,200**	**3,300**
2017	Normal	2,600	600	1,000	7,700	9,500	300	0	9,600	800	200	7,200	**39,400**	8,300	12,400	0	20,700	3,400	0	4,400	**28,500**	**10,800**
2018	Dry	2,700	600	900	8,200	3,200	300	0	9,600	800	200	7,200	**33,600**	8,300	11,500	0	19,800	3,400	0	4,500	**27,800**	**5,900**
2013-2018 Average		**2,700**	**600**	**1,000**	**7,600**	**5,500**	**300**	**0**	**9,700**	**800**	**200**	**7,200**	**35,600**	**8,500**	**13,200**	**0**	**21,700**	**3,400**	**0**	**4,400**	**29,500**	**6,100**

[a] Simulation results from SJFM-2014 indicate that surface water conveyed through the Salt Creek flood control channel did not recharge the Plan Area

Table 2-26
Current Water Budget for the Hemet San Jacinto Management Area

All units reported in acre-feet (AF)													
		Inflows to Groundwater System							*Outflows from Groundwater System*				
Water Year	**Water Year Type**	*Deep percolation of precipitation*	*Stream Infiltration*	*Applied water recharge*[a]	*Grant + IRRP Recharge*	*Mountain front Recharge*	*Subsurface flows from Plan Area*	*Total Inflows*	*Groundwater Extractions*	*Subsurface flows to Plan Area*	*Total Outflows*	*Annual Change in Storage*	*Cumulative Change in Storage*
2013	Dry	5,300	5,700	11,000	2,000	5,400	4,200	**33,600**	49,700	900	**50,600**	-17,000	**-17,000**
2014	Dry	5,400	9,400	10,800	1,700	5,600	4,300	**37,200**	42,600	1,000	**43,600**	-6,400	**-23,400**
2015	Dry	8,700	6,900	10,000	1,700	8,500	4,400	**40,200**	39,000	1,100	**40,100**	100	**-23,300**
2016	Dry	5,000	8,900	10,500	1,800	5,200	4,400	**35,800**	38,400	1,100	**39,500**	-3,700	**-27,000**
2017	Normal	10,500	8,800	9,500	1,800	10,100	4,400	**45,100**	38,700	1,000	**39,700**	5,400	**-21,600**
2018	Dry	4,400	7,800	10,100	1,500	4,600	4,500	**32,900**	40,000	1,000	**41,000**	-8,100	**-29,800**
2013-2018 Average		**6,500**	**7,900**	**10,300**	**1,700**	**6,600**	**4,400**	**37,400**	**41,400**	**1,000**	**42,400**	**-5,000**	**-23,700**

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Similar to the current condition water budgets, projected water budgets for the Hemet-San Jacinto Management Area were developed using simulated hydrology in the management area and projected water supplies and demands.

2.5.6.3.1 Projected Water Budget Assumptions

This section describes the data and assumptions used during development of the future simulations for the Plan Area.

Projected Recycled Water Supplies

EMWD projects recycled water demands in the Basin as part of their Recycled Water Master Plan. The most recent update to the Recycled Water Master Plan was completed in 2016 and provided recycled water demand projections through 2045 (EMWD 2016c, Table 2-27).

Recycled water usage in the Basin is expected to increase from approximately 38,500 AF in 2020 to approximately 64,800 AF in 2045 (Table 2-27). This increase is expected to be driven by the Purified Water Replenishment (PWR) project that EMWD plans to implement starting in 2020. The PWR project plans to deliver wastewater that will undergo tertiary treatment and/or reverse osmosis to recharge ponds located along the San Jacinto River corridor.

Total agricultural demands for recycled water in the Plan Area are expected to decrease from approximately 6,600 AFY in 2020 to approximately 4,900 AFY in 2045 (Table 2-27). The 2045 predicted agricultural demands correspond to approximately 25% of the total recycled water demands in the Plan Area.

Industrial and irrigation demands for recycled water are expected to account for approximately 20% and 40% of the total recycled water demand in the Plan Area by 2045, respectively. Approximately 15% of the total recycled water demand is allocated for deliveries to the CDFW SJWA.

Reclaimed Water Facilities

With the exception of the Trumble Road storage pond, recharge of recycled water through unlined storage ponds was assumed to occur at the same rate as historical conditions (Table 2-18). The Trumble Road storage pond was expanded in 2017 and the updated rate of recharge was applied in both the current and projected conditions.

Land Usage

Land Use in the future simulations is based on EMWD's build out projections (see Section 2.1.3 Land Use Elements of Topic Categories of Applicable General Plans; EMWD 2019d). EMWD projects that agricultural land use and vacant land will decrease by approximately 25% and 5%, respectively, by 2040. Commercial land use is projected to increase by approximately 60% by 2040.

Projects Implemented in the Future Baseline Simulations

Future simulations of the Basin using the SJFM-2014 incorporated projects that aim to mitigate water quality degradation, stimulate potable groundwater supplies, and address seepage of SWP water into the Basin. These projects are implemented through the operation of groundwater extraction wells that are included in the future simulations. Table 2-28 tabulates annual groundwater extraction rates, by calendar year, associated with each of the four projects included in the future simulations.

(i) Lake Perris Seepage Recovery Project

DWR is designing the Lake Perris Seepage Recovery Program to recover seepage that typically occurs under the Perris Dam. The project includes installation of five extraction wells located along the Right Dam, that will operate at a total extraction rate of 7,500 AFY. The project design specifies that the 7,500 AFY will be achieved by operating up to four out of the five wells simultaneously. The combined extraction rate of 7,500 AFY is based on an estimate of seepage from the Lake using historical Lake levels, groundwater levels at the toe of the Dam, and a numerical model developed for the project. The project is expected to begin operations in 2024.

The Future Baseline and both Future Baseline with Climate Change scenarios simulate the extraction of 7,500 AFY from the six proposed DWR seepage recovery wells.

(ii) EGETS

EGETS currently pumps groundwater along the eastern boundary of MARB (see Section 2.1.2.3 Water Quality). Contaminated groundwater that is extracted as part of the EGETS program is treated with granular activated carbon and delivered to WMWD’s WWRF, when there is demand, and/or discharged to the Heacock storm drain when there is no demand. Both future scenarios assume that groundwater extraction rates at the EGETS wells will operate at the current extraction rate of approximately 240 AFY.

(iii) Perris North Groundwater Contamination Prevention and Remediation Program

Portions of the groundwater aquifer underlying the Cities of Perris and Moreno Valley contain a series of non-point source co-mingled VOC, perchlorate, and nitrate plumes located upgradient of potable groundwater that is used as a source of water supply in the Basin. The Perris North Groundwater Contamination Prevention and Remediation Program plans to implement a series of up to 9 extractions wells that will be operated to prevent the spread of the co-mingled plumes, accelerate cleanup of the contaminants, and protect potable regions of the aquifer that underlie the Basin. The Perris North Groundwater Contamination Prevention and Remediation Program will be implemented by EMWD.

Table 2-27
Projected Recycled Water Demands in the San Jacinto Basin

Calendar Year	Demand by Usage Sector (Units in Acre-Feet)										
	Plan Area					*Hemet-San Jacinto management Area*					Total Demand
	Ag	*Industrial*	*Irrigation*	*Habitat Management*	*sub-total*	*Agriculture*	*PWR[a]*	*Irrigation*	*Wholesale NPR[b]*	*sub-total*	
2014	11,020	2,487	3,402	3,024	19,933	13,174	0	2,026	846	16,046	**35,979**
2015	9,327	2,775	3,820	2,500	18,422	11,857	0	2,447	1,029	15,333	**33,755**
2016	8,785	2,775	3,846	2,500	17,906	11,798	0	2,450	1,083	15,331	**33,237**
2018	7,700	2,775	3,900	2,500	16,875	11,679	0	2,457	1,191	15,327	**32,202**
2020	6,616	3,212	5,087	2,500	17,415	11,560	4,875	3,363	1,299	21,098	**38,513**
2025	5,388	3,652	5,766	2,500	17,306	12,053	10,746	4,025	1,569	28,393	**45,699**
2030	5,210	4,090	6,313	2,500	18,113	12,176	14,268	4,669	1,569	32,683	**50,796**
2035	5,109	4,521	6,859	2,500	18,989	12,364	17,790	5,314	1,569	37,038	**56,027**
2040	5,008	4,521	7,585	2,500	19,614	12,553	20,895	5,813	1,569	40,830	**60,445**
2045	4,909	4,521	8,301	2,500	20,231	12,744	24,000	6,304	1,569	44,617	**64,848**

[a] PWR = Purified Water Replenishment
[b] NPR = Non-Potable Reuse

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There are three well clusters proposed under the Perris North Basin Groundwater Contamination Prevention and Remediation Program that will be located near the following approximate locations: (1) in the Moreno Valley Area, near the intersection of Ironwood Avenue and Heacock Street, (2) in the vicinity of MARB, near Alessandro Blvd and Frederick Street, and between Cactus Avenue and Iris Avenue, and (3) in the City of Perris near North Perris Blvd and East Nance Street. Final siting for each well cluster will be determined based on ongoing groundwater modeling results.

EMWD plans to install two groundwater extraction wells in the Moreno Valley Area cluster. In the future model simulations, the combined groundwater extraction from these wells was 2,000 AFY, between 2019 and 2028 (Table 2-28). Between 2029 and 2070 the combine extraction rate in these wells was reduced to 1,500 AFY (Table 2-28).

In the vicinity of MARB, six groundwater extraction wells were included in the future model simulations at a combined extraction rate of 3,600 AFY between water years 2020 and 2070 (Table 2-28).

In the City of Perris, the future simulations include a single well that extracted 1,000 AFY of groundwater between water years 2020 and 2028. The simulated production at this well was increased to 1,500 AFY in water year 2029 and remained at 1,500 AFY until the end of the simulation in water year 2070 (Table 2-28).

The combined operation of the well clusters in the Moreno Valley Area, MARB, and city of Perris was simulated at an extraction rate of 6,750 AFY (Table 2-28).

(iv) Perris South Desalination Project

EMWD currently operates a system of 15 groundwater extraction wells in the cities of Perris and Menifee that produce brackish groundwater from the Basin. Brackish groundwater produced under this project is treated at two reverse osmosis desalter plants (desalters) and then delivered within EMWD's service area as potable water. The two desalters that are currently in operation produce approximately 8 MGD of drinking water. EMWD plans to expand the brackish water treatment system through the design and build of a third desalter unit. The third desalter is expected to produce an additional 5.4 MGD of drinking water.

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Table 2-28
Projects Implemented in the Future Simulations for the Plan Area

Project Simulated in Future Scenarios					Projected Extraction Rates (units reported in acre-feet per year)[a]														
Project Title	*Location*	*Agency*	*Project Type*	*Proposed Purpose*	*2019*	*2020*	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*	*2029*	*2030*	*2031*	*2032*	*2033-2070*
Lake Perris Seepage Recovery	Perris Dam	DWR	Seepage Recovery	Recovery of SWP water	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500
EGETS	MARB	Air Force and Air Force Reserve	GW Cleanup	Mitigation of GW Contaminant migration	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240
Perris North Basin Groundwater Contamination Prevention and Remediation Program	Moreno Valley Area	EMWD	GW Cleanup	Cleanup of co-mingled plumes in Perris Valley and Menifee Valley; protection of potable aquifer	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	1,500	1,500	1,500	1,500	1,500
	MARB				3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700	3,700
	Perris Valley				1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,550	1,550	1,550	1,550	1,550
Perris South Desalination Project[b]	Perris Valley	EMWD	GW Cleanup	Mitigation of brackish water migration, supplementation of potable water supplies	14,486	14,486	14,486	14,486	14,486	14,486	14,486+	14,486	14,486	14,486	14,486	14,486	14,486	14,486	14,486
				Total Project Extractions	**28,976**	**28,976**	**28,976**	**28,976**	**28,976**	**28,976**	**28,976**	**28,976**	**28,976**	**28,976**	**28,976**	**28,976**	**28,976**	**28,976**	**28,976**

[a] Reported extraction rates are total extractions in a given calendar year

[b] Represents extractions from EMWD 75 Salt Creek, EMWD 85 Murrieta/Salt Creek, EMWD 88 Pico/San Jacinto, EMWD 89 Ethanac II, EMWD 76 McLaughlin, EMWD 81 Antelope/Watson, EMWD 82 Mapes/Sherman, EMWD 83 Ellis/Sherman, EMWD 84 Ellis/Bradley, EMWD 86 Murrieta/San Jacinto, EMWD 96 Santa Rose, EMWD 87 Nuevo/Olivas, EMWD 93 Nuevo/Menifee, EMWD 94, and EMWD 95 13th St.

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Operation of the Perris South Desalination Project is the primary method of mitigating the migration of brackish water throughout the Plan Area. Currently, brackish water extends from the City of Menifee through portions of the city of Perris, and into the unincorporated areas of Nuevo/Lakeview (Figure 2-44). Groundwater extractions from the network of desalination wells are designed to protect fresh water stored in the eastern regions of the Lakeview GMZ, where groundwater is used for agricultural supply, and in the north eastern portions of the Cities of Perris and Moreno Valley, where groundwater is used as a source of potable water. Treated water produced as part of this project is served within EMWD's service area, which reduces EMWD's reliance on imported water for water supply.

Between water years 2013 and 2018, EMWD's operation of the Perris South Desalination Project extracted an average of approximately 8,800 AFY of brackish water from the Basin. Future operations of the Perris South Desalination Project are expected to increase and EMWD plans to extract an average of approximately 14,500 AF of brackish water from the Basin annually (Table 2-28).

2.5.6.3.2 Assessment of the Future Baseline Water Budget

Surface Water Availability

(i) Plan Area

During the 52-year synthetic hydrologic record used in the Future Baseline simulation, surface water entered the Plan Area through the San Jacinto River during water years 2028, 2030, 2032, 2033, 2040, 2041, 2056, 2063, and 2064. In these nine years, San Jacinto River flows entering the Plan Area ranged from approximately 10 AF to approximately 1,400 AF (Table 2-29). Seven of these water years were characterized as wet water years and two of these were characterized as dry water years. During these 9 water years, San Jacinto River water provided a maximum of approximately 70 AF of recharge to the Plan Area.

Table 2-29
San Jacinto River flows entering the Plan Area under Future Baseline Conditions

Water Year	Water Year Type	San Jacinto River Flows into Plan Area	San Jacinto River water recharge to Plan Area
		Units reported in Acre-Feet (AF)	
2019	Normal	0	0
2020	Normal	0	0
2021	Normal	0	0
2022	Normal	0	0
2023	Normal	0	0
2024	Normal	0	0

Table 2-29
San Jacinto River flows entering the Plan Area under Future Baseline Conditions

Water Year	Water Year Type	San Jacinto River Flows into Plan Area	San Jacinto River water recharge to Plan Area
		Units reported in Acre-Feet (AF)	
2025	Dry	0	0
2026	Normal	0	0
2027	Wet	0	0
2028	Wet	1,400	100
2029	Normal	0	0
2030	Wet	1,000	100
2031	Normal	0	0
2032	Normal	0	0
2033	Wet	1,000	100
2034	Dry	0	0
2035	Normal	0	0
2036	Normal	0	0
2037	Dry	0	0
2038	Wet	0	0
2039	Normal	0	0
2040	Wet	200	0
2041	Dry	0	0
2042	Dry	0	0
2043	Normal	0	0
2044	Dry	0	0
2045	Normal	0	0
2046	Wet	0	0
2047	Dry	0	0
2048	Normal	0	0
2049	Dry	0	0
2050	Dry	0	0
2051	Dry	0	0
2052	Normal	0	0
2053	Dry	0	0
2054	Normal	0	0
2055	Normal	0	0
2056	Wet	700	0
2057	Dry	0	0
2058	Normal	0	0
2059	Normal	0	0
2060	Dry	0	0
2061	Wet	0	0
2062	Normal	0	0

Table 2-29
San Jacinto River flows entering the Plan Area under Future Baseline Conditions

Water Year	Water Year Type	San Jacinto River Flows into Plan Area	San Jacinto River water recharge to Plan Area
		Units reported in Acre-Feet (AF)	
2063	Wet	200	0
2064	Dry	0	0
2065	Dry	0	0
2066	Normal	0	0
2067	Dry	0	0
2068	Normal	0	0
2069	Wet	0	0
2070	Dry	0	0

Numbers in this table represent simulation results from the Future Baseline simulation using SJFM-2014

As discussed in Section 2.5.1.3.2, surface water elevations in the Perris Valley Storm Drain are kept constant in the SJFM-2014. Surface water elevations in the Perris Valley Storm Drain were not adjusted for the future simulations. The SJFM-2014 estimates that storm water conveyed through the Perris Valley Strom contributed 300 AFY of recharge to the Plan Area. The 300 AFY of recharge from surface water infiltration through the Perris Valley Storm Drain is the same average annual recharge rates estimated by the SJFM-2014 during the historical period.

(ii) Hemet-San Jacinto Management Area

The Physical Solution, as defined in the Stipulated Judgement Case No. 1207274, identifies groundwater recharge as the preferred method of accomplishing Soboba Settlement Agreement requirements (Appendix D). The Soboba Settlement Agreement facilitated an agreement between EMWD and MWD for an average delivery of 7,500 AF of water for 50 years. This water is used to recharge the Hemet-San Jacinto Management Area through the IRRP and Grant Avenue Ponds. Projected water budgets for this GSP assume that MWD provided 7,500 AFY to EMWD for these purposes.

Estimates of San Jacinto River recharge rates to the Basin within the Hemet-San Jacinto Management Area were based on regressions between historical simulation results for San Jacinto River recharge in the management area, and future projected hydrology. These estimates implicitly account for diversions of San Jacinto River water by EMWD and LHMWD; projected diversions by EMWD and LHWMD were not independently estimated as part of the GSP preparation. On average of approximately 9,500 AFY of San Jacinto River water recharged the Basin in the future simulations (Table 2-30).

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Table 2-30
Projected Water Budget for the Hemet-San Jacinto Management Area under Future Baseline conditions

Water Year Type	All units reported in acre-feet (AF)										
	Inflows to Groundwater System							*Outflows from Groundwater System*			
	Deep percolation of precipitation	*Stream Infiltration*	*Applied water recharge*	*Grant + IRRP Recharge*	*Mountain front Recharge*	*Subsurface flows from Plan Area*	*Total Inflows*	*Groundwater Extractions*	*Subsurface flows to Plan Area*	*Total Outflows*	*Annual Change in Storage*
2019-2070 Average	7,500	9,500	10,300	7,500	8,300	3,600	**46,700**	45,100	1,500	**46,600**	**100**
Normal Water Year Average *(24 years)*	6,600	6,400	10,000	7,500	7,300	3,700	**41,500**	45,100	1,400	**46,500**	**-5,000**
Dry Water Year Average *(17 years)*	4,500	4,300	10,700	7,500	5,400	3,300	**35,700**	45,100	1,700	**46,800**	**-11,000**
Wet Water Year Average *(11 years)*	13,900	24,200	10,400	7,500	14,800	3,600	**74,400**	45,100	1,500	**46,600**	**27,800**

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Groundwater Inflows, Outflows, and Changes in Storage

(i) Plan Area

The SJFM-2014 estimates that the Plan Area will receive approximately 46,400 AF of recharge annually under the Future Baseline conditions (Table 2-31; Figure 2-53). This is approximately 6,700 AFY more than historical conditions in the Plan Area (Table 2-32; Figure 2-53). The difference in average annual recharge simulated in the historical and future scenarios is, in part, due to the operation of the Lake Perris Seepage Recovery Project, which is expected to increase underflows from the Right Dam of the Perris Dam. Historically, the SJFM-2014 estimated that approximately 3,400 AFY flowed under the Right Dam; these underflows were captured by a series of toe drains. Under the Future Baseline conditions, the SJFM-2014 estimates that approximately 7,500 AFY of Lake Perris water will flow under the Right Dam, which is approximately 4,100 AFY more than historical seepage rates (Table 2-32).

Return flows from potable water sales[42] are expected to increase by an average of approximately 1,400 AFY from historical, providing an average of approximately 4,700 AF of recharge to the Plan Area annually (Table 2-32). The expansion of EMWD's brackish and wastewater treatment facilities is expected to increase incidental recharge of recycled water to the Plan Area by 3,400 AFY from historical conditions, providing an average of approximately 8,200 AF of recharge to the Plan Area annually (Table 2-32). The SJFM-2014 estimates that inflows to the Plan Area from mountain front recharge will be similar to historical conditions. Recharge from precipitation infiltration will be approximately 20% lower than historical conditions due to a reduction in pervious land coverage that results from the conversion of agricultural and vacant land to commercial and residential areas (Table 2-32; Section 2.5.6.3.1 Projected Water Budget Assumptions).

Groundwater extraction rates in the future simulations exceed historical groundwater extraction rates in the Plan Area. Extractions from existing municipal wells in the Plan Area were simulated to be approximately 11,000 AFY more than the historical average groundwater extraction rate (Table 2-32; Figure 2-53). Additionally, extractions from the Perris North Basin Groundwater Contamination Prevention and Remediation Program, Perris South Desalination Project, and EGETS wells were simulated to extract an additional 9,900 AFY of groundwater from the Plan Area. The Lake Perris Seepage Recovery wells are expected to extract 7,500 AFY of seepage underflows along the Right Dam of Perris Dam. Excluding extractions from the Lake Perris Seepage Recovery Wells, the Future Baseline conditions simulate an average annual extraction rate of approximately 37,600 AFY (Table 2-31), which is approximately 20,900 AFY more than the historical groundwater extraction rate in the Plan Area.

[42] Potable water is sold in the Plan Area by EMWD, Nuevo Water Company, Box Springs Mutual Water Company, City of Perris, and Western Municipal Water District. Return flows from all water sales by all water companies and districts, excluding EMWD, are denoted as "Subagency Sales" in Table 2-31.

The Future Baseline scenario simulation predicts that approximately 3,500 AFY of groundwater will flow out of the Plan Area into the Hemet-San Jacinto Management Area along the jurisdictional boundaries between the Plan Area and the Hemet-San Jacinto Management Area in the unincorporated areas of Winchester and Nuevo/Lakeview (Table 2-31).

Expanded groundwater production in the Plan Area is expected to result in groundwater withdrawal rates that exceed recharge rates, which is necessary to lower groundwater elevations that have been increasing near MARB, prevent the spread of the co-mingled plumes in the Perris North GMZ, accelerate cleanup of the contaminants in the Perris North GMZ, protect potable regions of aquifer that underlie the Perris North GMZ, and mitigate the migration of brackish water in the Lakeview GMZ. Operation of the basin under the Future Baseline conditions is predicted to result in an average decline in groundwater in storage of approximately 2,200 AFY (Table 2-31). At the end of the 52-year simulation, the average reduction of 2,200 AFY leaves a surplus of approximately 358,800 AF of groundwater in storage relative to 1985 conditions.

(ii) Hemet-San Jacinto Management Area

Analysis of the future conditions within the Hemet-San Jacinto Management Area indicates that the adjudicated portion of the Basin will receive approximately 46,600 AF of recharge annually (Table 2-30; Figure 2-54). This is approximately 3,300 AFY more than historical conditions in the Hemet-San Jacinto management area (Table 2-33; Figure 2-54). This difference is due, in part, to 7,500 AFY of imported water recharge at the Grant and IRRP recharge ponds as part of the Soboba Settlement Agreement. Under Future Baseline conditions, precipitation, mountain front recharge, and stream infiltration provide approximately 3,600 AFY less recharge compared to historical conditions due to the combined effect of land use changes and projected hydrology.

Groundwater extractions are projected to decrease in the management area to 45,000 AFY (Table 2-30). This is approximately 6,800 AFY less than historical groundwater extraction rates in the management area (Table 2-33). Groundwater extraction rates under Future Baseline conditions were set using Adjusted Base Production Rights and the Soboba Tribe’s Water Development Schedule (EMWD et al. 2007).

These projected conditions produce no net change in storage over the 52-year period between water years 2019 and 2070.

(iii) SJGB

The combined results from the SJFM-2014 simulations in the Plan Area and the analysis of the Hemet-San Jacinto Management Area indicate that the Basin will receive approximately 87,800

AF of recharge annually (Table 2-34; Figure 2-55). This is approximately 9,900 AFY more recharge compared to historical conditions. Projected increases in recharge to the Basin are driven by managed aquifer recharge through the IRRP and Grant Avenue Ponds, incidental recharge from recycled water storage[43], Lake Perris seepage, and increased return flows from potable water sales in the Basin (Table 2-35).

43 Recharge from recycled water storage and the Grant + IRRP Ponds are represented as an aggregate volume labeled "Artificial" in Table 2-33.

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Table 2-31
Projected Water Budget under the Future Baseline Conditions in the Plan Area

Water Year Type	Inflows (AF)											Total Inflow (AF)	Outflows (AF)							Total Outflow (AF)	Annual Change in Storage (AF)
	Return flows from retail water sales					*Stream Leakage[b]*			*Underflows from HSJ South of San Jacinto River*	*Underflows from HSJ North of San Jacinto River*			*Groundwater Extractions*				*Lake Perris Seepage Recovery*		*Underflows to HSJ North of San Jacinto River*		
	Non-agricultural potable water sales[a]	*Agricultural Irrigation*	*Recycled Water Sales*	*Reclaimed Ponds*	*Deep percolation of precipitation*	*Perris Valley Drain*	*San Jacinto River*	*Mountain Front Recharge*			*Lake Perris Seepage*		*Agricultural*	*Municipal*	*Unknown Usage Sector*	***Total Groundwater Extractions***	*Seepage Recovery Wells*	*Underflows from HSJ South of San Jacinto River*			
2019-2070 Average	4,700	400	1,200	8,200	7,100	300	0	11,600	1,400	200	11,300	**46,300**	11,500	26,100	0	37,600	7,500	0	3,500	**48,600**	**-2,200**
Normal Water Year Average *(24 years)*	4,500	500	1,200	8,200	6,500	300	0	10,900	1,200	200	11,200	**44,700**	11,500	26,000	0	37,500	7,500	0	3,700	**48,700**	**-4,000**
Dry Water Year Average *(17 years)*	5,100	400	1,200	8,200	3,900	300	0	9,800	1,500	200	11,300	**41,900**	11,600	26,100	0	37,700	7,500	0	3,300	**48,500**	**-6,600**
Wet Water Year Average *(11 years)*	4,700	400	1,200	8,200	13,200	300	0	15,700	1,400	200	11,300	**56,500**	11,600	26,100	0	37,700	7,500	0	3,600	**48,800**	**7,800**

[a] Return flows from EMWD, WMWD, Nuevo Water Company, City of Perris, and Box Springs Water Company sales for non-agricultural irrigation.
[b] Results from the SJFM-2014 indicate that surface water conveyed through the Salt Creek flood control channel recharge the Basin upstream of the Plan Area.

Table 2-32
Comparison of Historical, Current, and Projected Average Annual Water Budget Components in the Plan Area

Flow		Historical Period Average WY 1985-2012 (AFY)		Current Condition Average WY 2013-2018 (AFY)		Updated Projected Baseline Average WY 2019-2070 (AFY)		2030 Central Tendency Average WY 2019-2070 (AFY)		2070 Central Tendency Average WY 2019-2070 (AFY)	
Recharge	EMWD Sales[a]	3,200	19,400	2,500	17,400	4,500	21,700	4,500	20,500	4,500	20,300
	Irrigation	1,500		600		400		400		400	
	Rain	8,700		5,500		7,100		5,900		5,700	
	Reclaimed Ponds	4,800		7,600		8,200		8,200		8,200	
	Recycled Water Sales	1,000		1,000		1,200		1,200		1,200	
	Subagency Sales[a]	200		200		300		300		300	
Stream Seepage		300	300	300	300	300	300	300	300	300	300
Underflows In	From Perris North	0	1,200	0	1,000	0	1,600	0	1,500	0	1,500
	From Perris South	0		0		0		0		0	
	From Menifee	0		0		0		0		0	
	From Lower Pressure	0		0		0		0		0	
	From Lakeview	0		0		0		0		0	
	From Hemet North	700		600		900		800		800	
	From Hemet South	300		200		500		500		500	

Table 2-32
Comparison of Historical, Current, and Projected Average Annual Water Budget Components in the Plan Area

Flow		Historical Period Average WY 1985-2012 (AFY)		Current Condition Average WY 2013-2018 (AFY)		Updated Projected Baseline Average WY 2019-2070 (AFY)		2030 Central Tendency Average WY 2019-2070 (AFY)		2070 Central Tendency Average WY 2019-2070 (AFY)	
	From Upper Pressure	200		200		200		200		200	
	From Canyon	0		0		0		0		0	
Boundary Flows	From Sun City Area	900		1,100		1,200		1,200		1,200	
	Lake Perris Right Dam Seepage	600		600		600		600		600	
	Lake Perris Right Dam Seepage	3,400	18,800	3,400	16,900	7,500	22,900	7,500	22,400	7,500	22,300
	Lake Perris Native Underflow	3,200		3,200		3,200		3,200		3,200	
	Mountain Front Recharge	10,700		8,600		10,400		9,900		9,800	
	Total Average Annual Inflow	**39,700**		**35,600**		**46,500**		**44,700**		**44,400**	
Underflows Out	To Perris North	0		0		0		0		0	
	To Perris South	0		0		0		0		0	
	To Menifee	0		0		0		0		0	
	To Lower Pressure	0		0		0		0		0	
	To Lakeview	0	3,800	0	4,400	0	3,500	0	3,400	0	3,400
	To Hemet North	100		0		0		0		0	
	To Hemet South	0		0		0		0		0	
	To Upper Pressure	3,700		4,400		3,500		3,400		3,400	
	To Canyon	0		0		0		0		0	
Extractions	Toe Drain	3,400		3,400		0		0		0	
	LPSRW	0		0		7,500		7,500		7,500	
	EGETS Wells	0		0		200		200		200	
	Perris North Basin Groundwater Contamination Prevention and Remediation Program	0	20,200	0	25,100	6,700	45,100	6,700	45,600	6,700	46,100
	Perris South Desal Project	0		0		3,000		3,000		3,000	
	Existing Wells	16,800		21,700		27,700		28,200		28,700	
	Total Average Annual Outflow	**24,000**		**29,500**		**48,600**		**49,000**		**49,500**	
	Average Annual Change in GW Storage	15,700		6,100		-2,100		-4,300		-5,100	

[a] EMWD Sales and Subagency sales represent return flows from non-agricultural potable water sales in the Plan Area

Table 2-33
Comparison of Historical, Current, and Projected Average Annual Water Budget Components in the Hemet San Jacinto management area

Flow		Historical Period Average WY 1985-2012 (AFY)		Current Condition Average WY 2013-2018 (AFY)		Updated Projected Baseline Average WY 2019-2070 (AFY)		Projected Climate Change (2030) Average WY 2019-2070 (AFY)		Projected Climate Change (2070) Average WY 2019-2070 (AFY)	
	Applied Water Recharge	10,700		10,300		10,300		10,300		10,300	
Recharge	Rain	9,000	19,700	6,500	18,500	7,500	25,300	6,600	24,400	6,400	24,200
	Grant + IRRP Recharge	0		1,700		7,500		7,500		7,500	
Steam Seepage		10,800	10,800	7,900	7,900	9,500	9,500	9,000	9,000	8,700	8,700
	From Perris North	0		0		0		0		0	
	From Perris South	0		0		0		0		0	
	From Menifee	0		0		0		0		0	
	From Lower Pressure	3,700		4,400		3,500		3,700		3,800	
Underflows In	From Lakeview	100	3,800	0	4,400	0	3,500	0	3,700	0	3,800
	From Hemet North	0		0		0		0		0	
	From Hemet South	0		0		0		0		0	
	From Upper Pressure	0		0		0		0		0	
	From Canyon	0		0		0		0		0	
	From Sun City Area	0		0		0		0		0	
	Lake Perris Right Dam Seepage	0		0		0		0		0	
Boundary Flows	Lake Perris Right Dam Seepage	0	9,000	0	6,600	0	8,300	0	8,200	0	7,900
	Lake Perris Native Underflow	0		0		0		0		0	
	Mountain Front Recharge	9,000		6,600		8,300		8,200		7,900	
Total Average Annual Inflow		**43,300**		**37,400**		**46,600**		**45,300**		**44,600**	
	To Perris North	0		0		0		0		0	
	To Perris South	300		200		500		500		500	
	TO Menifee	0		0		0		0		0	
	To Lower Pressure	200		200		200		200		200	
Underflows Out	To Lakeview	700	1,200	600	1,000	900	1,600	800	1,500	800	1,500
	To Hemet North	0		0		0		0		0	
	To Hemet South	0		0		0		0		0	
	To Upper Pressure	0		0		0		0		0	
	To Canyon	0		0		0		0		0	
	EMWD	13,700		7,200		7,300		7,300		7,300	
	LHWMD	9,500		9,400		7,400		7,400		7,400	
	City of Hemet	4,300		3,700		4,500		4,500		4,500	
	City of San Jacinto	3,000		2,600		3,000		3,000		3,000	
Productions	Soboba (From Natural Recharge)	1,500	51,800	1,500	41,500	1,500	45,000	1,500	45,700	1,500	47,100
	Soboba	200		200		2,400		2,400		2,400	
	Agency Unused Soboba	0		4,300		5,100		5,100		5,100	
	Private Production	19,600		12,600		13,800		14,500		15,900	
Total Average Annual Outflow		**53,000**		**42,500**		**46,600**		**47,200**		**48,600**	
Average Annual Change in GW Storage		-9,700		-5,100		0		-1,900		-4,000	

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Under the Future Baseline conditions, groundwater extractions in the Basin are expected to average approximately 90,200 AFY (Table 2-34; Figure 2-55). These projected groundwater extraction rates result in a net increase in groundwater production in the Basin of approximately 18,100 AFY. The 18,100 AFY increase in groundwater extractions is expected to result in an annual average decline in groundwater storage of approximately 2,400 AFY.

2.5.6.3.3 Assessment of the Projected Water Budgets under the Future Baseline with 2030 Climate Change Factors Conditions

Surface Water Availability

(i) Plan Area

Flows in the San Jacinto River were adjusted using the 2030 central tendency precipitation change factors to account for the influence of reduced precipitation in the San Jacinto Mountains on stream flows entering the Basin. During these 52-year simulation period, San Jacinto River water provided a maximum of approximately 65 AF of recharge to the Plan Area.

Flows in the Perris Valley Storm drain were adjusted using the 2030 Central Tendency precipitation change factors to account for the influence of precipitation variability on surface runoff in the cities of Moreno Valley and Perris. Under the 2030 Central Tendency conditions, the SJFM-2014 estimates approximately 300 AF of surface water recharges the Plan Area through the Perris Valley Storm Drain. This is similar to the historical and Future Baseline conditions (Table 2-32).

(ii) Hemet-San Jacinto Management Area

The Physical Solution, as defined in the Stipulated Judgement Case No. 1207274, identifies groundwater recharge as the preferred method of accomplishing Soboba Settlement Agreement requirements. The Soboba Settlement Agreement facilitated an agreement between EMWD and MWD for an average delivery of 7,500 AF of water for 50 years. This water is used to recharge the Hemet-San Jacinto Management Area through the IRRP and Grant Avenue Ponds.

MWD has determined it is able to meet the surface water demands of all member agencies through 2040 (EMWD 2016a). Beyond 2040, State Water Project water and Colorado River water availability may be impacted by regional climate conditions. MWD has not projected surface water supply availability under different climate conditions. Because MWD has not assessed impacts of climate change on surface water supply availability, it was assumed that MWD will meet EMWD’s surface water demands and the requirements of the Soboba Settlement Agreement through 2070.

San Jacinto River flows were adjusted using the 2030 Central Tendency precipitation change factors. Application of the 2030 Central Tendency change factors resulted a 2% reduction in stream flow entering the Basin, compared to the Future Baseline conditions. Under these conditions, it was estimated that an average of approximately 9,000 AFY of San Jacinto River water recharges the management area (Table 2-33). This approximately 500 AFY less than the Future Baseline conditions and 1,800 AFY less than historical conditions (Table 2-33).

Groundwater Inflows, Outflows, and Changes in Storage

(i) Plan Area

The Basin is expected to experience drier conditions under the 2030 climate change scenario compared to the Future Baseline scenario. Precipitation is expected to decrease by approximately 0.2 inches per year and ET demands are expected to increase by 5% compared to the Future Baseline conditions. The generally drier climate results in less recharge from native water supplies and increased private pumping to meet increased irrigation demands.

Under the 2030 climate change conditions, the SJFM-2014 estimates that the Plan Area will receive approximately 44,700 AF of recharge annually (Table 2-32). This is approximately 5,000 AFY more than historical conditions in the Plan Area, and approximately 1,800 AFY less than the projected Future Baseline conditions (Table 2-32). The 1,800 AFY difference between 2030 climate change and Future Baseline conditions is due to a reduction in rain infiltration and mountain front recharge.

Groundwater extractions from private wells were adjusted using the 2030 ET and precipitation change factors to account for increasing groundwater demands in response to higher ET rates and less precipitation. Under the 2030 climate change scenario, the SJFM-2014 estimates that private wells would extract approximately 500 AFY more than Future Baseline conditions (Table 2-32). Groundwater extractions from municipal wells were not affected by increasing ET demands. Average annual groundwater extractions under the 2030 climate change conditions are approximately 45,600 AFY (Table 2-32).

The 2030 Central Tendency simulation predicts that approximately 3,400 AFY of groundwater will flow out of the Plan Area into the Hemet-San Jacinto Management Area along the jurisdictional boundaries between the Plan Area and the Hemet-San Jacinto Management Area in the unincorporated areas of Winchester and Nuevo/Lakeview (Table 2-32).

The reduction of recharge from native water supplies and increase in private well extractions resulted in an average annual loss of groundwater storage of approximately 4,300 AFY. This is approximately 2,000 AFY more than the Future Baseline Conditions (Table 2-32). At the end of the 52-year simulation, the average reduction of 4,300 AFY leaves a surplus of approximately 249,600 AF of groundwater in storage relative to 1985 conditions.

Table 2-34
Projected Future Baseline Water Budget for the San Jacinto Groundwater Basin

Water Year Type	Inflows (AF)							Total Inflows	Outflows (AF)	Change in Storage [AF]
	Sales	*Irrigation*	*Rain*	*Artificial*	*Stream Leakage*	*From Lake Perris*	*Mountain Front Recharge*		*Groundwater Extractions*	*Annual*
2019-2070 Average	13,700	2,400	14,500	16,300	9,800	11,300	19,800	**87,800**	**90,200**	**-2,400**
Normal Water Year Avg	13,100	2,400	13,100	16,300	6,700	11,200	18,200	**81,100**	**90,100**	**-9,000**
Dry Water Year Avg	14,500	2,400	8,400	16,300	4,600	11,300	15,300	**72,700**	**90,300**	**-17,500**
Wet Water Year Avg	13,700	2,400	27,000	16,300	24,500	11,300	30,500	**125,700**	**90,300**	**35,400**

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(ii) Hemet-San Jacinto Management Area

Under the 2030 climate change conditions, the Hemet-San Jacinto management area is expected to receive approximately 45,400 AF of recharge annually (Table 2-36). This is approximately 2,000 AFY more than historical conditions and approximately 1,300 AFY less that the Future Baseline Conditions (Table 2-33). The 1,300 AFY difference between Future Baseline and 2030 climate change conditions is driven by a reduction of precipitation recharge and San Jacinto River water recharge (Table 2-33). Reduced recharge from rainfall and San Jacinto River water is expected to induce an additional 100 AFY of underflows from the Plan Area to the Hemet San Jacinto management area.

Groundwater extractions from private wells were adjusted to account for the drier climate produced by the 2030 climate change conditions. The water budget analysis for the Hemet-San Jacinto management area indicates that 2030 climate change conditions will result in approximately 700 AFY more extractions from private wells compared to the Future Baseline conditions. The increase of 700 AFY results in an annual average extraction rate in the management area that is approximately 6,100 AFY less than historical conditions (Table 2-33).

The 2030 climate change conditions result in an average annual decline in groundwater storage of approximately 1,900 AFY. Over the 52-year period between water years 2019 and 2070, this results in a total loss of storage of approximately 98,000 AF.

(iii) SJGB

Under the 2030 climate change conditions, the Basin is expected to receive approximately 84,900 AF of recharge annually. This is approximately 7,000 AFY more recharge than historical conditions in the Basin. The increase in recharge is due to imported water recharge, incidental recharge from recycled water storage, Lake Perris Seepage, and increased water sales in the Basin (Tale 2-34). Projected 2030 climate change conditions produce approximately 3,000 AFY less recharge than the Future Baseline Conditions; this is attributed to lower precipitation recharge, mountain front recharge, and stream seepage (Table 2-35).

Under the 2030 climate change conditions, groundwater extractions in the Basin are expected to average approximately 91,300 AFY (Table 2-35). Groundwater extractions in the Plan Area are expected to increase over historical conditions by approximately 25,400 AFY (Table 2-32), while groundwater extractions in the Hemet-San Jacinto management area are expected to decrease by approximately 6,000 AFY (Table 2-33). These projected groundwater extraction rates result in a net increase in groundwater production in the Basin of approximately 19,400 AFY.

Table 2-35
Comparison of Historical, Current, and Projected Average Annual Water Budget Components in the San Jacinto Groundwater Basin

Flow		Historical Period Average WY 1985-2012 (AFY)		Current Condition Average WY 2013-2018 (AFY)		Future Baseline Average WY 2019-2070 (AFY)		Projected Climate Change 2030 Average WY 1985-2070 (AFY)		Projected Climate Change 2070 Average WY 1985-2070 (AFY)	
Recharge	Sales	9,700	39,000	11,400	35,900	13,700	46,900	13,700	44,900	13,700	44,500
	Irrigation	5,100		2,600		2,400		2,400		2,400	
	Rain	17,700		12,000		14,500		12,500		12,100	
	Artificial	6,500		9,900		16,300		16,300		16,300	
Stream Seepage		11,100	11,100	8,215	8,200	9,795	9,800	9,300	9,300	9,000	9,000
Boundary Flows	From Sun City Area	900	27,800	1,100	23,500	1,200	31,200	1,200	30,700	1,200	30,300
	Lake Perris Right Dam Seepage	600		600		600		600		600	
	Lake Perris Right Dam Seepage	3,400		3,400		7,500		7,500		7,500	
	Lake Perris Native Underflow	3,200		3,200		3,200		3,200		3,200	
	Mountain Front Recharge	19,700		15,200		18,700		18,200		17,800	
Total Average Annual Inflow		**77,900**		**67,600**		**87,900**		**84,900**		**83,800**	
Production	Toe Drain	3,400	72,000	3,400	66,500	0	90,100	0	91,300	0	93,200
	LPSRW	0		0		7,500		7,500		7,500	
	EGETS Wells	0		0		200		200		200	
	Perris North Basin Groundwater Contamination Prevention and Remediation Program	0		0		6,700		6,700		6,700	
	Perris South Desal Project	0		0		3,000		3,000		3,000	

Table 2-35
Comparison of Historical, Current, and Projected Average Annual Water Budget Components in the San Jacinto Groundwater Basin

Flow		Historical Period Average WY 1985-2012 (AFY)		Current Condition Average WY 2013-2018 (AFY)		Future Baseline Average WY 2019-2070 (AFY)		Projected Climate Change 2030 Average WY 1985-2070 (AFY)		Projected Climate Change 2070 Average WY 1985-2070 (AFY)	
	Soboba	1,700		1,700		3,900		3,900		3,900	
	HSJ Mgmt Area Production	50,100		39,700		41,100		41,800		43,200	
	West Side Basin Production	16,800		21,700		27,700		28,200		28,700	
Total Average Annual Outflow		**72,000**		**66,500**		**90,100**		**91,300**		**93,200**	
Average Annual Change in GW Storage		5,900		1,100		-2,200		-6,400		-9,400	

Reduced recharge from native water supplies and increased groundwater pumping to meet irrigation demands under the 2030 climate change conditions results in an average annual decline of groundwater storage of approximately 6,400 AFY. Over the 52-year simulation period, this results in a cumulative loss of storage of approximately 332,800 AF.

2.5.6.3.4 Assessment of the Projected Water Budgets under the Future Baseline with 2070 Climate Change Factors Conditions

Surface Water Availability

(i) Plan Area

Flows in the San Jacinto River were adjusted using the 2070 Central Tendency precipitation change factors to account for the influence of reduced precipitation in the San Jacinto Mountains on stream flows entering the Basin. During the 52-year synthetic hydrologic record used in the 2070 Climate Change simulation, groundwater recharge of San Jacinto River water to the Plan Area did not exceed 100 AFY and averaged less than 10 AFY.

Flows in the Perris Valley Storm drain were adjusted using the 2070 Central Tendency precipitation change factors to account for the influence of precipitation variability on surface runoff in the cities of Moreno Valley and Perris. Under the 2070 climate change conditions, the SJFM-2014 estimates that infiltration of surface water through the Perris Valley Storm Drain will provide an average of approximately 300 AFY of recharge to the Plan Area. This is approximately similar to the historical and Future Baseline conditions.

(ii) Hemet-San Jacinto Management Area

The Physical Solution, as defined in the Stipulated Judgement Case No. 1207274, identifies groundwater recharge as the preferred method of accomplishing Soboba Settlement Agreement requirements. The Soboba Settlement Agreement facilitated an agreement between EMWD and MWD for an average delivery of 7,500 AF of water for 50 years. This water is used to recharge the Hemet-San Jacinto Management Area through the IRRP and Grant Avenue Ponds. Because MWD has not assessed impacts of climate change on surface water supply availability, it was assumed that MWD will meet EMWD's surface water demands and the requirements of Soboba Settlement Agreement through 2070.

Estimates of the San Jacinto River recharge rates to the Basin within the Hemet-San Jacinto Management Area were based on regressions between historical simulation results for San Jacinto River recharge in the management area, and future projected hydrology. These estimates implicitly account for diversions of San Jacinto River water by EMWD and LHMWD; projected diversions by EMWD and LHWMD were not independently estimated as part of the GSP preparation. An average of approximately 8,700 AFY of San Jacinto River water recharged the Basin in the 2070 climate change future simulations (Table 2-39). This is approximately 800 AFY less than Future Baseline conditions.

Groundwater Inflows, Outflows, and Changes in Storage

(i) Plan Area

The Basin is expected to experience drier conditions under the 2070 climate change scenario compared to both the Future Baseline scenario and 2030 climate change scenario. Compared to the Future Baseline conditions, precipitation is expected to decrease by an average of approximately 0.5 inches per year and ET demands are expected to increase by approximately 10%. The generally drier climate results in less recharge from native water supplies and increased private pumping to meet increased irrigation demands.

Under the 2070 climate change conditions, the SJFM-2014 estimates that the Plan Area will receive approximately 44,400 AF of recharge annually (Table 2-32). This is approximately 4,700 AFY more than historical conditions in the Plan Area, and approximately 2,100 AFY less than the projected Future Baseline Conditions (Table 2-32). The 2,100 AFY difference between 2030 climate change and Future Baseline Conditions is due to a general reduction in rain infiltration and mountain front recharge.

Groundwater extractions from private wells were adjusted using the 2070 ET and precipitation change factors to account for increasing groundwater demands in response to higher ET rates and less precipitation. Under the 2070 climate change scenario, the SJFM-2014 estimates that private wells would extract approximately 1,100 AFY more than Future Baseline Conditions (Table 2-32). Average annual groundwater extractions under the 2070 climate change conditions are approximately 46,100 AFY (Table 2-32).

The 2070 Central Tendency simulation predicts that approximately 3,400 AFY of groundwater will flow out of the Plan Area into the Hemet-San Jacinto Management Area along the jurisdictional boundaries between the Plan Area and the Hemet-San Jacinto Management Area in the unincorporated areas of Winchester and Nuevo/Lakeview (Table 2-32).

The reduction of recharge from native water supplies and increase in private well extractions resulted in an average annual loss of groundwater storage of approximately 5,100 AFY. This is approximately 3,000 AFY more than the Future Baseline Conditions (Table 2-32). At the end of the 52-year simulation, the average reduction of 5,400 AFY leaves a surplus of approximately 208,000 AF of groundwater in storage relative to 1985 conditions.

(ii) Hemet-San Jacinto Management Area

Under the 2070 climate change conditions, the Hemet-San Jacinto management area is expected to receive approximately 44,600 AF of recharge annually (Table 2-36). This is approximately 1,300 AFY more than historical conditions and approximately 2,000 AFY less that the Future Baseline conditions (Table 2-33). The 2,000 AFY difference between Future Baseline and 2070 climate change conditions is driven by a reduction of precipitation recharge and San Jacinto River water recharge (Table 2-33).

Groundwater extractions from private wells were adjusted to account for the drier climate produced by the 2070 climate change conditions. The water budget analysis for the Hemet-San Jacinto management area indicates that 2070 climate change conditions will result in approximately 2,000 AFY more extractions from private wells compared the Future Baseline conditions. The increase of 2,100 AFY results in an annual average extraction rate in the management area that is approximately 3,700 AFY less than historical conditions (Table 2-33).

The 2070 climate change conditions result in an average annual decline in groundwater storage of approximately 4,000AFY. Over the 52-year period between water years 2019 and 2070, this results in a total loss of storage of approximately 208,000 AF.

(iii) SJGB

Under the 2070 climate change conditions, the Basin is expected to receive approximately 83,800 AF of recharge annually. This is approximately 5,900 AFY more recharge than historical conditions in the Basin. The increase in recharge is largely driven by the imported water recharge and incidental recharge from recycled water storage (Tale 2-34). Projected 2070 Climate Change conditions produce approximately 4,100 AFY less recharge than the Future Baseline conditions; this is attributed to lower precipitation recharge, mountain front recharge, and stream seepage (Table 2-35).

Under the 2070 climate change conditions, groundwater extractions in the Basin are expected to average approximately 93,200 AFY (Table 2-35). Groundwater extractions in the Plan Area are expected to increase over historical conditions by approximately 25,900 AFY (Table 2-32), while groundwater extractions in the Hemet-San Jacinto management area are expected to decrease by approximately 4,700 AFY (Table 2-33). These projected groundwater extraction rates result in a net increase in groundwater production in the Basin of approximately 21,200 AFY.

Reduced recharge from native water supplies and increased groundwater pumping to meet irrigation demands under the 2070 climate change conditions results in an average annual decline of groundwater storage of approximately 9,400 AFY. Over the 52-year simulation period, this results in a cumulative loss of storage in the Basin of approximately 488,000 AF.

2.5.7 Surface Water Available for Groundwater Recharge or In-Lieu Use

EMWD relies on imported and locally derived surface water supplies to recharge the Basin and meet water demands of customers within their service area. Surface water availability for groundwater recharge and deliveries within the Basin is discussed in Sections 2.5.6.1 and 2.5.6.2. Imported water volumes between water years 2007 and 2019 are presented in Table 2-22. Imported water used to supplement municipal and agricultural supplies is not accounted for as in-lieu water deliveries to the Basin.

In addition to imported water supplies, EMWD holds the right to divert up to 5,760 AF of San Jacinto River water at EMWD's Grant Avenue Ponds (EMWD 2016). EMWD's diversions take place between November 1st and June 30th each year; because the San Jacinto River is ephemeral, river flows may be insufficient for any diversions in some years. EMWD is required to store diverted San Jacinto River water in the Basin (EMWD 2019b). Surface water diversions between 2009 and 2019 are provided in Table 2-23.

2.5.8 Characterization of Model Sensitivity and Predictive Uncertainty

The SJFM-2014 was calibrated using static groundwater elevations measured between January 1984 and December 2012 at 197 wells located throughout the Basin (EMWD 2016b). Calibration of the SJFM-2014 was performed by adjusting horizontal hydraulic conductivity, vertical hydraulic conductivity, storage parameters, streambed hydraulic conductivity, and dynamic boundary conditions to produce realistic water budgets, match long-term groundwater elevation trends, and match measured static water level elevations (EMWD 2016b).

Following the model calibration, a sensitivity analysis of the SJFM-2014 was performed to quantify the sensitivity of predicted groundwater elevations to the calibrated parameters (EMWD 2016b). The sensitivity analysis was performed by systematically adjusting seven model parameters and boundary conditions:

- Applied water recharge
- Horizontal Hydraulic conductivity
- Vertical hydraulic conductivity
- Specific yield
- Specific storage
- Mountain Front Recharge
- Streambed hydraulic conductivity

A total of 28 model runs were performed to characterize the sensitivity of predicted groundwater elevations to the seven parameters. During each model run, one of the seven parameters was multiplied by a factor of either 0.25, 0.5, 1.5, or 2 and the remaining parameters were held constant at the calibrated parameter value. Each model was run using the historical conditions and model sensitivity to the parameter adjustment was quantified by calculating changes to the average groundwater elevation at each calibration well and changes to the root mean square error (RMSE) between observed and simulated groundwater elevations. Large changes to the average groundwater elevation and RMSE indicated that the SJFM-2014 was sensitive to the parameter (EMWD 2016b).

Results from the sensitivity analysis indicate that the SJFM-2014 is most sensitive to applied water recharge rates, mountain front recharge, specific yield, and horizontal hydraulic conductivity. Mountain front recharge and applied water recharge, which includes recharge from potable water sales, agricultural irrigation, and recycled water sales and storage, are the two largest sources of groundwater inflows to the Plan Area. Specific yield and horizontal hydraulic conductivity control the volume of groundwater released from storage and hydraulic gradients across the Basin, which directly affect simulated groundwater elevations.

Average groundwater elevations in the Plan Area were most sensitive to increases and decrease in the applied water recharge rates. When applied water recharge was multiplied by a factor of 2, average groundwater elevations across the Plan Area increased by approximately 50 feet and the RMSE increased by approximately 2.5 feet. When the applied water recharge rates were multiplied by a factor of 0.5, average groundwater elevations across the San Jacinto Basin decreased by approximately 50 feet, and the RMSE increased by approximately 2 feet.

Following applied water recharge, average groundwater elevations in the Plan Area were most sensitive to mountain front recharge. When mountain front recharge was adjusted by a factor of 0.25, average groundwater elevations in the Plan Area decreased by approximately 40 feet; when mountain front recharge was multiplied by a factor of 2, average groundwater elevations in the Plan Area increased by approximately 50 feet. Average groundwater elevation changes were largest in the north-eastern segment of the Plan Area that borders the San Timoteo Badlands. Here, a factor of 2 adjustment to the mountain front recharge rate resulted in an increase in the average groundwater elevation of approximately 125 feet. This largely reflects the fact that this portion of the model has the highest inflows from mountain front recharge (EMWD 2016b).

Adjustments to specific yield and horizontal hydraulic conductivity resulted in average groundwater elevation changes across the Plan Area that ranged from -10 to 50 feet and -5 to 5 feet, respectively. Changes to specific yield resulted in average groundwater elevation changes in the City of Perris that ranged from an increase of 50 feet to a decrease of 25 feet. This region of the Plan Area is dynamically stressed by variable groundwater extraction rates and receives large volumes of groundwater recharge via recycled water storage.

The RMSE values calculated for the sensitivity analysis model runs were all larger than the RMSE calculated for the calibrated model. The fact that changes to the seven parameters produced larger model errors when compared to the calibrated model indicates that the SJFM-2014 has been optimized to represent historical conditions. The relatively high model-sensitivity to values of applied water recharge suggests that uncertainty in projected land use change, consumptive use patterns, and hydrology introduce uncertainty in the projected water levels and storage change computed by the SJFM-2014. Throughout the planning and implementation process, land use changes, water deliveries, and hydrology will be incorporated into the SJFM-2014 to refine model estimates of projected water levels and storage change in an effort to reduce predictive uncertainty, refine management strategies, and ensure ongoing beneficial use of groundwater in the Basin.

2.5.8.1 Uncertainty associated with future climate conditions

Projected groundwater conditions in the GSP Plan Area were assessed using results from the SJFM-2014 under three climate scenarios: (1) a Future Baseline scenario, in which the simulated climate conditions, and corresponding inputs to the SJFM-2014, were developed using an aggregate of measured data for the period of 1984-2018 and 1992-2012, (2) a Climate Change I scenario, in which DWR’s 2030 central tendency precipitation and ET change factors were applied to model input files and (3) a Climate Change II scenario, in which DWR’s 2070 central tendency precipitation and ET change factors were applied to model input files. In addition to the 2030 and 2070 central tendency change factors, DWR has developed change factors to simulate conditions under a drier extreme warming (DEW) scenario. As noted in Section 2.2.3, the 2030, 2070, and DEW change factors result in a reduction in the average annual precipitation rate of 3%, 7%, and 17% compared to historical measured precipitation rates (Section 2.2.3). Groundwater conditions under the DEW climate scenario were not simulated as part of this GSP development.

Results from the SJFM-2014 indicate that groundwater recharge from native water supplies[44] historically accounted for approximately 50% of the average annual recharge to the Plan Area (Table 2-32). Under the future conditions, recharge from native water supplies are expected to decrease, but this decrease will be offset by an increase in recycled water recharge and potable water sales within the Plan Area (Table 2-32). Climate conditions represented by the DEW scenario may reduce native recharge such that the total recharge to the Plan Area is not offset by water sales and recycled water production. These reduced recharge rates may lead to a faster rate of groundwater storage decline compared to the three simulated future climate scenarios.

The sustainable management criteria presented in Chapter 3 of this Plan are established to ensure long-term beneficial use of groundwater in the Plan Area, in part, by maintaining sufficient volume of groundwater in storage to support the operation of water quality control projects that protect

[44] Groundwater recharge to the Plan Area from native water supplies include recharge from rainfall infiltration, mountain front recharge, and recharge from surface water infiltration.

municipal and domestic groundwater supplies (Chapter 3, Section 3.1). The implementation and operation of these projects will result in groundwater extraction rates that exceed the historical sustainable yield and historical groundwater production rates (Section 2.5.6.3.1). Groundwater elevations in the Plan Area have historically risen by as much as 150 feet (Section 2.4.1) and the implementation of future projects are projected to cause groundwater elevation declines that locally approach historical low conditions (Chapter 3, Section 3.2).

Climate conditions represented by the DEW scenario demonstrate the need to develop and implement projects and management actions that enhance and protect local water supplies. The water quality control projects implemented as part of this GSP aim to decrease reliance on imported water supplies, thereby providing a more reliable future water supply to all beneficial users (EMWD 2018). It is not anticipated that climate conditions under the DEW scenario will impact future operation of the GSP projects. However, climate conditions, and their effects on groundwater in the Plan Area will be evaluated throughout the GSP Implementation.

2.5.8.2 Potential groundwater losses associated with Native Vegetation and Managed Wetlands

As part of the water budget development, each Plan is required to characterize total groundwater outflows for all water use sectors present in the Basin (23 CCR §354.18 (b)(3)). Water use sectors include domestic, municipal, and agricultural users, as well as managed wetlands and native vegetation. Groundwater outflows due to domestic, municipal, and agricultural users are described in Section 2.5.2.1, 2.5.6.1, 2.5.6.2, and 2.5.6.3.

Evapotranspiration of shallow groundwater by native vegetation may contribute to the total groundwater outflows in the Plan Area. These losses are not explicitly modeled by the SJFM-2014 but were implicitly accounted for during model development and calibration. The omission of these processes in the SJFM-2014 is a reasonable assumption as groundwater generally occurs at depths that exceed the rooting zones of the natural vegetation communities identified by the NCCAG (Section 2.4.7). The exception to this is near MARB, where groundwater likely supplies a source of water to Red Willow and the Common Elderberry habitats, and along the periphery of the Plan Area, where groundwater may provide a source of water to overlying habitats (Section 2.4.7).

The Red Willow and Common Elderberry GDEs identified near MARB range in size from approximately 1.1 to 2.5 acres. Because these habitats are small (approximately 0.007% of the total Plan Area size) their effects on the overall Plan Area water budget are considered negligible. Groundwater outflows from the potential GDEs in the Plan Area are not well constrained by measured data and simulated groundwater elevations in this region of the model domain are uncertain (Section 2.4.6 and 2.4.7).

The CDFW maintains approximately 900 acres of managed wetland within the San Jacinto Wildlife Area. These wetlands are maintained using recycled water supplied to the San Jacinto Wildlife Area by EMWD (Section 2.4.7). The managed wetland is underlain by thick clay deposits that act as a physical barrier between groundwater and the vegetation in the wetland. Because the thick clay limits groundwater-surface water interactions here, the managed wetland does not contribute to groundwater outflows from the Plan Area.

2.6 REFERENCES CITED

23 CCR (California Code of Regulations) 354 Groundwater Sustainability Plan Contents. In Subchapter 2: Groundwater Sustainability Plans.

ACOE (U.S. Army Corps of Engineers). 2015. Submittal of Final 2014 Annual Groundwater Sampling and Analysis Report for Site “Y” at Camp Haan, Riverside County, California. Prepared by Eco & Associates Inc. June.

AFCEC (Air Force Civil Engineer Center). 2018. *Final Site Inspection Report for Aqueous Film Forming Foam Areas, Former March Air Force Base, Site Inspection of Potential Perfluorinated Compound Release Areas at Multiple BRAC Installations.* Prepared by Aerostar SES LLC. July 2018.

AFCEC (Air Force Civil Engineer Center). 2019a. *Final Fourth Five-Year Review Report. March Air Reserve Base and Former March Air Force Base, California*. Prepared by AECOM Technical Services Inc. July 16, 2019.

AFCEC (Air Force Civil Engineer Center). 2019b. *Final 4th Quarter 2018 Groundwater Monitoring Informal Technical Information Report, Site CG049 Basewide Groundwater Monitoring Program, Operating Unit 5, March Air Reserve Base and Former March Air Force Base.* Prepared for Prepared by AECOM Technical Services Inc. May 16, 2019.

Allen, Robert J. and Ray G. Anderson 2018. 21st Century California Drought Risk Linked to Model Fidelity of the El Nino Teleconnection. *Climate and Atmospheric Science.* doi: 10.1038/s41612-018-0032-x.

California Water Code (CWC) Sections 10720 through 10736. Sustainable Groundwater Management Act and Related Provisions.

California Water Code (CWC) Section 12924. Identification of Groundwater Basins.

California Water Code (CWC) Sections 13000 through 16104. Water Quality.

Cayan, Daniel R. Tapash Das, David W. Pierce, Tim P. Barnett, Mary Tyree, and Alexander Gershunov 2010. Future Dryness in the Southwest US and the Hydrology of the Early 21st Century Drought. *Proceedings of the National Academy of Sciences.* doi: 10.1073/pnas.0912391107.

CGS (California Geological Survey). 2012. *Geologic Compilation of Quaternary Surficial Deposits in Southern California*. By T.L. Bedrossian, P. Roffers, C.A. Hayhurst, J.T. Lancaster, and W.R. Short. CGS Special Report 117. Available at: https://www.conservation.ca.gov/cgs/publications/sr217. December 2012.

CDFW (California Department of Fish and Wildlife). 2017. *San Jacinto Wildlife Area Land Management Plan Draft Environmental Impact Report*. State Clearinghouse No. 2016061018. December 2017.

City of Perris. 2019. "Water and Sewer." Webpage. Accessed at http://cityofperris.org/residents/water.html on 11/5/2019.

City of Perris. 2016. *City of Perris General Plan*. As amended through August 2016. http://www.cityofperris.org/city-hall/general-plan.html

City of Menifee. 2018. *City of Menifee General Plan*. As amended through 2018. https://cityofmenifee.us/221/General-Plan.

City of Moreno Valley. 2016. *City of Moreno Valley General Plan*. Dated July 2006, as amended through July 2016. http://www.moreno-valley.ca.us/city_hall/general_plan.shtml

City of San Diego. 2003. *San Diego River System Conceptual Groundwater Management Plan*. Prepared by CH2MHILL. May 2003.

County of Riverside. 2019. Riverside County General Plan. As amended through April 2019.

DWR (California Department of Water Resources). 1981. *Bulletin 74-81: Water Well Standards*, Accessed at https://water.ca.gov/well-standards

DWR (California Department of Water Resources). 1991 *Bulletin 74-90: California Well Standards.* June 1991. Accessed at https://water.ca.gov/well-standards

DWR (California Department of Water Resources). 2003. California's Groundwater. Basin Description for the San Jacinto Groundwater Basin. DWR Bulletin 118.

DWR (California Department of Water Resources). 2014. Summary of Recent, Historical, and Estimated Potential for Future Land Subsidence in California. 2014.

DWR (California Department of Water Resources). 2016. *California's Groundwater*. Bulletin 118, Interim Update 2016. Basin Boundary Descriptions. DWR Basin No. 8-005.

DWR (California Department of Water Resources). 2018. Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development. July 2018.

DWR (California Department of Water Resources). 2019a. "Lake Perris and Perris Dam Projects" Website. Accessed at https://water.ca.gov/Programs/Engineering-And-Construction/PerrisDam-Remediation on 10/29/2019.

DWR (California Department of Water Resources). 2019b. "Basin Boundary Assessment Tool" Website. Accessed at https://gis.water.ca.gov/app/bbat/ on 2/6/2020.

EMWD (Eastern Municipal Water District) 1967. *Geophysical Investigation of the San Jacinto Valley, Riverside County, California.* Prepared by John D. Fett and Associates. December 1967.

EMWD (Eastern Municipal Water District). 1995. *Groundwater Management Plan, West San Jacinto Groundwater Basin*. June 8, 1995.

EMWD (Eastern Municipal Water District). 2002. *Regional Groundwater Model for the San Jacinto Watershed.* Prepared by TechLink Environmental, Inc. December 2002.

EMWD (Eastern Municipal Water District). 2011a. *Water Level Monitoring Plan for the San Jacinto Groundwater Basin for Submittal to California State Department of Water Resources Under the California Statewide Groundwater Elevation (CASGEM) Program.* December 2011.

EMWD (Eastern Municipal Water District). 2011b. *Results of the Soil Characterization Study at the San Jacinto Wildlife Area in Support of the Use of Recycled Water in the San Jacinto Lower Pressure Management Zone.* Prepared by Wildermuth Environmental, Inc. April 29, 2011.

EMWD (Eastern Municipal Water District). 2016a. *2015 Urban Water Management Plan*. Final. Prepared by RMC Water and Environment. June 2016.

EMWD (Eastern Municipal Water District). 2016b. *San Jacinto Groundwater Flow Model Update – 2014 (SJFM – 2014). Model Development and Scenarios*. Prepared by RMC Water and Environment. June 9, 2016.

EMWD (Eastern Municipal Water District). 2016c. *Eastern Municipal Water District Recycled Water Facilities Master Plan, Final Report*. Prepared by RMC Water and Environment. August 2016.

EMWD (Eastern Municipal Water District). 2018. *Perris North Basin Groundwater Contamination Prevention and Remediation Program, Proposition 1 GWGP Implementation Full Proposal*.

EMWD (Eastern Municipal Water District). 2019a. *West San Jacinto Groundwater Management Area 2018 Annual Report*. June 2019

EMWD (Eastern Municipal Water District). 2019b. *Hemet/San Jacinto Groundwater Management Area, 2018 Annual Report*. Prepared for the Hemet-San Jacinto Watermaster. April 2019.

EMWD (Eastern Municipal Water District). 2019c. *Perris II Reverse Osmosis Treatment Facility (ROTF) Monitoring & Reporting Plan (MRP)*. Prepared by Woodard & Curran. March 28, 2019

EMWD (Eastern Municipal Water District). 2019d. Shapefile of Land Use for future buildout

EMWD (Eastern Municipal Water District). 2020. *Perris Valley Regional Water Reclamation Facility*. Webpage. Accessed at https://www.emwd.org/sites/main/files/file-attachments/pvrwrffactsheet.pdf?1537295012 on May 4, 2020.

EMWD (Eastern Municipal Water District), LHMWD (Lake Hemet Municipal Water District), City of Hemet, City of San Jacinto, DWR (California Department of Water Resources). 2007. *Hemet/San Jacinto Groundwater Management Area Water Management Plan*, prepared by Water Resources & Information Management Engineering, Inc.

EPA (U.S. Environmental Protection Agency). 2020. "March Air Force Base Superfund Site Cleanup Activities" Website. Accessed at https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.cleanup&id=0902761, on February 6, 2020.

Fryer, J. L. 2008. *Sambucus racemose. In: Fire Effects Information System, U.S. Department of Agriculture, Forest Service.* Webpage. Accessed at https://fs.fed.us/database/feis/plants/shrub/samrac.all.html, on July 20,2020

Geotracker. 2020. State Water Resources Control Board data management system. Accessed on August 16, 2021. https://geotracker.waterboards.gov/profile_report?global_id=T0606506567

Lite, S. J., and Stromberg, J. C., 2005. *Surface water and ground-water thresholds for maintaining Populus-Salix forests, San Pedro River, Arizona*. Biological Conservation. 125: 153-167. May 2005.

March Joint Powers Authority (JPA). 2019. "About the JPA." Website. Accessed at https://marchjpa.com/about.php, on 10/15/2019.

March Joint Powers Authority (JPA). 2014. Zoning Map. Website. Accessed at https://www.marchjpa.com/documents/docs_forms/planning_zoningmap.pdf, on 10/15/2019. Last Updated March 2014.

March Joint Powers Authority (JPA). Undated. *General Plan for the March Joint Powers Authority*. Available at https://www.marchjpa.com/planning.php. Accessed 10/15/2019.

Matti, J.C., Morton, D.M., and Langenheim, V.E., 2010. Geologic and Geophysical Maps of the El Casco 7.5' Quadrangle, Riverside County, Southern California, with Accompanying Geologic-Map Database. USGS Open-File Report 2010-1274.

Morton, D.M., and Matti, J.C., 2001. Geologic Map of the Lakeview 7.5' Quadrangle, Riverside County, California. USGS Open-File Report OF 01-174.

Morton, D.M., and Miller, F.K., 2006. Geologic Map of the San Bernardino and Santa Ana 30' x 60' Quadrangles, California. USGS Open-File Report 2006-1217. Version 1.0.

RWQCB (California Regional Water Quality Control Board, Santa Ana Region). 2004. Resolution No. R8-2004-0001. January 2004.

RWQCB (Regional Water Quality Control Board, Santa Ana Region). 2019. *Water Quality Control Plan for the Santa Ana River Basin*. Adopted in 1995, Updated June 2019 to include approved amendments.

RWQCB (Regional Water Quality Control Board, Santa Ana Region). 2020. Staff Letter - *Detection of Elevated Per- And Polyfluoroalkyl Substances (Pfas) Released From The Former March Air Force Base and the March Air Reserve Base and Their Impacts On The Beneficial Uses Of Perris North Groundwater Management Zone.* September 29, 2020.

SAWPA (Santa Ana Watershed Project Authority). 2017. *Recomputation of Ambient Water Quality in the Santa Ana River Watershed for the Period 1996 to 2015*. Technical Memorandum. Prepared by Daniel B. Stephens and Associates, Inc. September 22, 2017.

SCAG (Southern California Association of Governments). 2016. *Demographics and Growth Forecast*. Adopted April 2016.

SWRCB (State Water Resources Control Board). 2009. Right to Divert and Use Water: Permit 21404.

SWRCB (State Water Resources Control Board). 2019. *Final 2014/2016 California Integrated Report (Clean Water Act Section 303(d) List / 305(b) Report)*. Accessed September 9, 2019. https://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2014_2016.shtml

SWRCB (State Water Resources Control Board) 2019a. "Drinking Water Watch." Safe Drinking Water Information System (SDWIS). California Public Water Supply Systems Search. Webpage. Accessed at https://sdwis.waterboards.ca.gov/PDWW/index.jsp. On October 28, 2019.

SWRCB (State Water Resources Control Board). 2019b. "eWRIMS Public Summary Page." Water Rights Search Result for the City of Perris. Accessed at https://ciwqs.waterboards.ca.gov/ciwqs/ewrims/EWServlet?Page_From=EWWaterRightSearchResults.jsp&Redirect_Page=EWPublicAppSummary.jsp&Purpose=getEwrimsPublicSummary&wrWaterRightID=46319&applicationID=46099 on 11/5/2019.

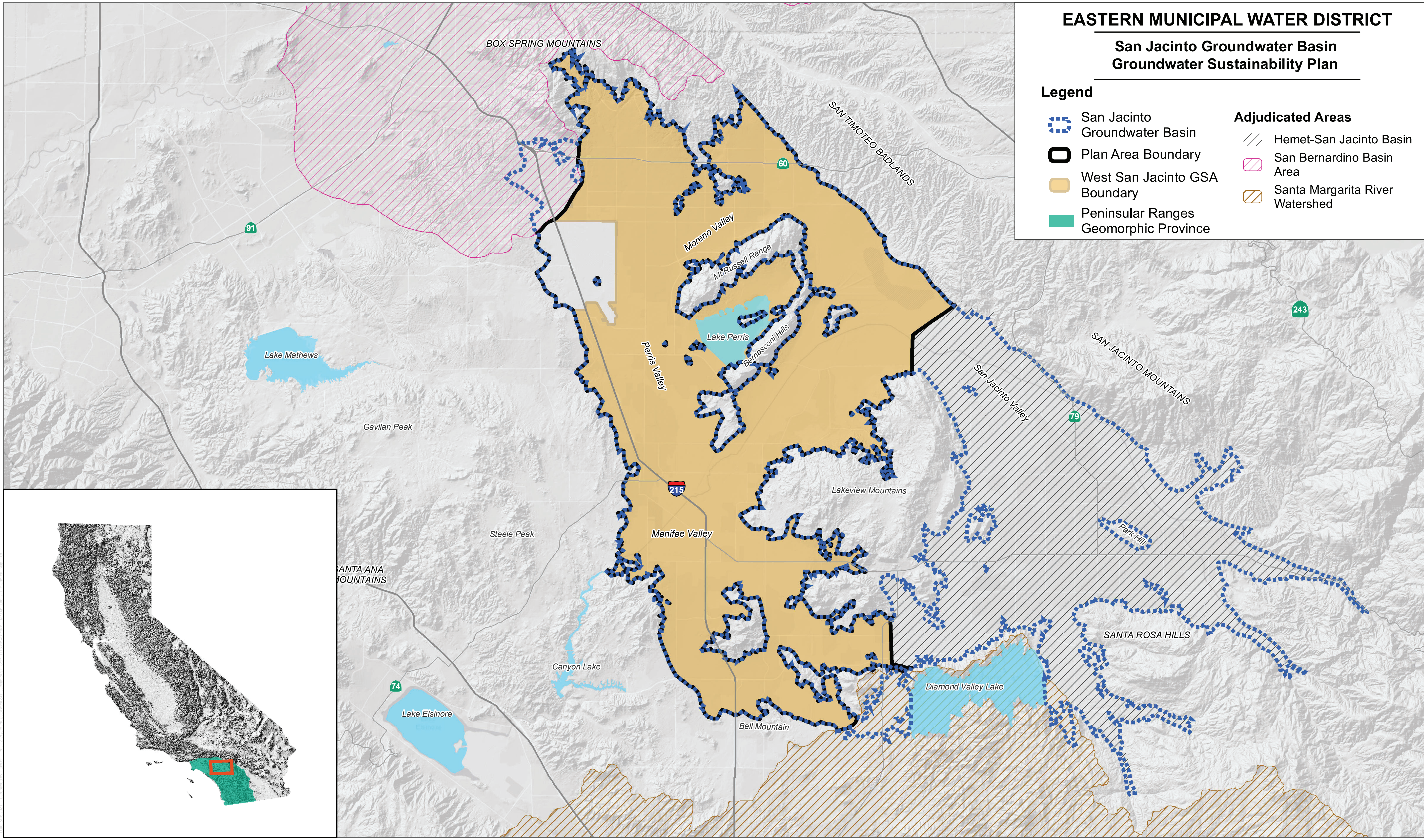
SWRCB (State Water Resources Control Board). 2019c. "Sustainable Groundwater Management Act: Water Quality Frequently Asked Questions." Safe Drinking Water Information System (SDWIS). California Public Water Supply Systems Search. Webpage. Accessed at https://sdwis.waterboards.ca.gov/PDWW/index.jsp. On October 28, 2019.

WMWD (Western Municipal Water District). 2016. 2015 Urban Water Management Plan Update. Final Report. June 2016.

WMWD (Western Municipal Water District). 2020. Western Water Recycling Facility. Webpage. Accessed at https://www.wmwd.com/187/Western-Water-Recycling-Facility-WWRF on September 23, 2020.

Woodford, A. O., Doehring, D. O., and Morton, R. K., 1971. *Pliocene-Pleistocene History of the Perris Block, Southern California*. Geological Society of America Bulletin, v. 82, p. 3421-3448. December 1971.

UNAVCO 2020. *PPBF Overview: Station Page*. Webpage. Accessed at https://unavco.org/instrumentation/network/status/nota/overview/PPBF on September 29, 2020



SOURCE: Esri, Eastern Municipal Water District, California Department of Water Resource

emwd EASTERN MUNICIPAL WATER DISTRICT

0 3 6 Miles

FIGURE 2-1

San Jacinto Groundwater Basin, Plan Area Boundary, and Groundwater Sustainability Agency

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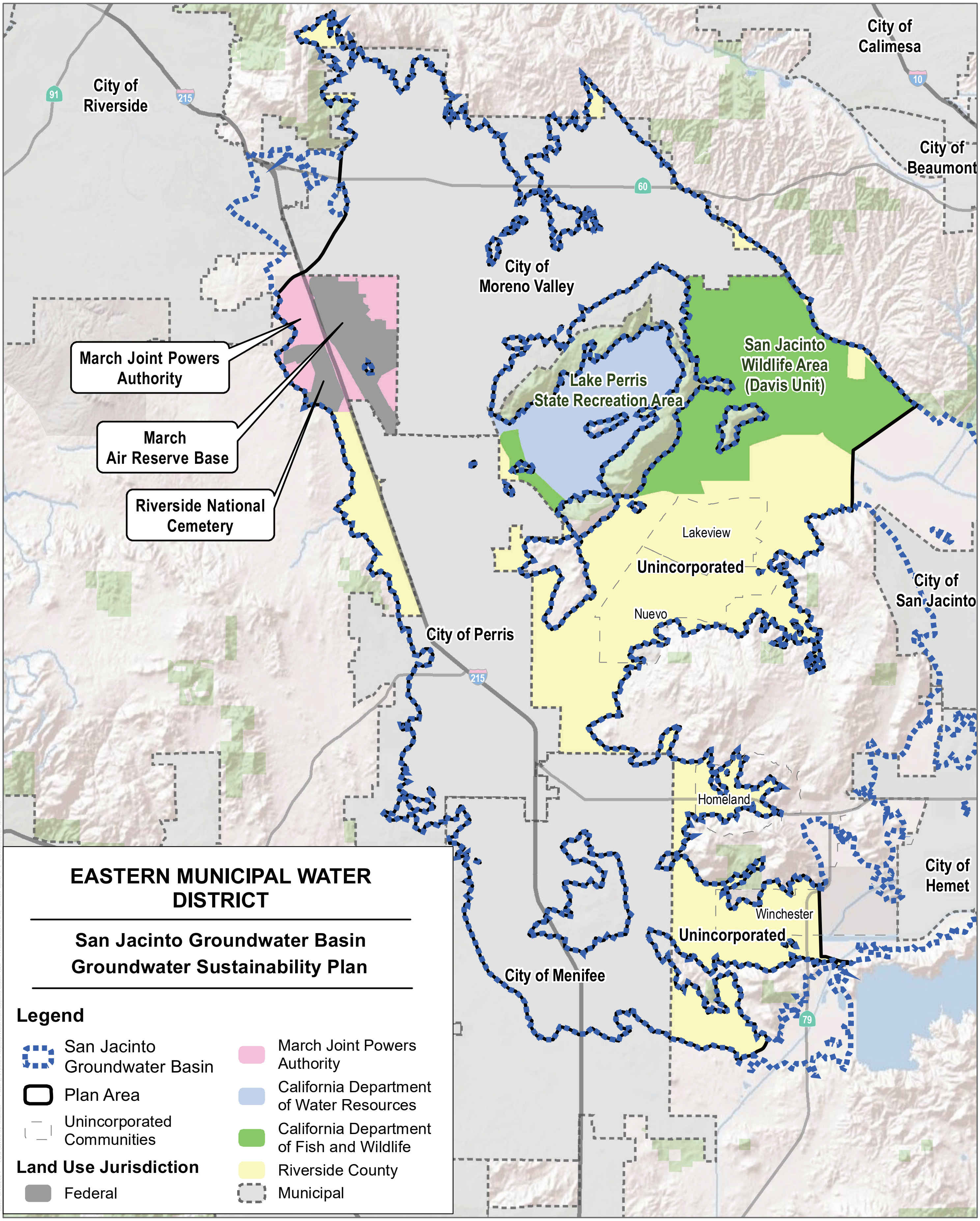

SOURCE: EMWD 2019, March Join Powers Authority 2014 (Zoning Map), CDFW 2017, County of Riverside 2019

0 1 2 Miles

FIGURE 2-2

Jurisdictional Map

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SOURCE: Esri, U.S. Geological Survey, National Geographic Society

emwd EASTERN MUNICIPAL WATER DISTRICT

FIGURE 2-3

State Water Project

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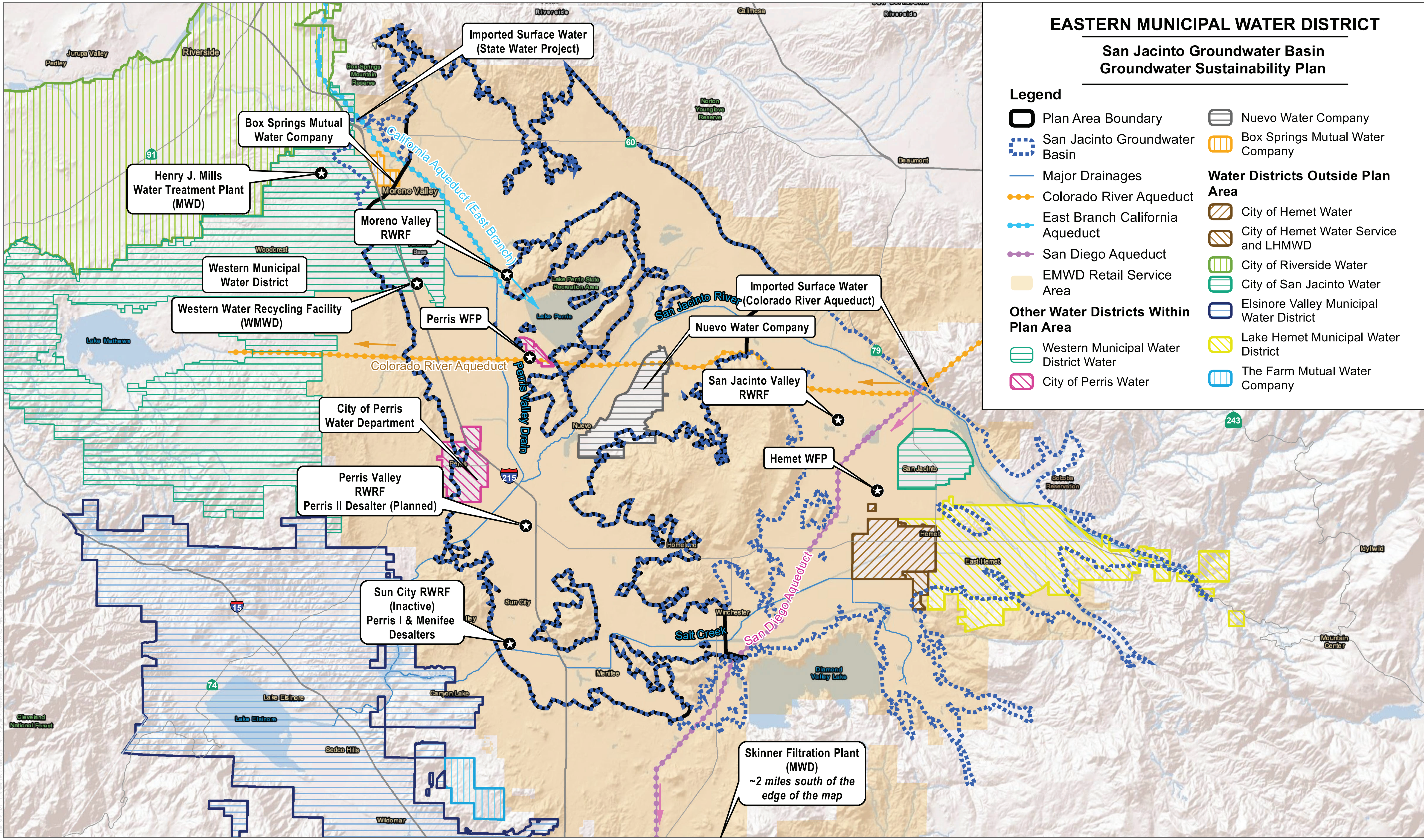

SOURCE: Esri, Eastern Municipal Water District, California Department of Water Resource

FIGURE 2-4

Water Agency Boundaries, Imported Surface Water Sources, and Major Water Treatment Facilities

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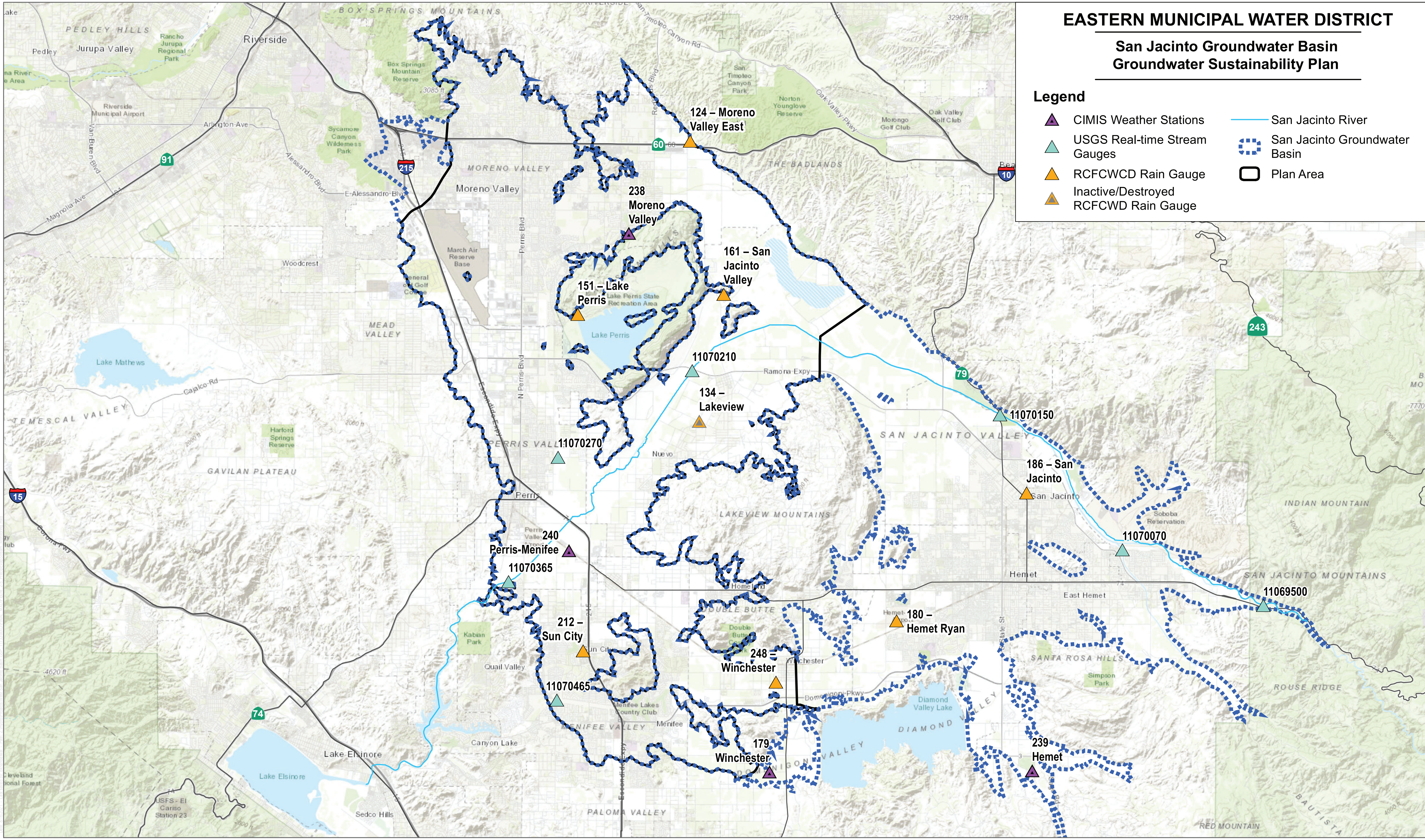

SOURCE: EMWD, U.S. Geological Survey

emwd EASTERN MUNICIPAL WATER DISTRICT

0 2.5 5 Miles

FIGURE 2-5

Precipitation, Evapotranspiration, and Streamflow Monitoring Locations by Agency

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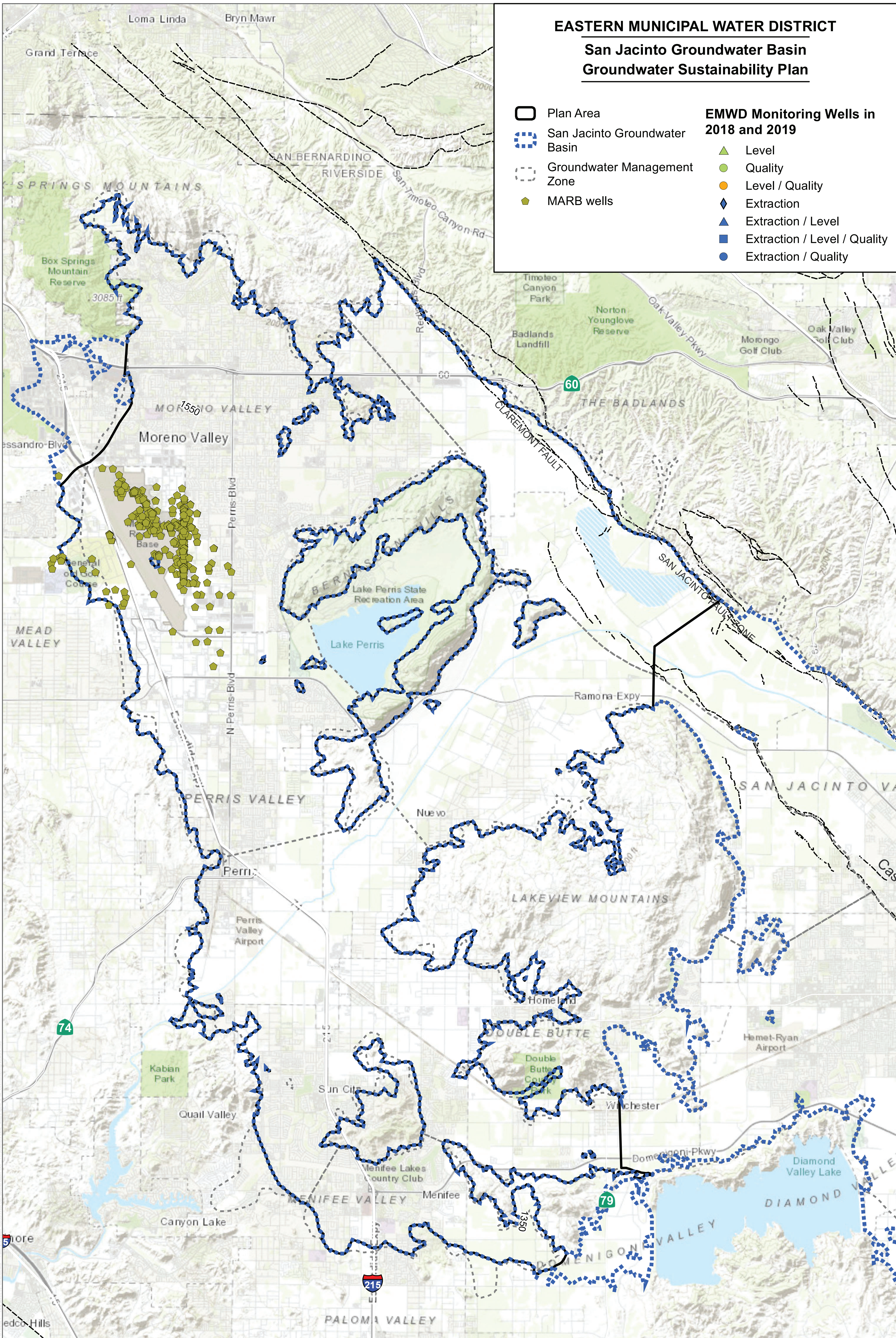

SOURCE: EMWD

FIGURE 2-6

Plan Area Groundwater Monitoring Network

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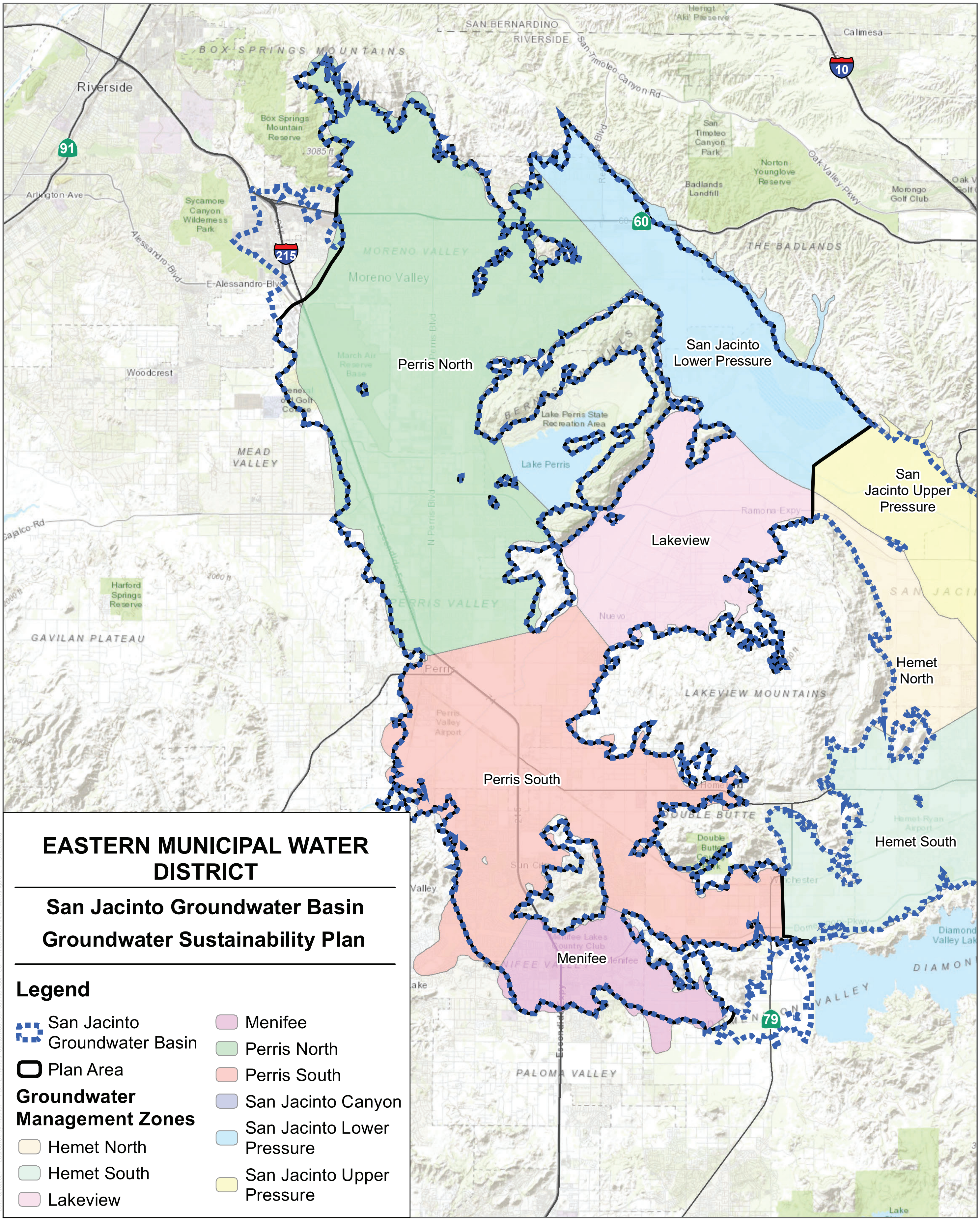

SOURCE: EMWD

FIGURE 2-7

Groundwater Management Zones

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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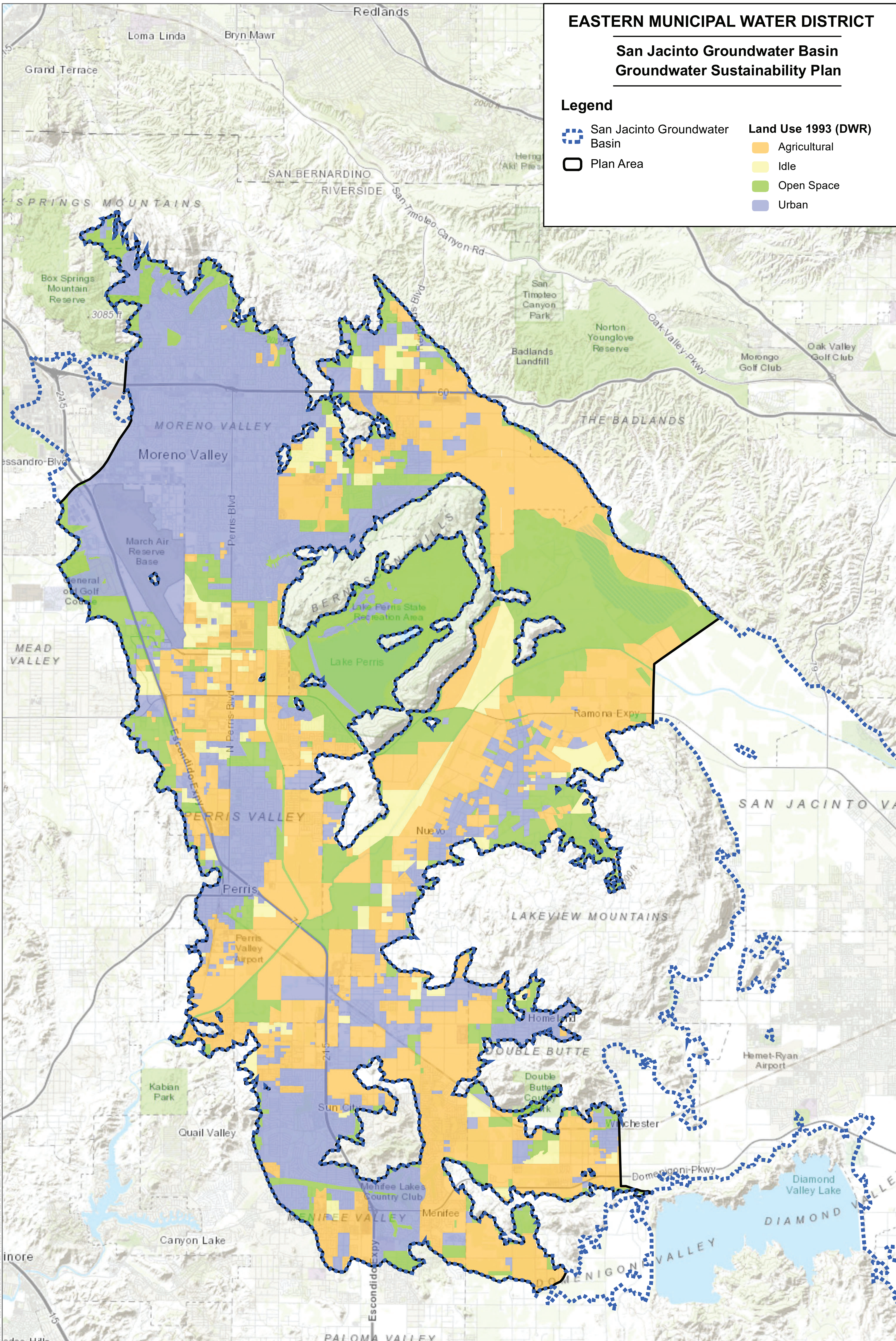

SOURCE: California Department of Water Resources, Esri

emwd EASTERN MUNICIPAL WATER DISTRICT

0 1 2 Miles

FIGURE 2-8A

Land Use, 1993

San Jacinto Groundwater Basin Groundwater Sustainability Plan

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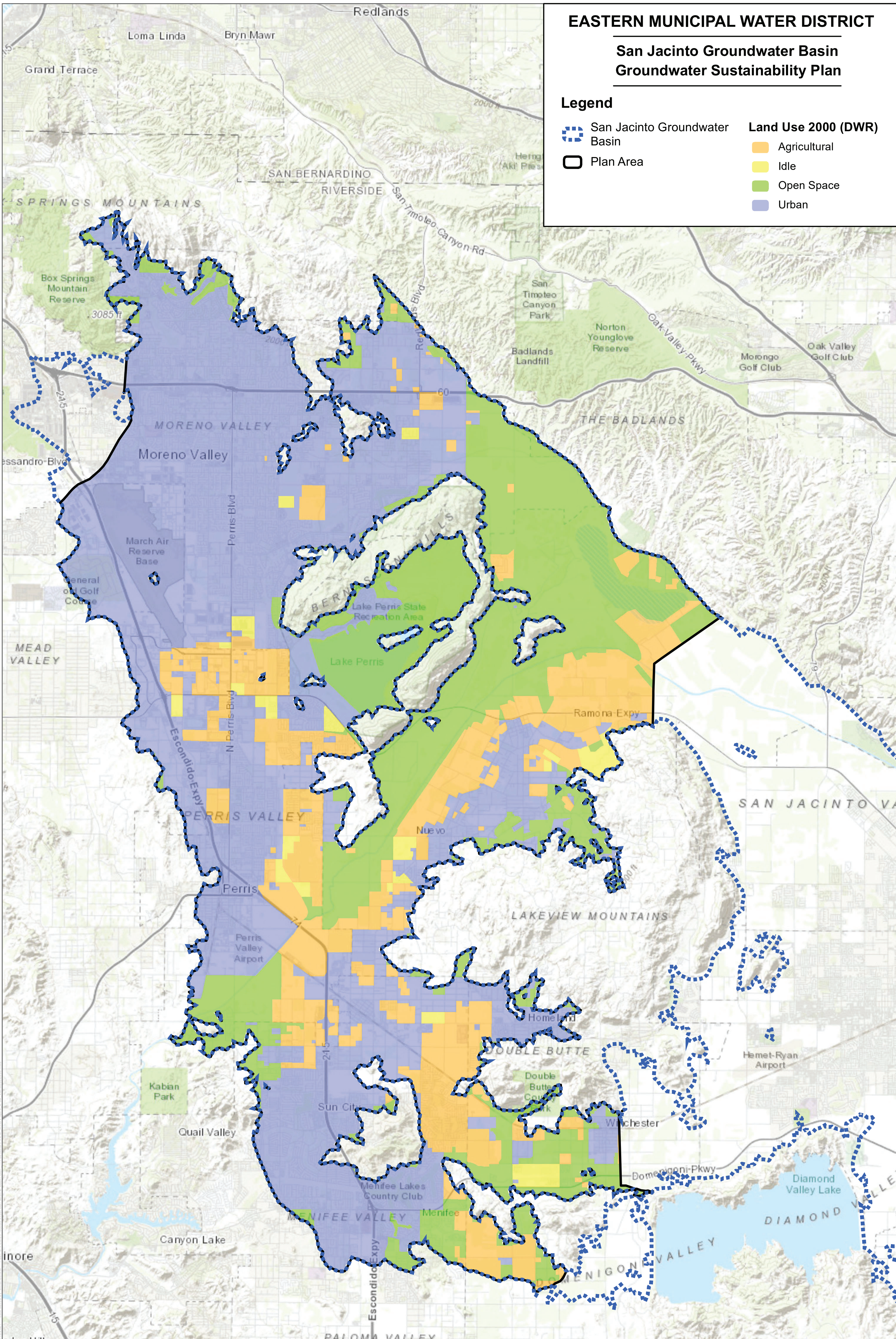

SOURCE: California Department of Water Resources, Esri

FIGURE 2-8B

Land Use, 2000

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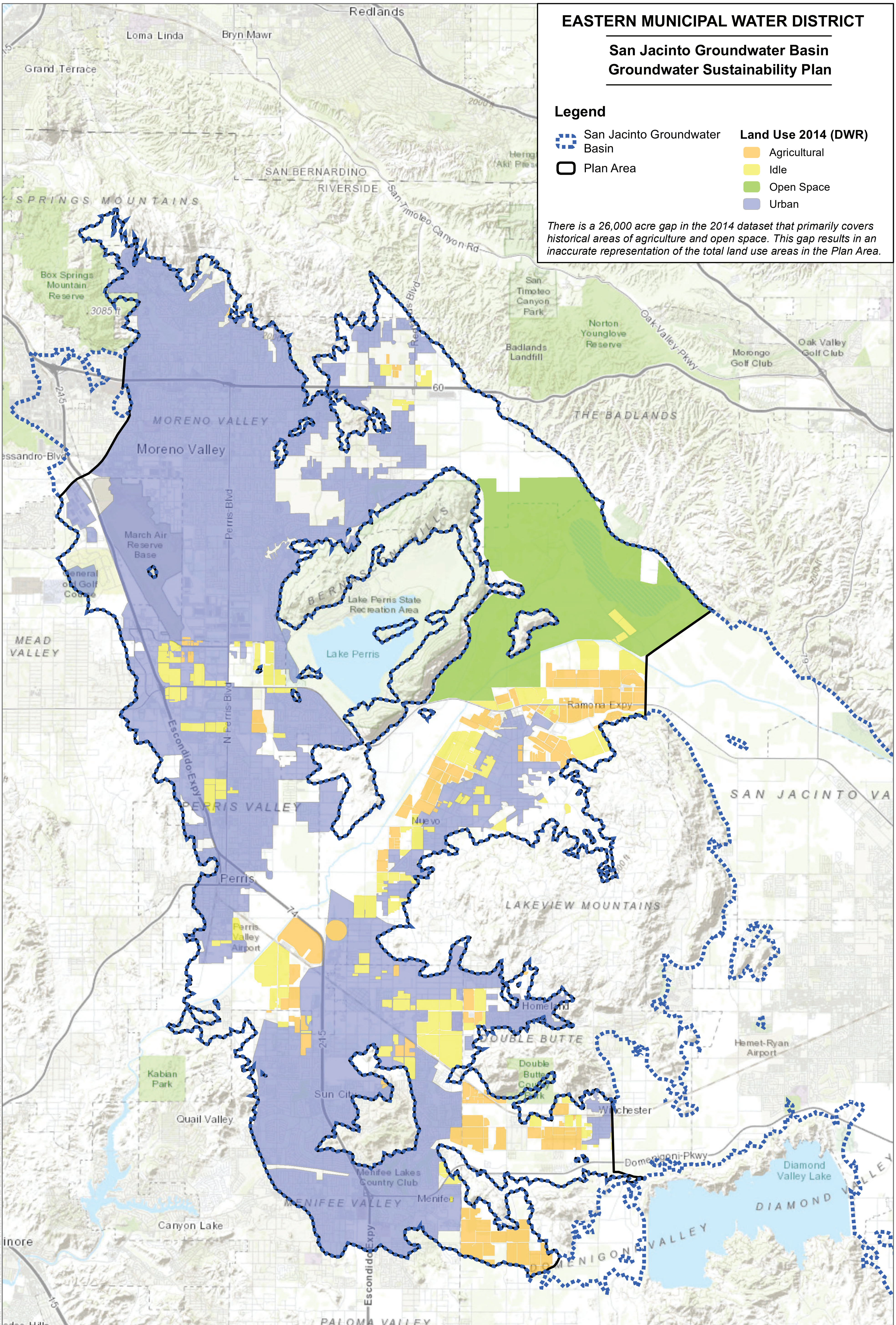

SOURCE: California Department of Water Resources, Esri

FIGURE 2-8C

Land Use: 2014

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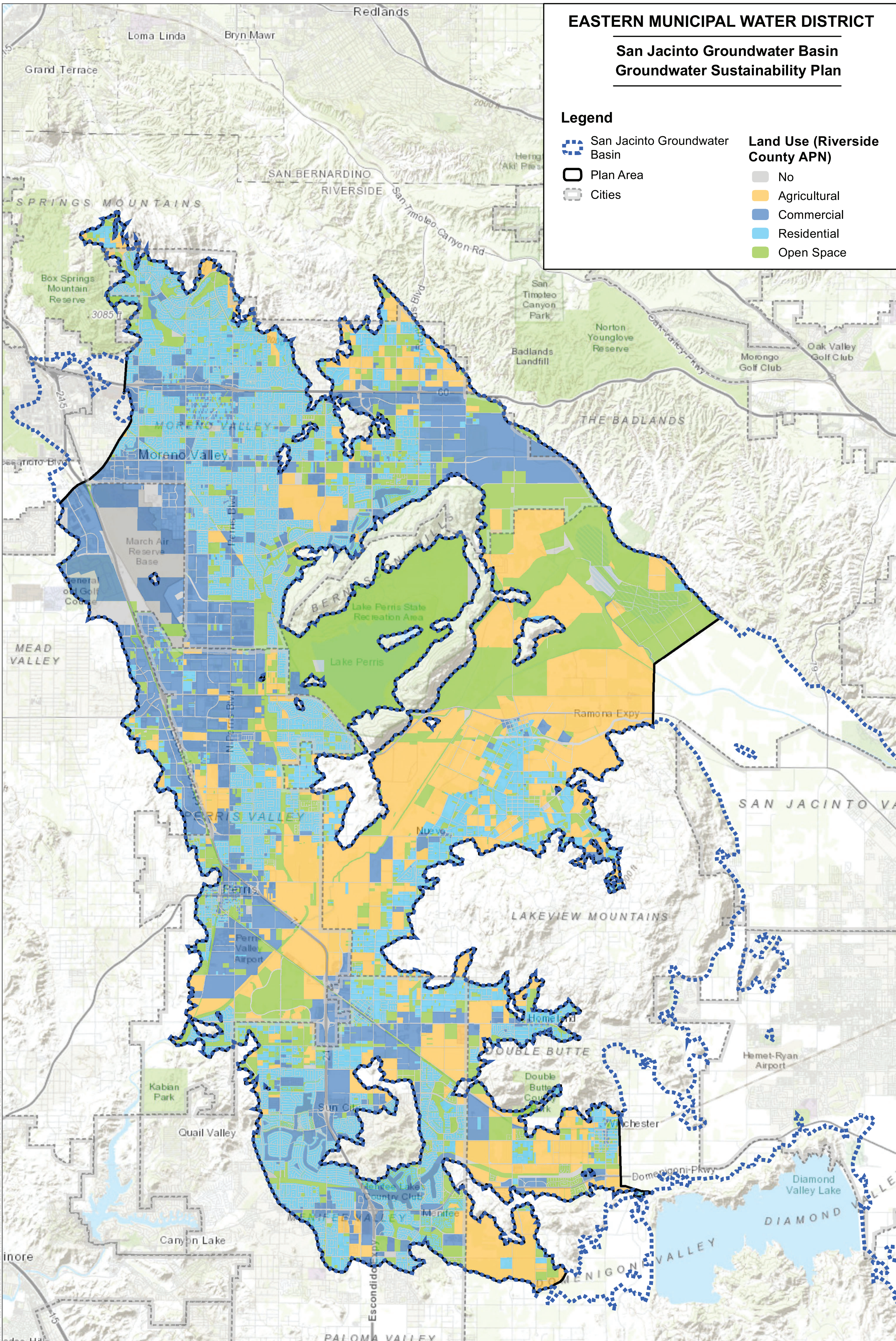

SOURCE: Riverside County (2019), Esri

emwd EASTERN MUNICIPAL WATER DISTRICT

0 1 2 Miles

FIGURE 2-8D

Land Use Based on Riverside County APN Use Codes (2019)

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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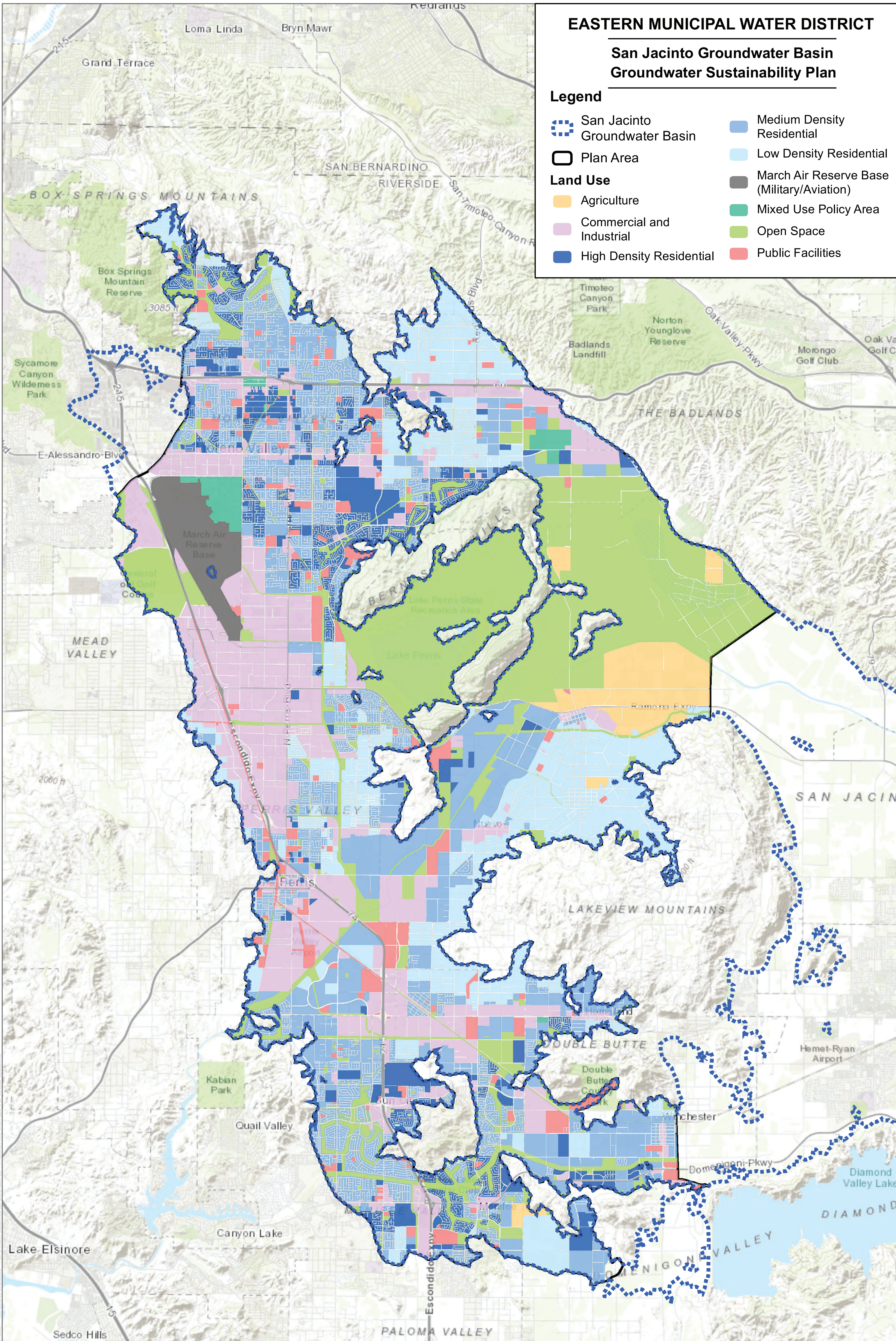

SOURCE: EMWD, Esri

0 1 2 Miles

FIGURE 2-8E

EMWD Estimate of Ultimate Land Use (Build-Out) by 2040 in the Plan Area

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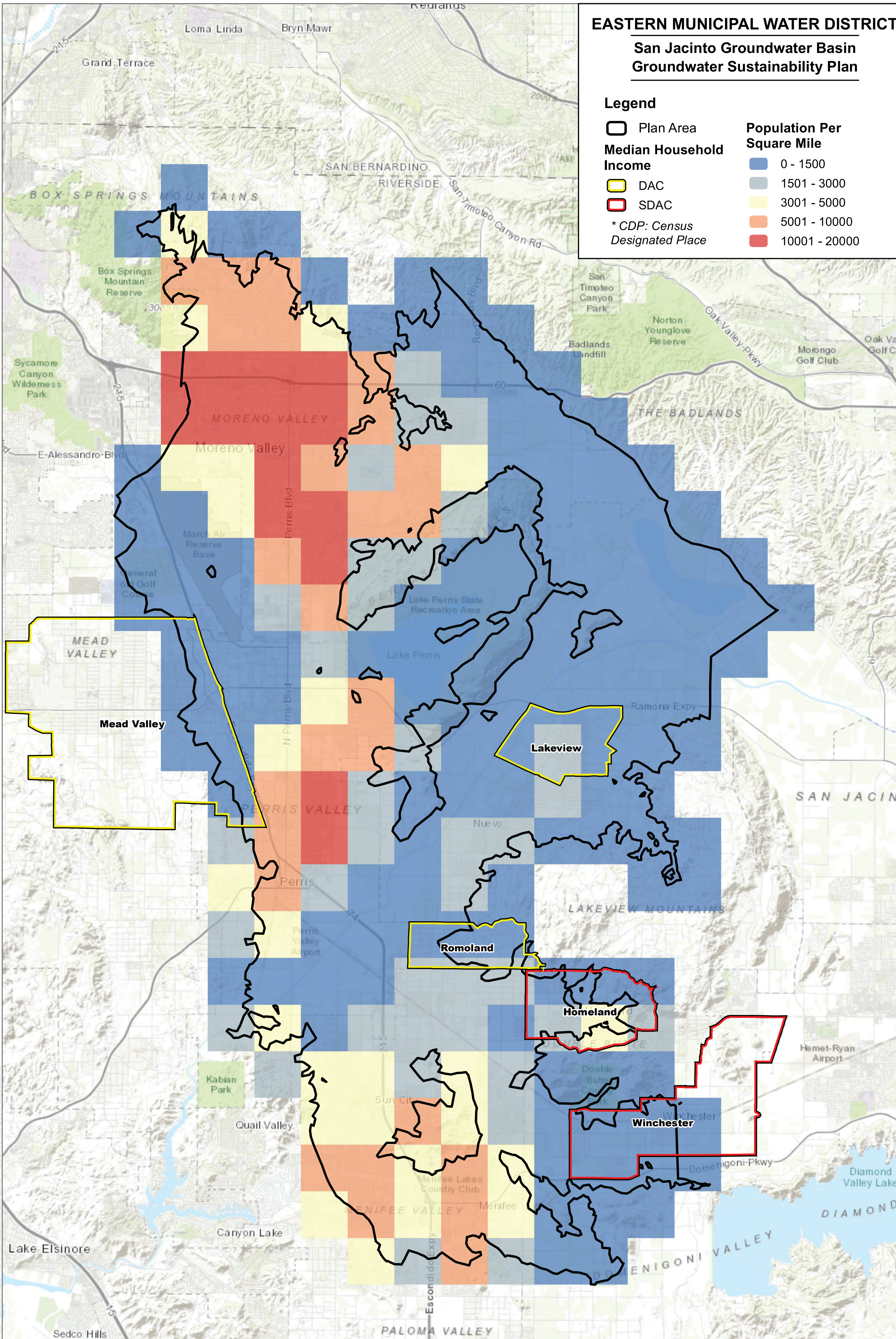

SOURCE: California Department of Water Resources, Esri

FIGURE 2-9

Population Density and Disadvantaged Communities

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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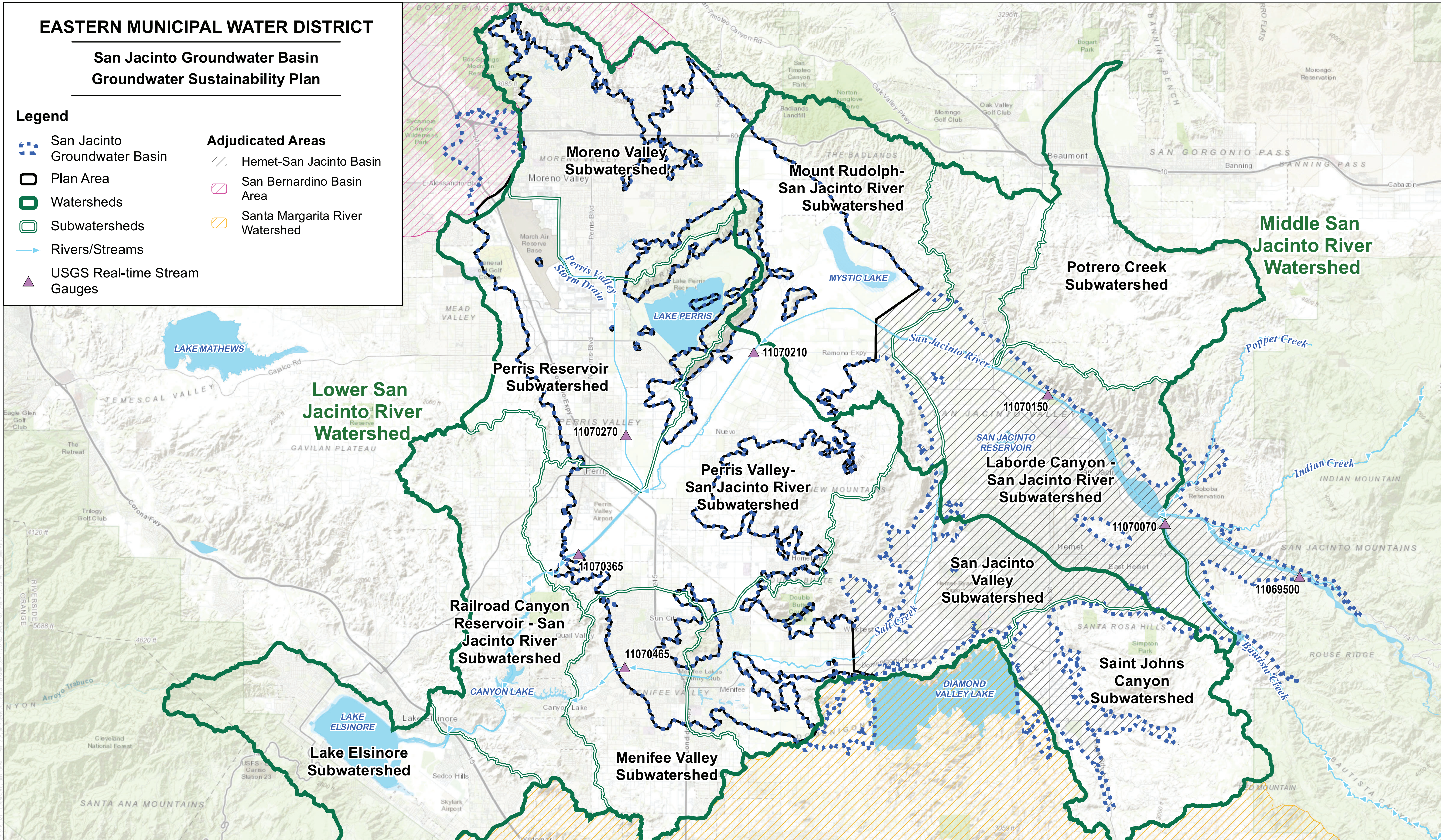

SOURCE: DWR, U.S. Geological Survey NHD, Riverside County Flood Control and Water Conservation District

emwd EASTERN MUNICIPAL WATER DISTRICT

FIGURE 2-10

Watersheds and Drainage

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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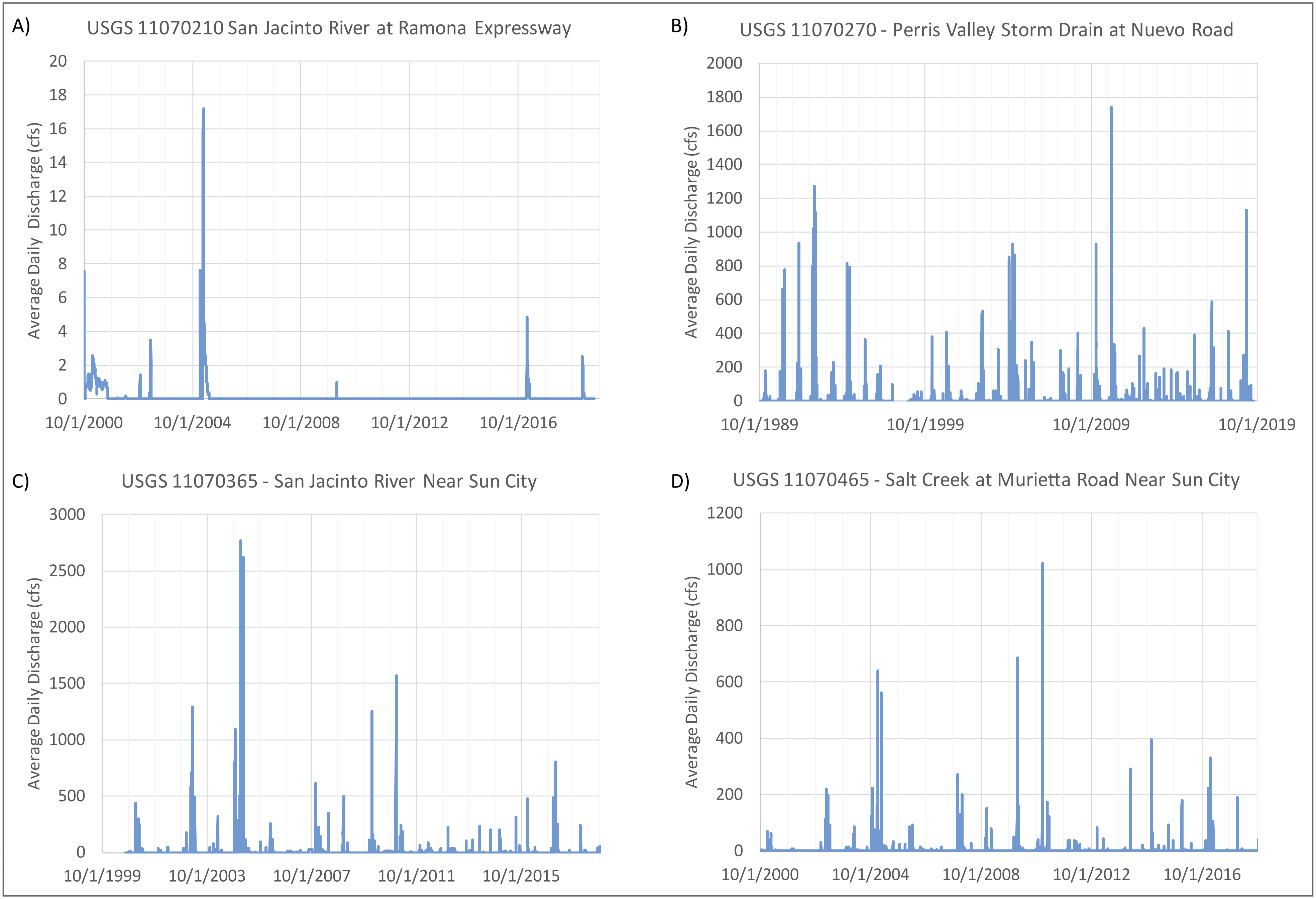

FIGURE 2-11

Stream Gauge Hydrographs for Gauges in the Plan Area

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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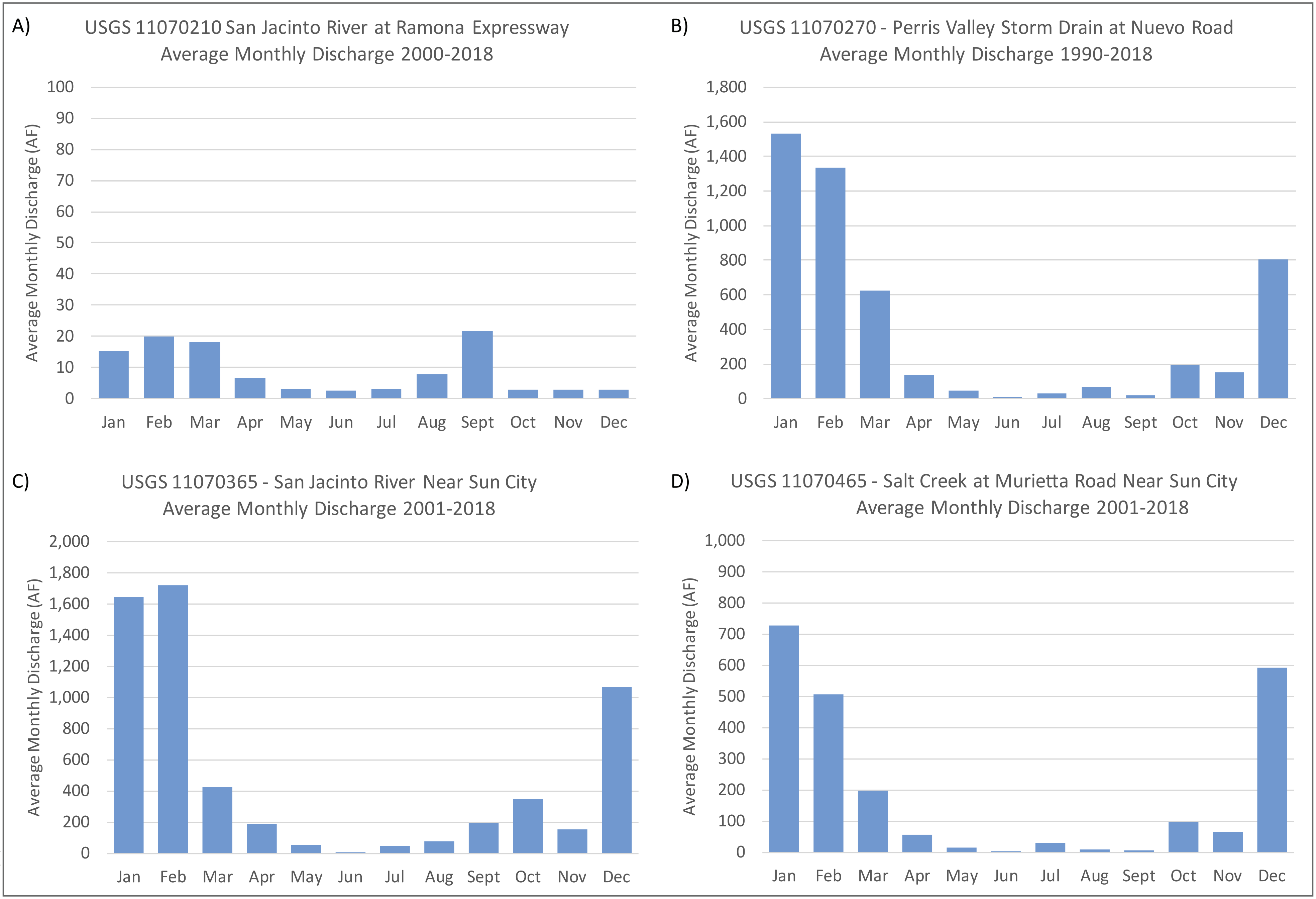

FIGURE 2-12

Monthly Average Streamflow in the Plan Area

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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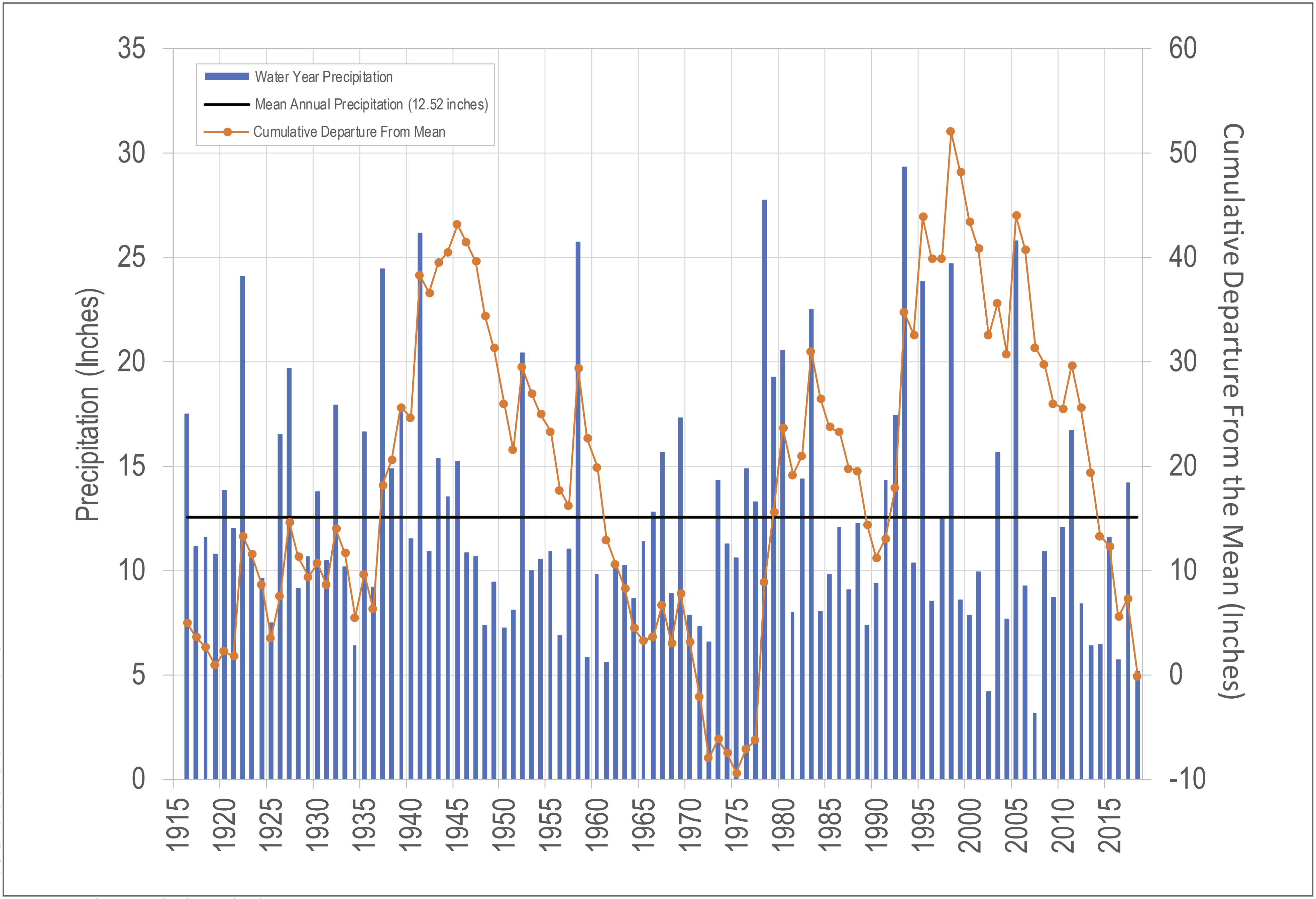

Source: Riverside County Flood Control and Water Conservation District

EASTERN MUNICIPAL WATER DISTRICT

FIGURE 2-13

Water Year Precipitation and Cumulative Departure From the Mean Precipitation at Station #186 - San Jacinto

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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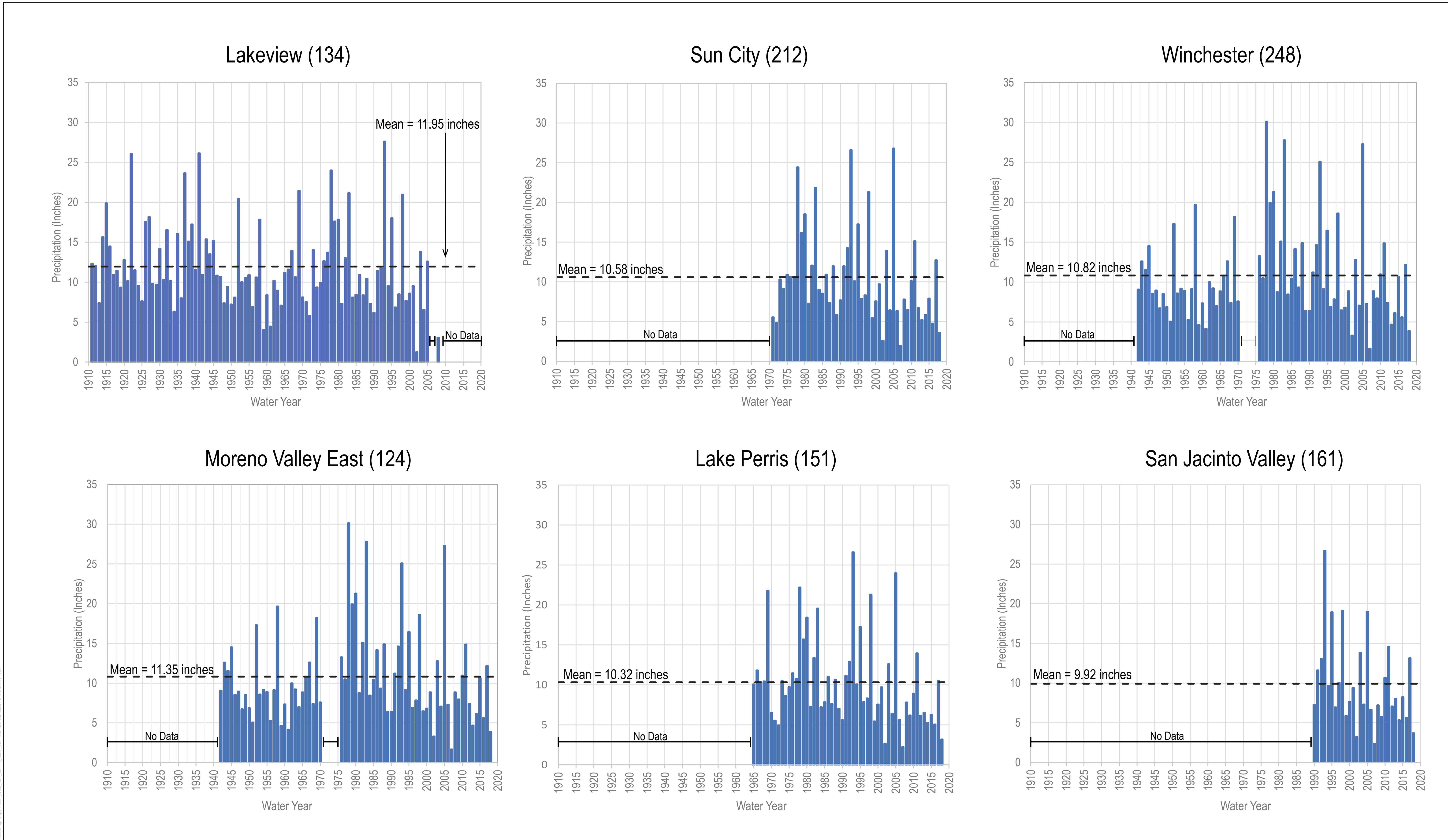

SOURCE: Riverside County Flood Control and Water Conservation District

emwd EASTERN MUNICIPAL WATER DISTRICT

FIGURE 2-14

Water Year Precipitation

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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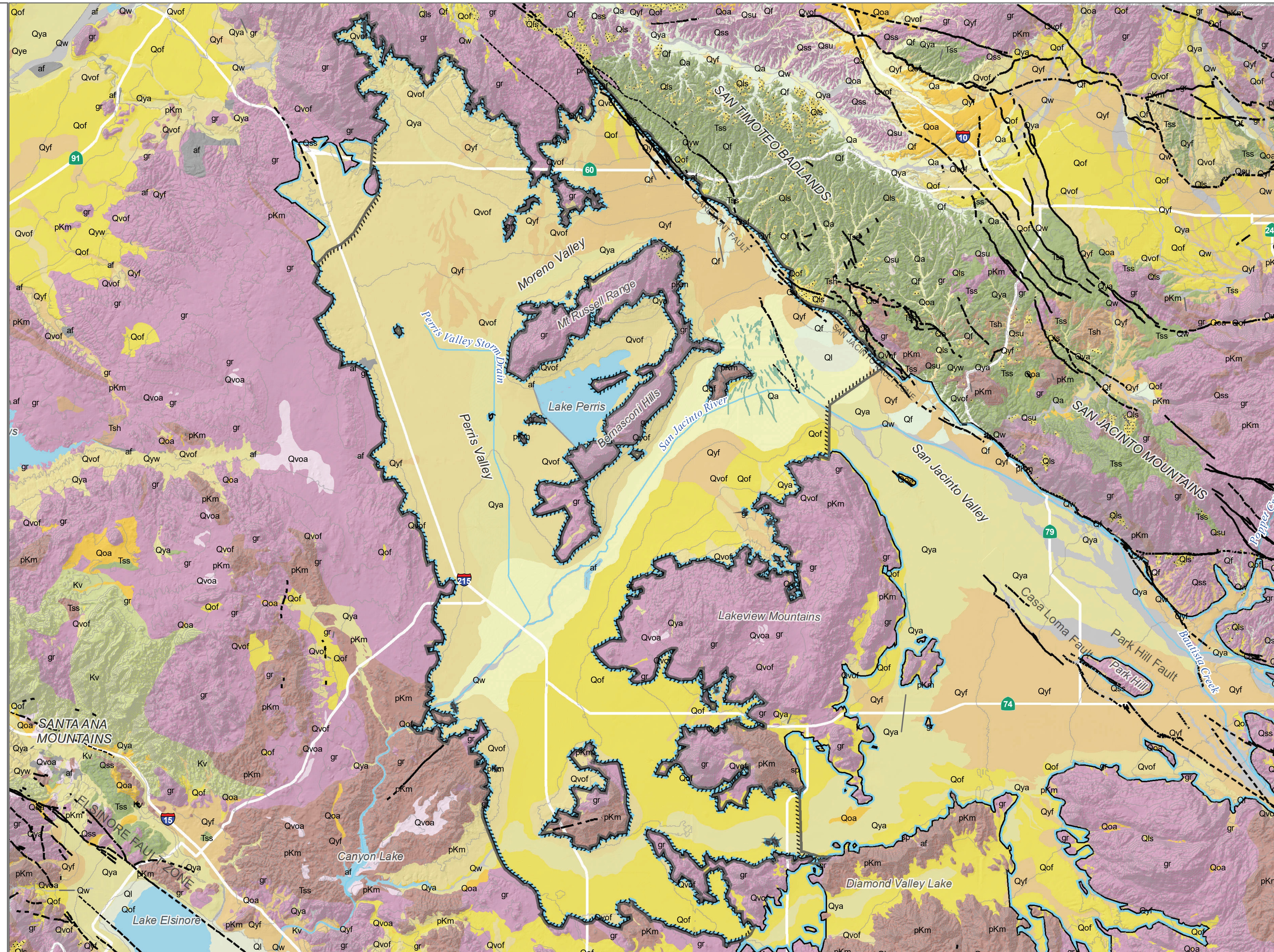
EASTERN MUNICIPAL WATER DISTRICT

San Jacinto Groundwater Basin Groundwater Sustainability Plan

- San Jacinto Groundwater Basin
- Plan Area Boundary
- Elevation Contour Lines (30 ft intervals)
- Fault, identity and existence certain, location accurate
- Fault, identity and existence certain, location approximate
- Fault, identity and existence certain, location concealed
- Fault, identity and existence certain, location inferred
- Fault, identity or existence questionable, location concealed
- Fault, identity or existence questionable, location inferred
- Fissure
- River
- Water

Geologic Units

- af - Artificial Fill
- Qls - Landslide Deposits; may include debris flows and older landslides
- Qsu - Undifferentiated Surficial Deposits; includes colluvium, slope wash, talus deposits, and other surface deposits of all ages
- Qw - Alluvial Wash Deposits
- Qf - Alluvial Fan Deposits
- Qa - Alluvial Valley Deposits
- Ql - Lacustrine, Playa and Estuarine (Paralic) Deposits
- Qe - Eolian and Dune Deposits
- Qyw - Young Alluvial Wash Deposits
- Qyf - Young Alluvial Fan Deposits
- Qya - Young Alluvial Valley Deposits
- Qye - Young Eolian and Dune Deposits
- Qow - Old Alluvial Wash Deposits
- Qof - Old Alluvial Fan Deposits
- Qoa - Old Alluvial Valley Deposits
- Qoe - Old Eolian and Dune Deposits
- Qvof - Very Old Alluvial Fan Deposits
- Qvoa - Very Old Alluvial Valley Deposits
- Qvol - Very Old Lacustrine, Playa and Estuarine (Paralic) Deposits
- Qss - Coarse-grained formations of Pleistocene age and younger; primarily sandstone and conglomerate
- Tss - Coarse-grained Tertiary age formations of sedimentary origin
- Tv - Tertiary age formations of volcanic origin
- Tsh - Fine-grained Tertiary age formations of sedimentary origin
- gr - Granitic and other intrusive crystalline rocks of all ages
- Kss - Coarse-grained Cretaceous age formations of sedimentary origin
- Kv - Cretaceous age formations of volcanic origin
- Ksh - Fine-grained Cretaceous age formations of sedimentary origin
- pKm - Cretaceous and Pre-Cretaceous metamorphic formations of sedimentary and volcanic origin
- sp - Serpentinite of all ages



SOURCE: California Department of Conservation, US Geological Survey

0 2 4 Miles

FIGURE 2-15

Topography, Geology, and Faults

San Jacinto Groundwater Basin Groundwater Sustainability Plan

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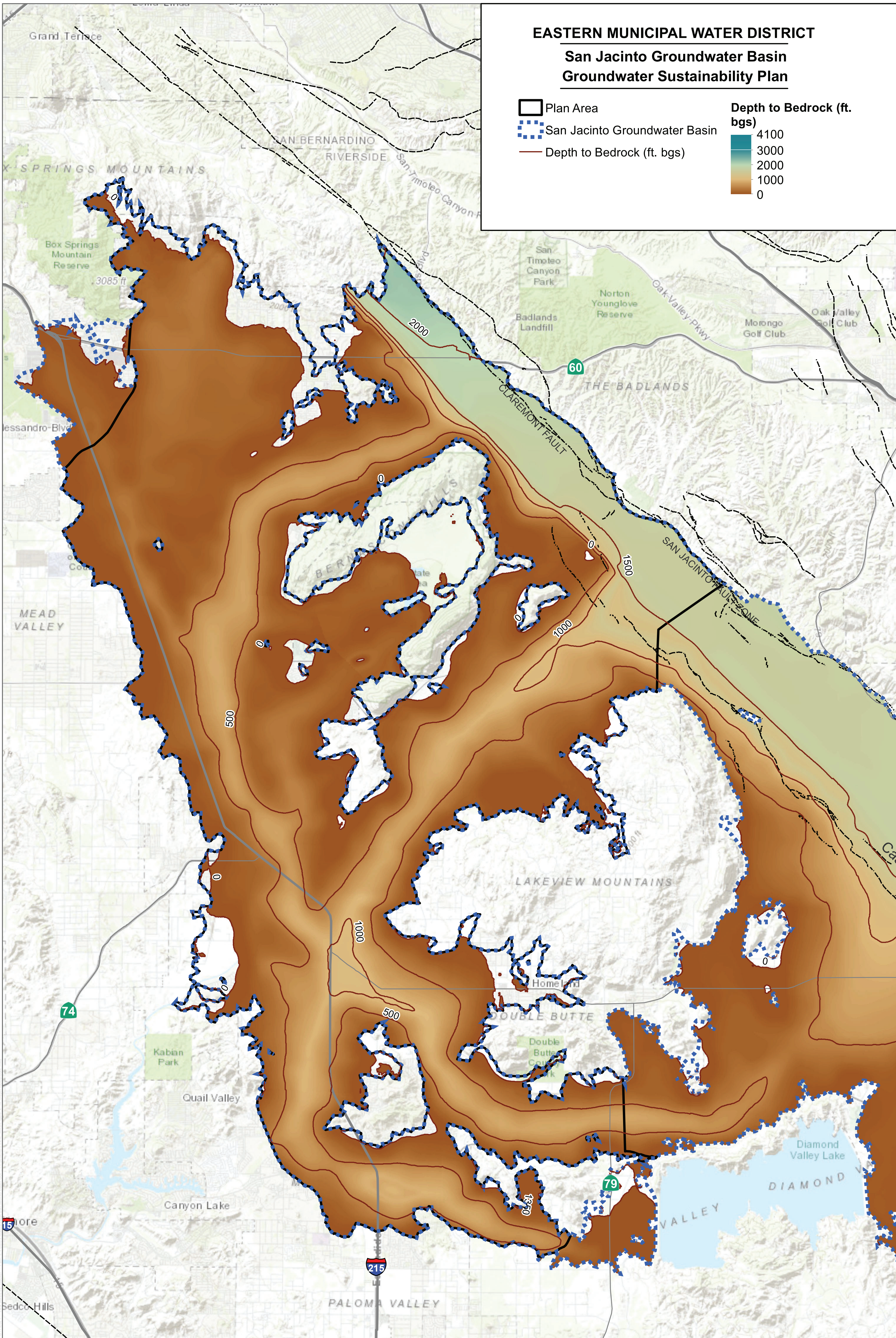

SOURCE: Data provided by EMWD

emwd EASTERN MUNICIPAL WATER DISTRICT

0 5,000 10,000 Feet

FIGURE 2-16

Depth to Bedrock

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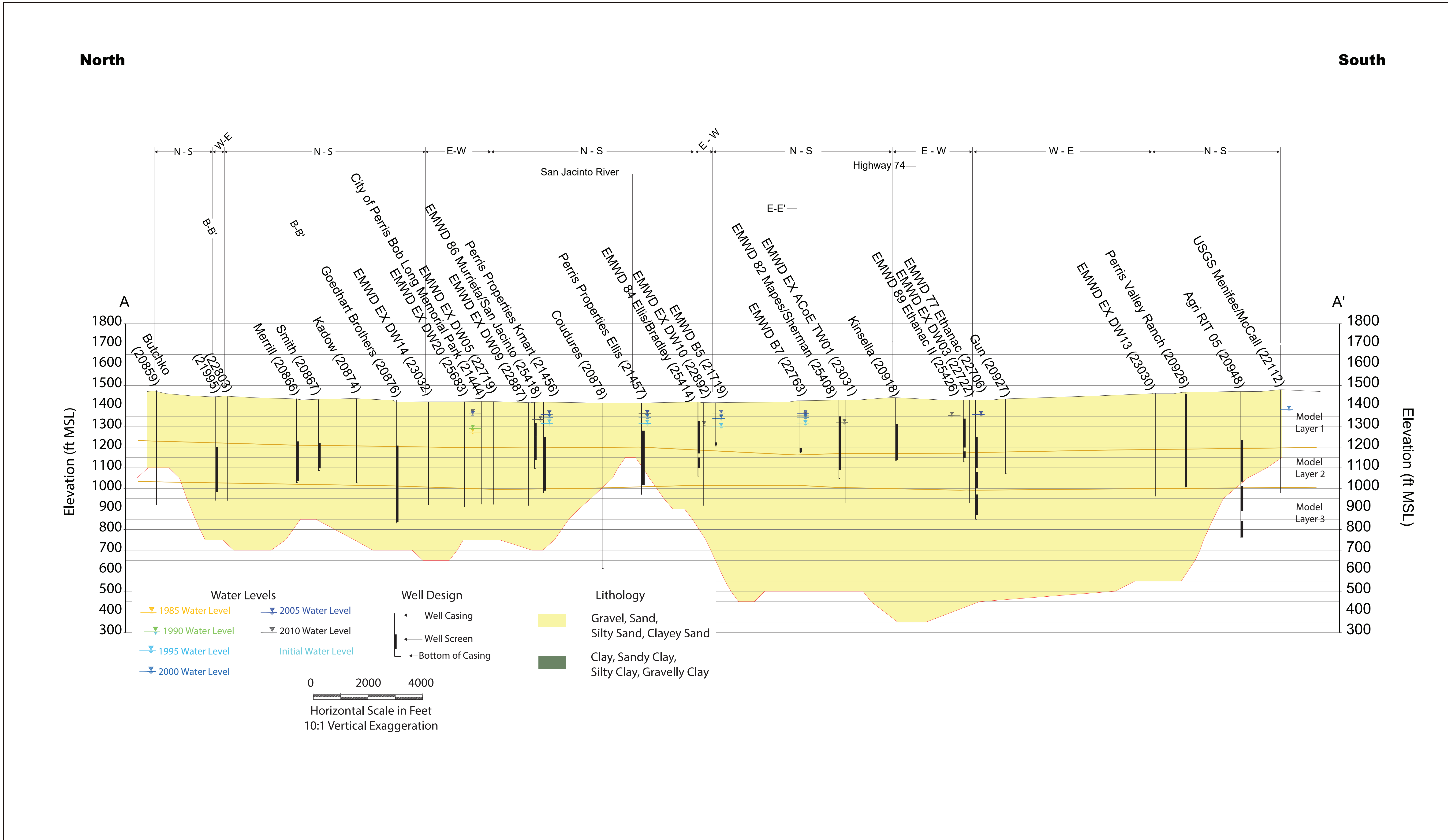

SOURCE: EMWD 2016b - San Jacinto Groundwater Flow Model Update 2014 (SJFM-2014) Model Development and Scenarios

FIGURE 2-17

Cross Section A-A'

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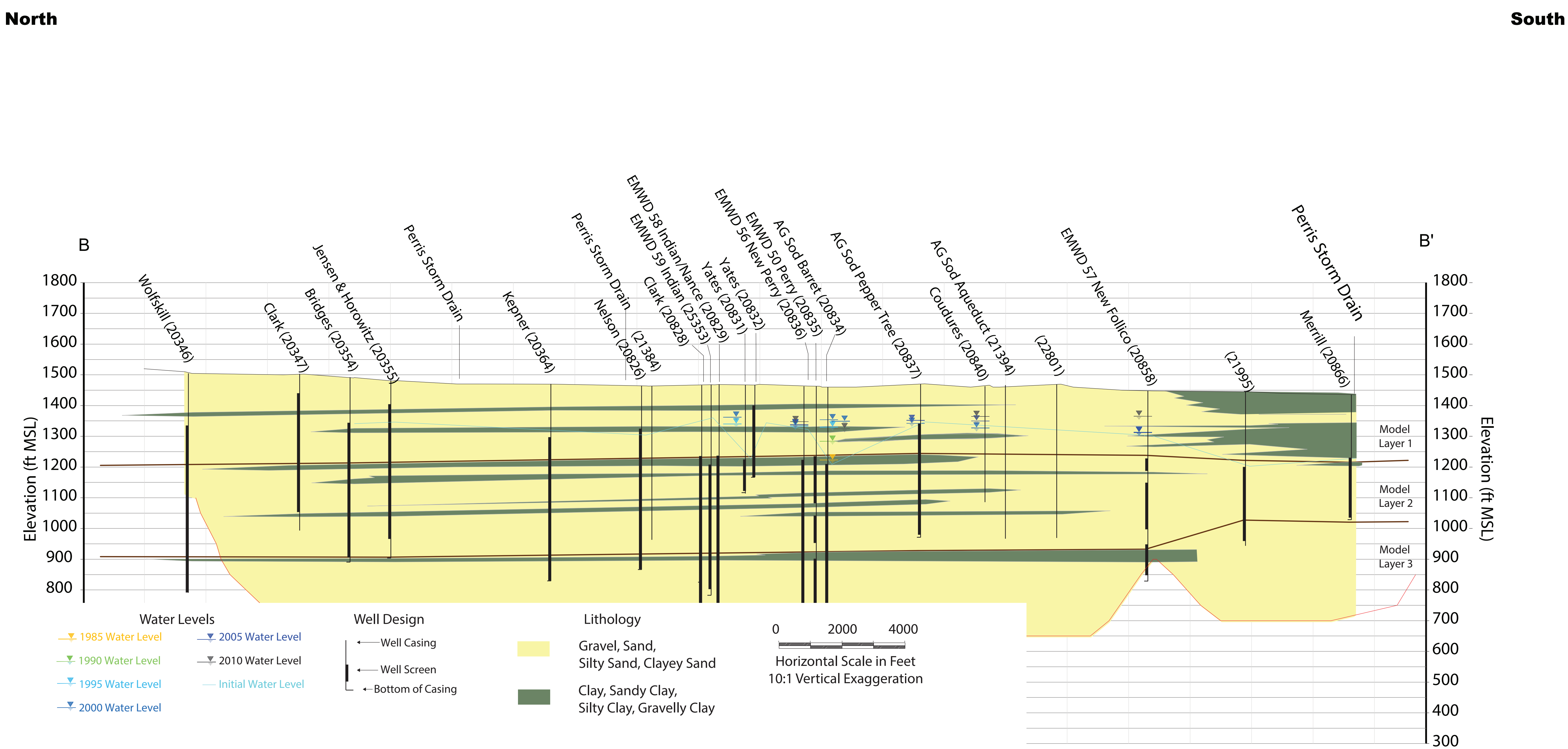

SOURCE: EMWD 2016b - San Jacinto Groundwater Flow Model Update 2014 (SJFM-2014) Model Development and Scenarios

FIGURE 2-18

Cross Section B-B'

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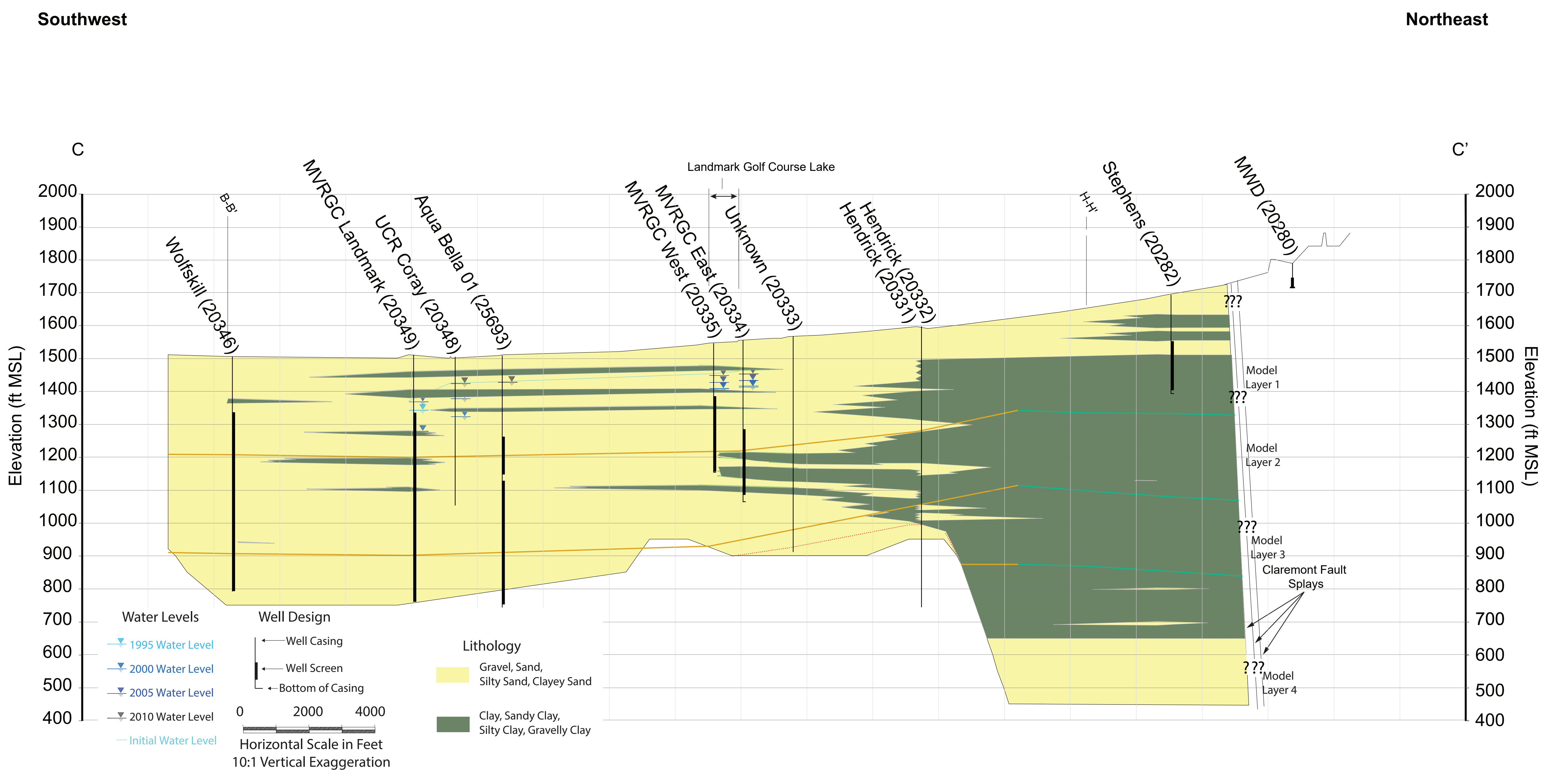

SOURCE: EMWD 2016b - San Jacinto Groundwater Flow Model Update 2014 (SJFM-2014) Model Development and Scenarios

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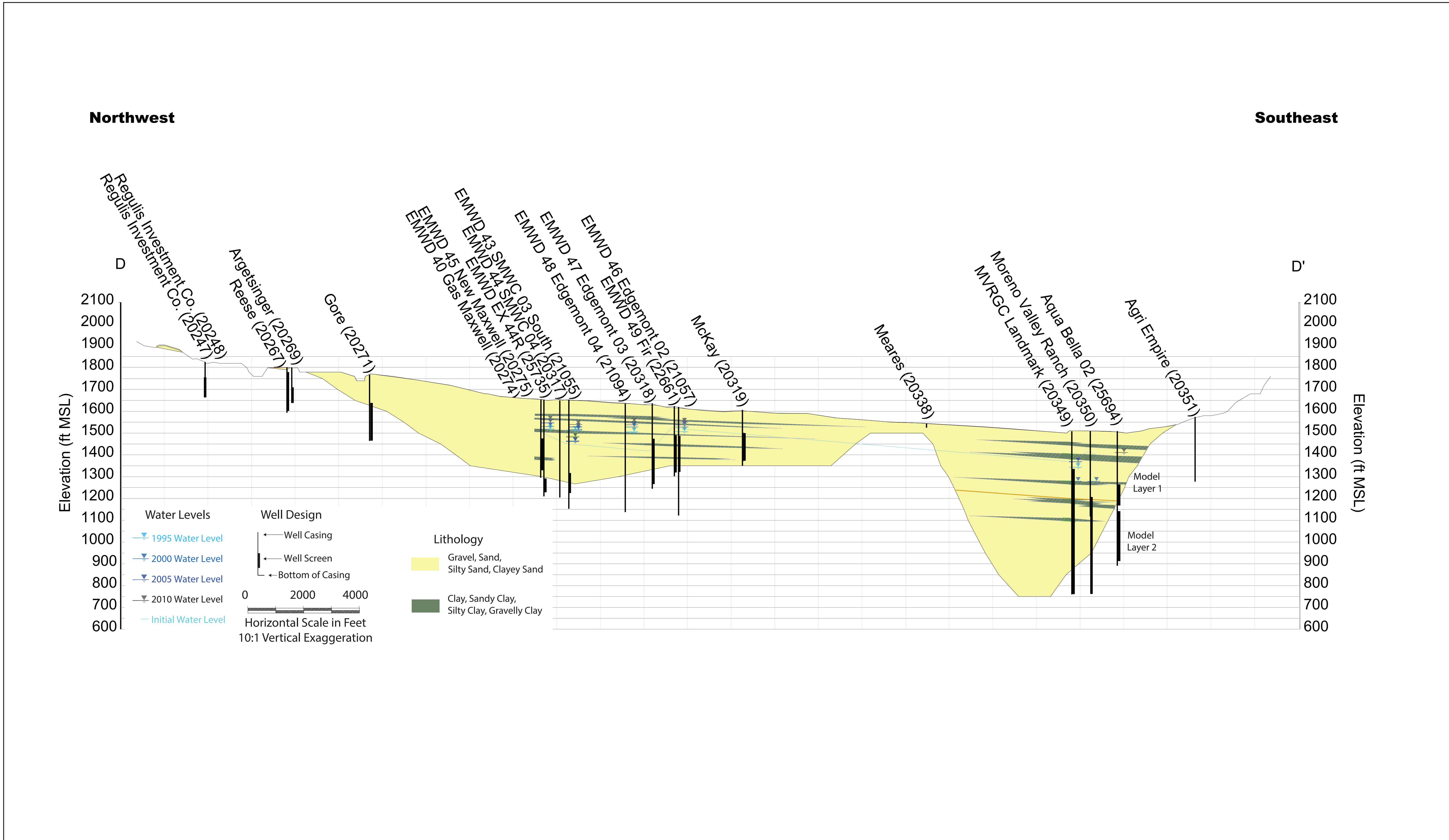

SOURCE: EMWD 2016b - San Jacinto Groundwater Flow Model Update 2014 (SJFM-2014) Model Development and Scenarios

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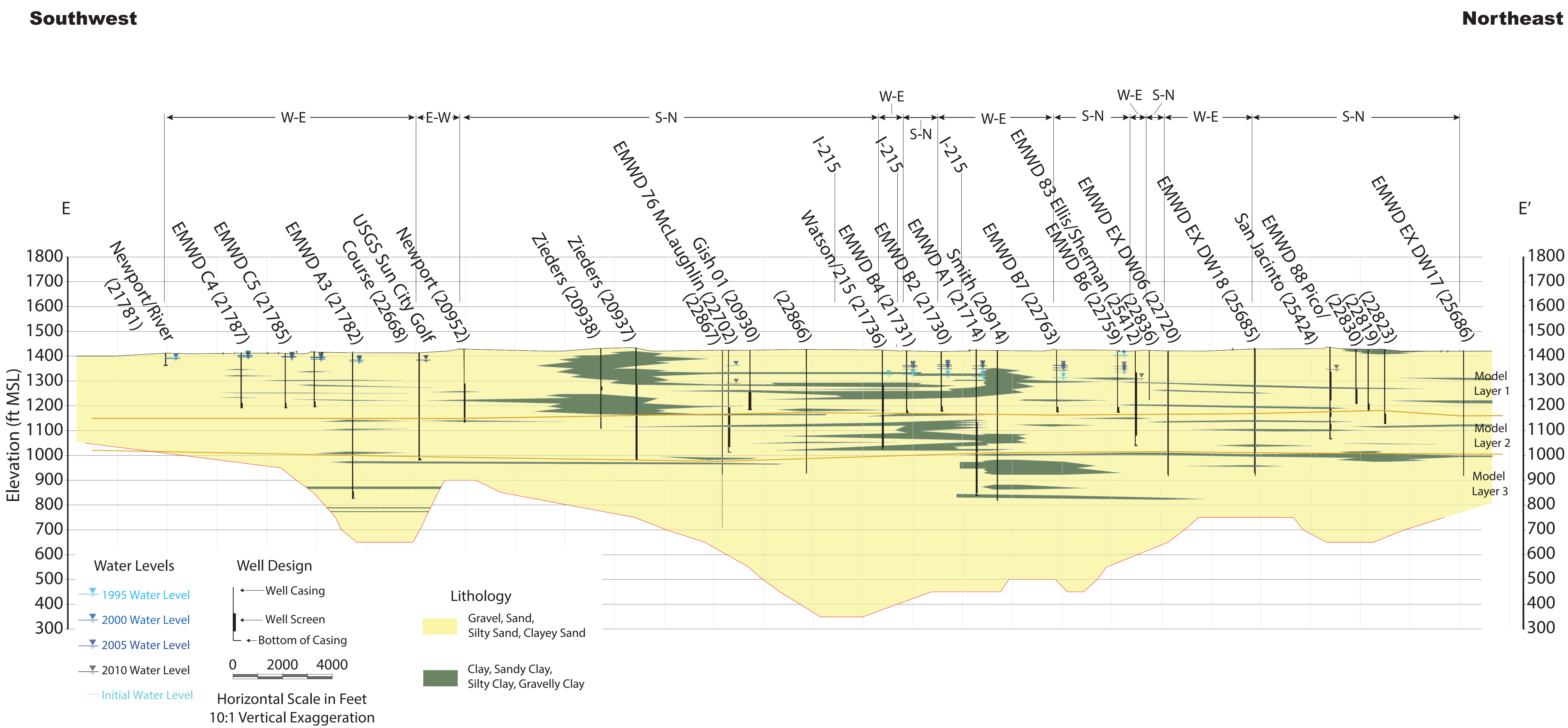

SOURCE: EMWD 2016b - San Jacinto Groundwater Flow Model Update 2014 (SJFM-2014) Model Development and Scenarios

emwd EASTERN MUNICIPAL WATER DISTRICT

FIGURE 2-21

Cross Section E-E'

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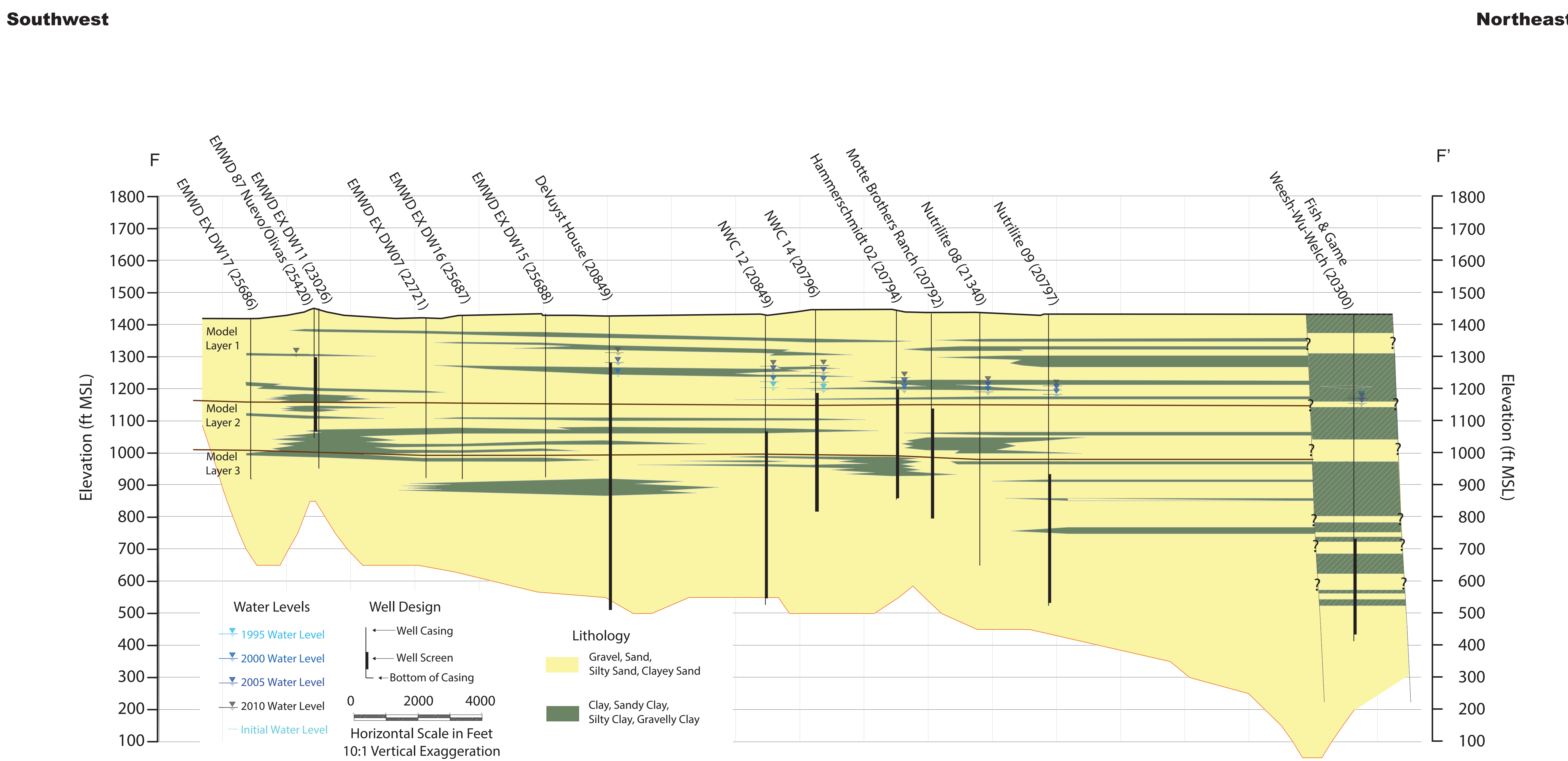

SOURCE: EMWD 2016b - San Jacinto Groundwater Flow Model Update 2014 (SJFM-2014) Model Development and Scenarios

FIGURE 2-22

Cross Section F-F'

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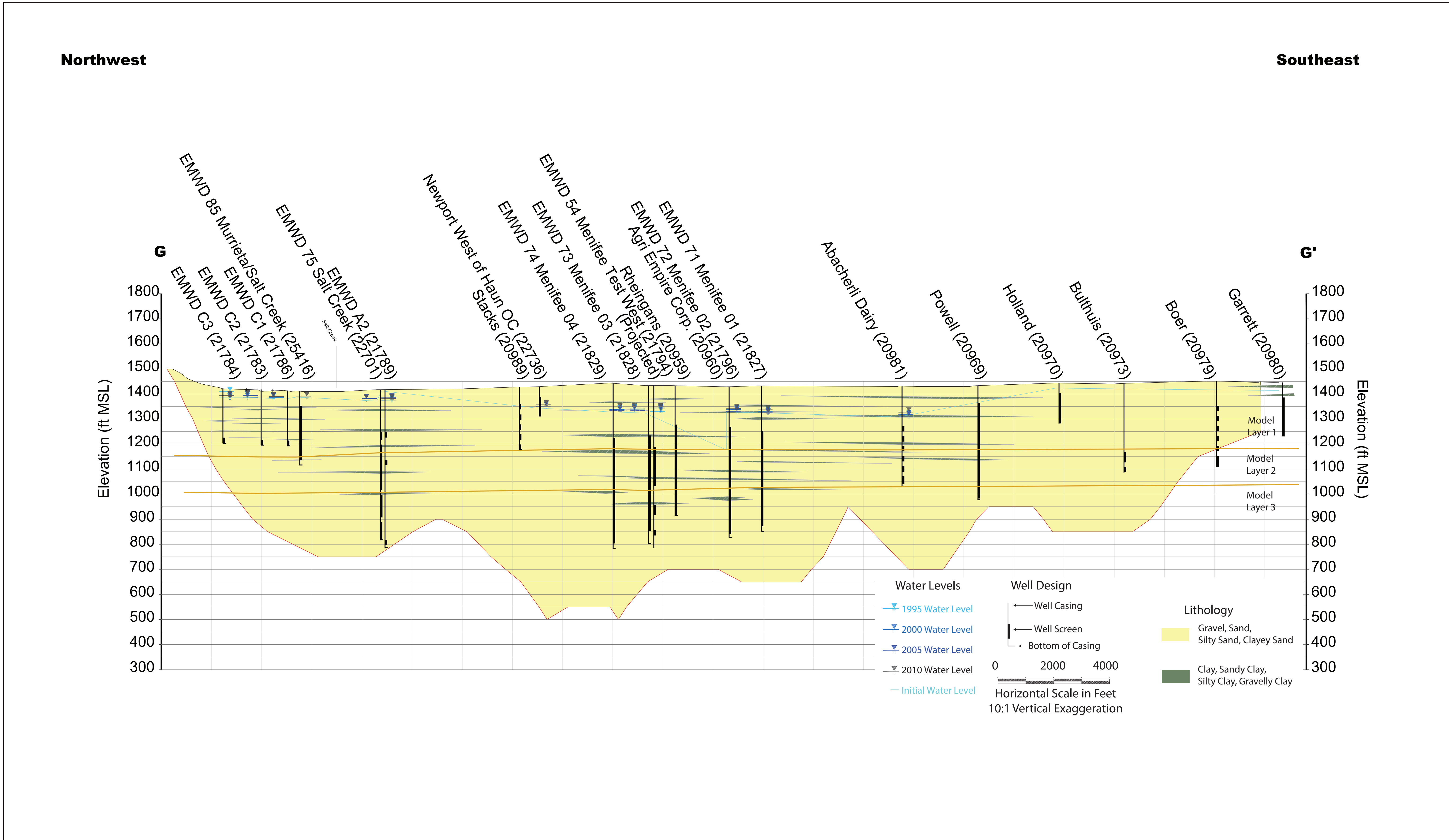

SOURCE: EMWD 2016b - San Jacinto Groundwater Flow Model Update 2014 (SJFM-2014) Model Development and Scenarios

FIGURE 2-23

Cross Section G-G'

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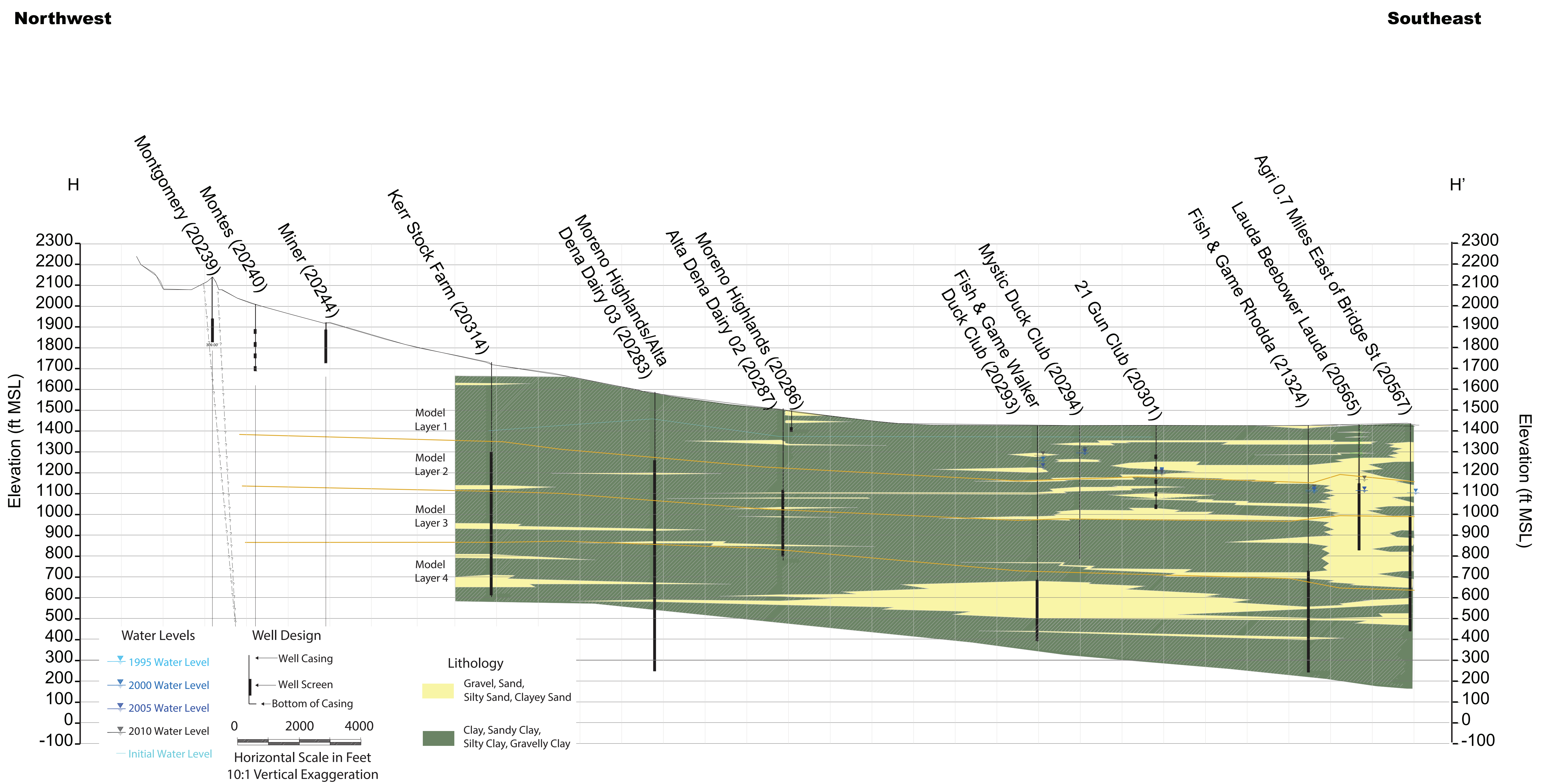

SOURCE: EMWD 2016b - San Jacinto Groundwater Flow Model Update 2014 (SJFM-2014) Model Development and Scenarios

FIGURE 2-24

Cross Section H-H'

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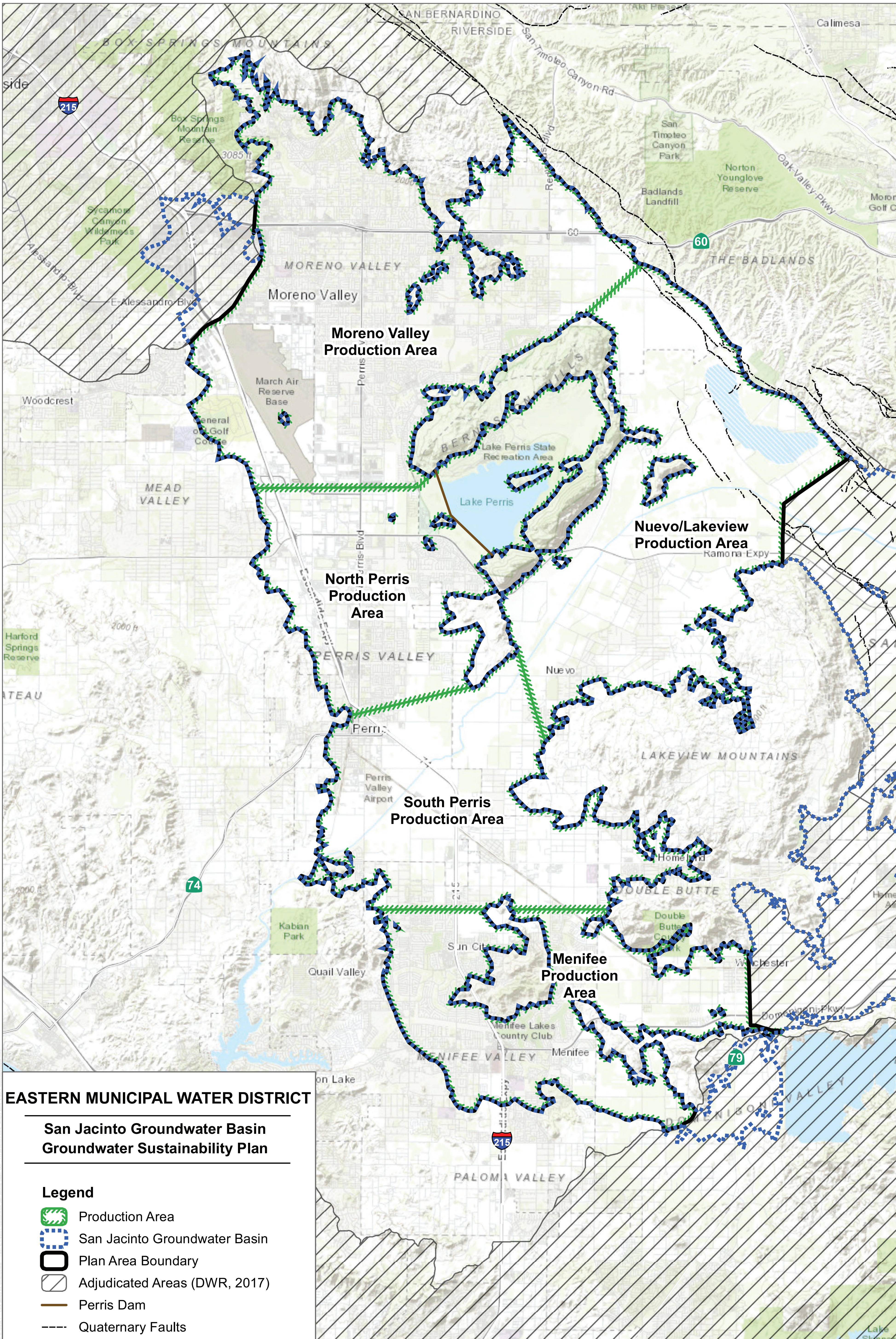

SOURCE: Data provided by EMWD

0 1 2 Miles

FIGURE 2-25

Groundwater Production Areas in the Plan Area

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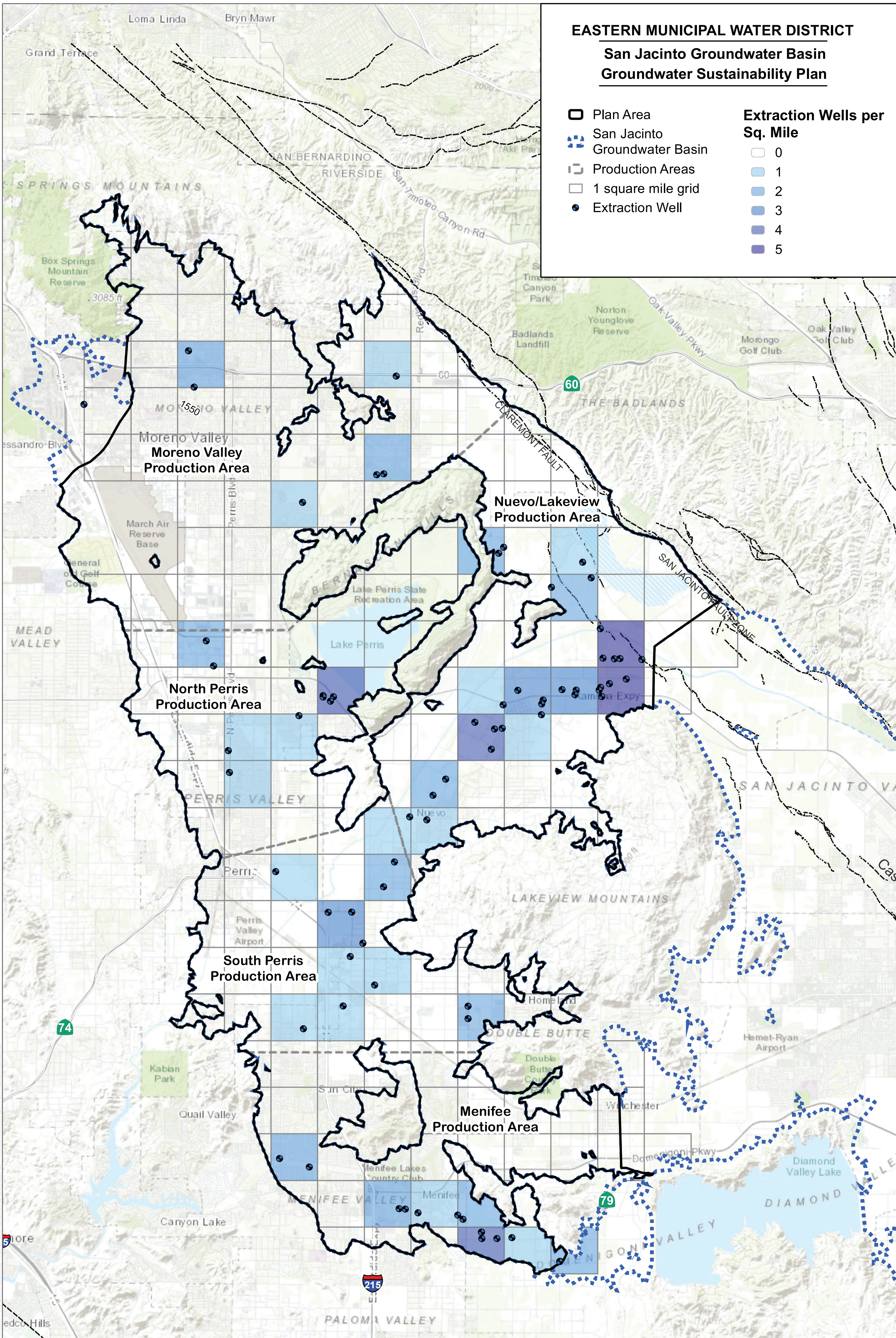

SOURCE: Esri, EMWD

emwd EASTERN MUNICIPAL WATER DISTRICT

0 5,000 10,000 Feet

FIGURE 2-26

Groundwater Extraction Well Density in the Plan Area

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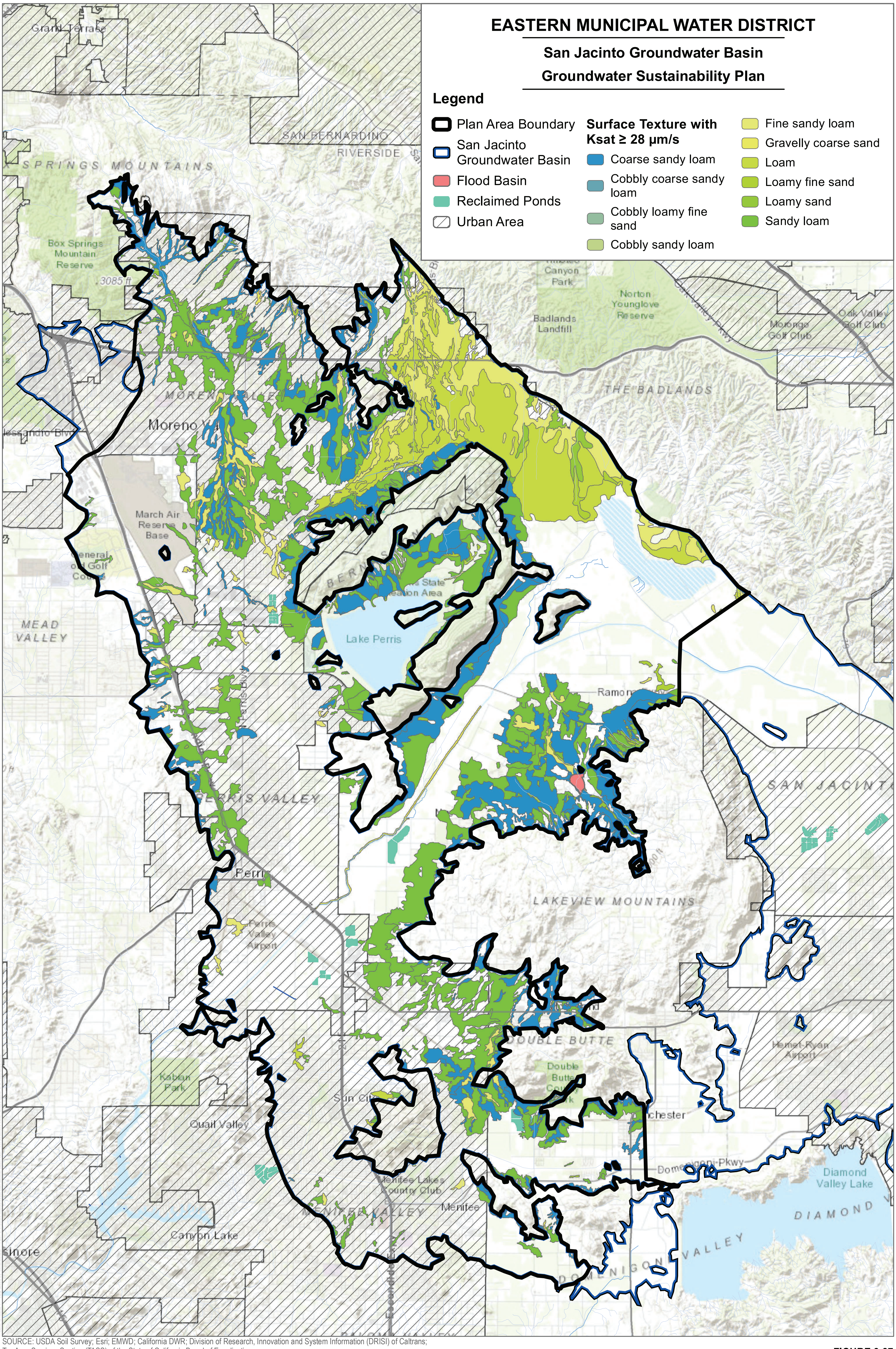

SOURCE: USDA Soil Survey; Esri; EMWD; California DWR; Division of Research, Innovation and System Information (DRISI) of Caltrans; Tax Area Services Section (TASS) of the State of California Board of Equalization.

emwd EASTERN MUNICIPAL WATER DISTRICT

FIGURE 2-27

Recharge Map

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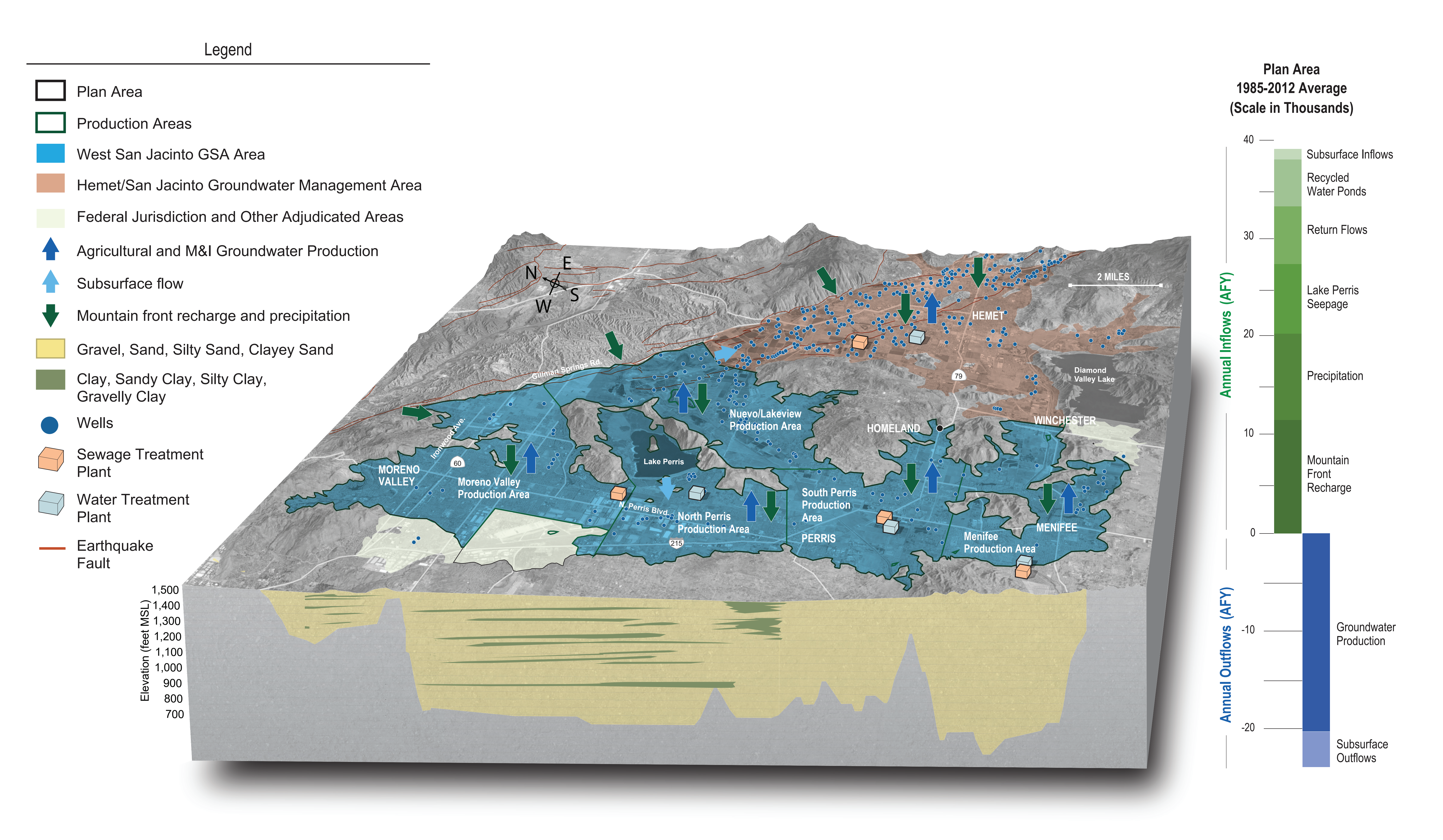

emwd EASTERN MUNICIPAL WATER DISTRICT

FIGURE 2-28

Hydrogeological Conceptual Model

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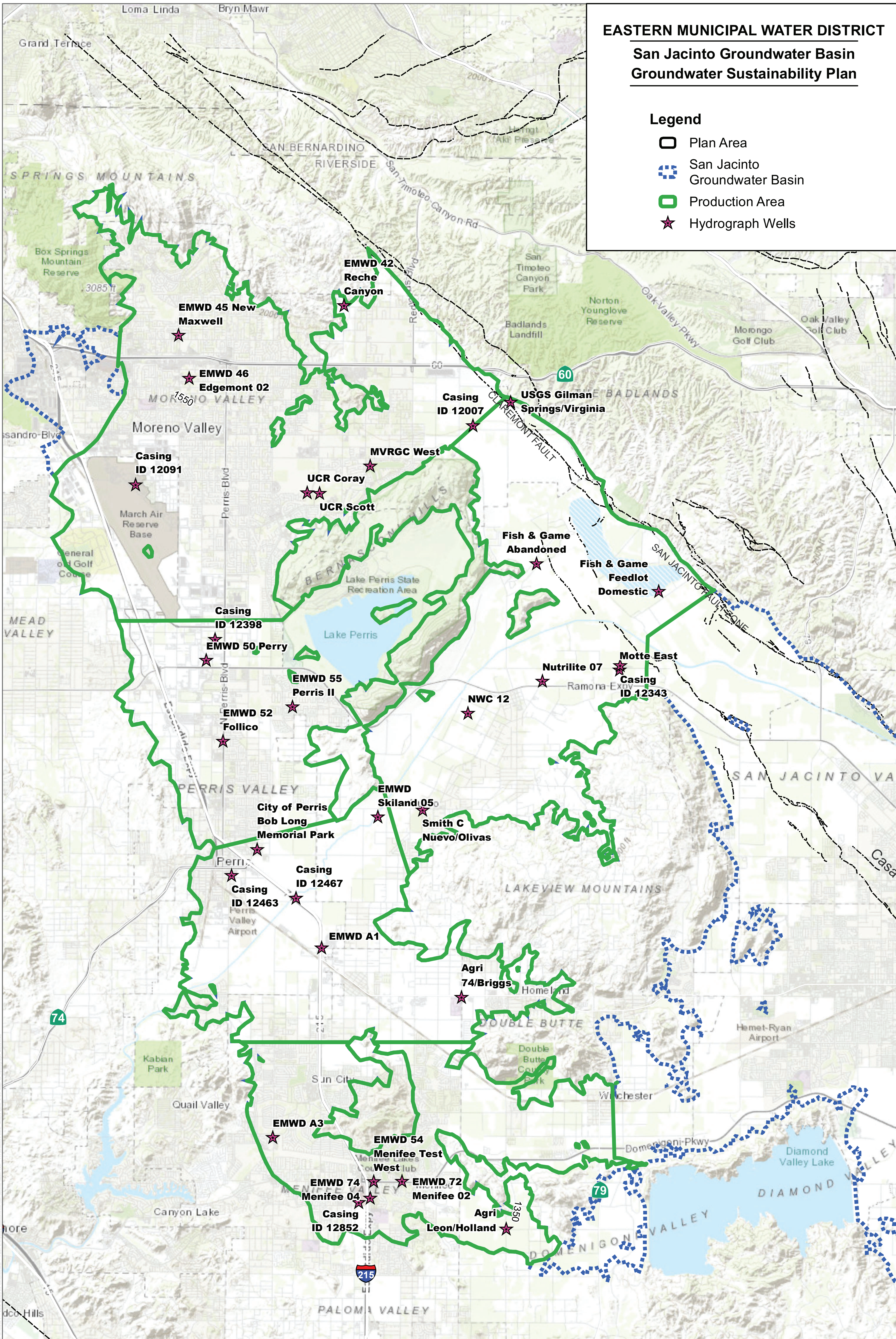

SOURCE: EMWD

emwd EASTERN MUNICIPAL WATER DISTRICT

0 1 2 Miles

FIGURE 2-29

Map of Hydrograph Well Locations

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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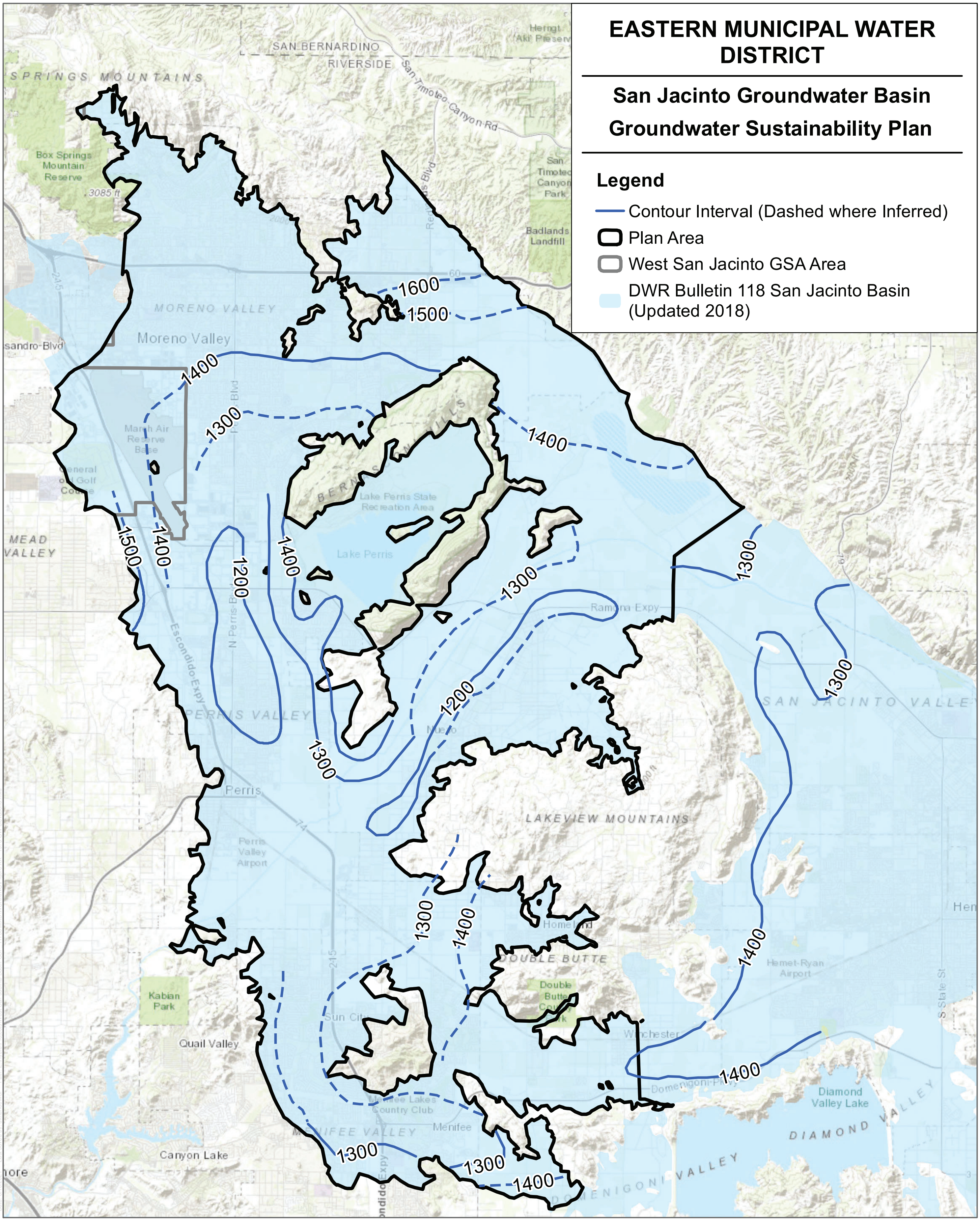

SOURCE: ERSI, Eastern Municipal Water District, California Department of Water Resource, EMWD 1995 Groundwater Management Plan

emwd EASTERN MUNICIPAL WATER DISTRICT

0 1 2 Miles

FIGURE 2-30

Representative Groundwater Elevations in 1974

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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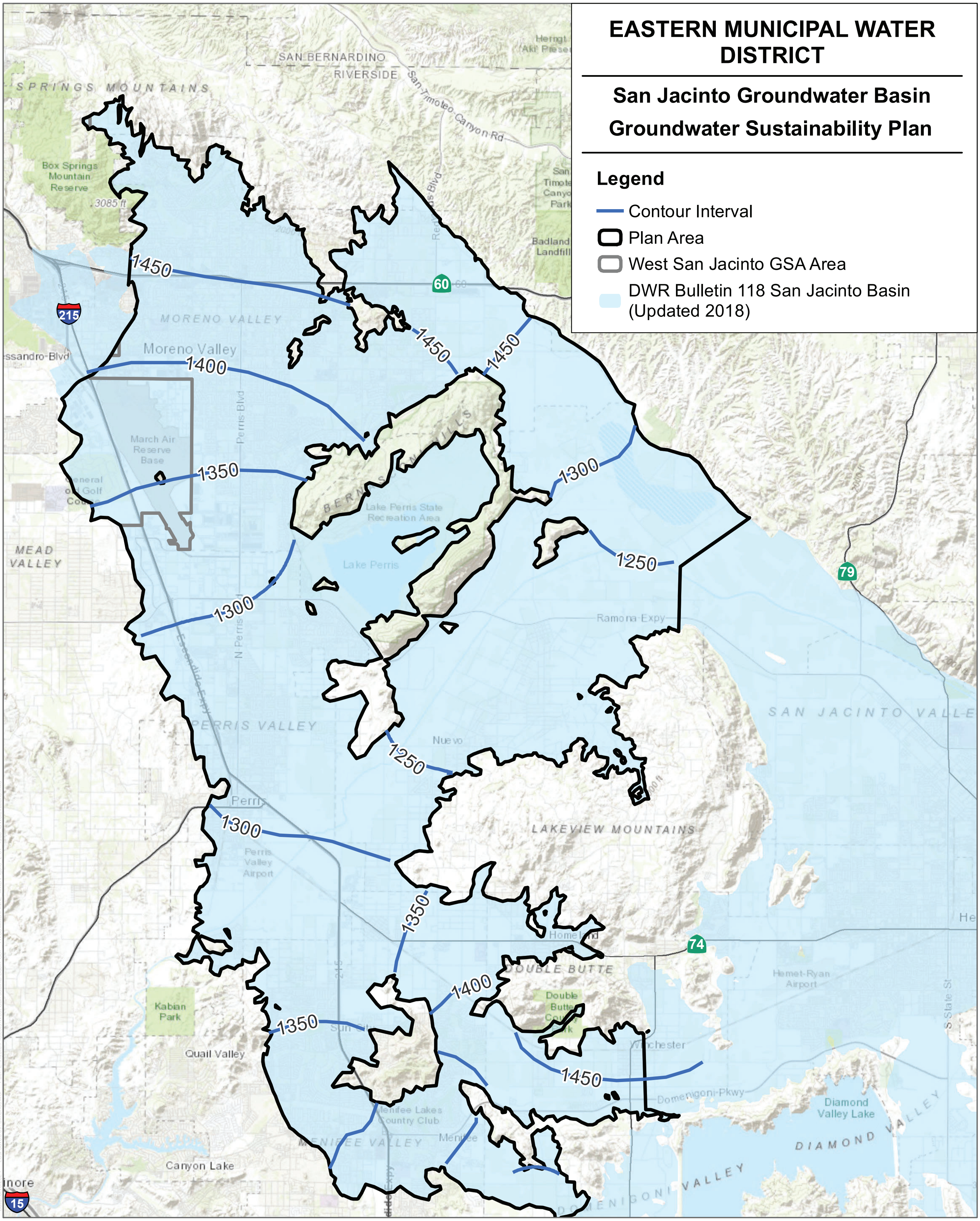

SOURCE: ERSI, Eastern Municipal Water District, California Department of Water Resource, EMWD 1995 Groundwater Management Plan

emwd EASTERN MUNICIPAL WATER DISTRICT

FIGURE 2-31

Representative Groundwater Elevations in 1993

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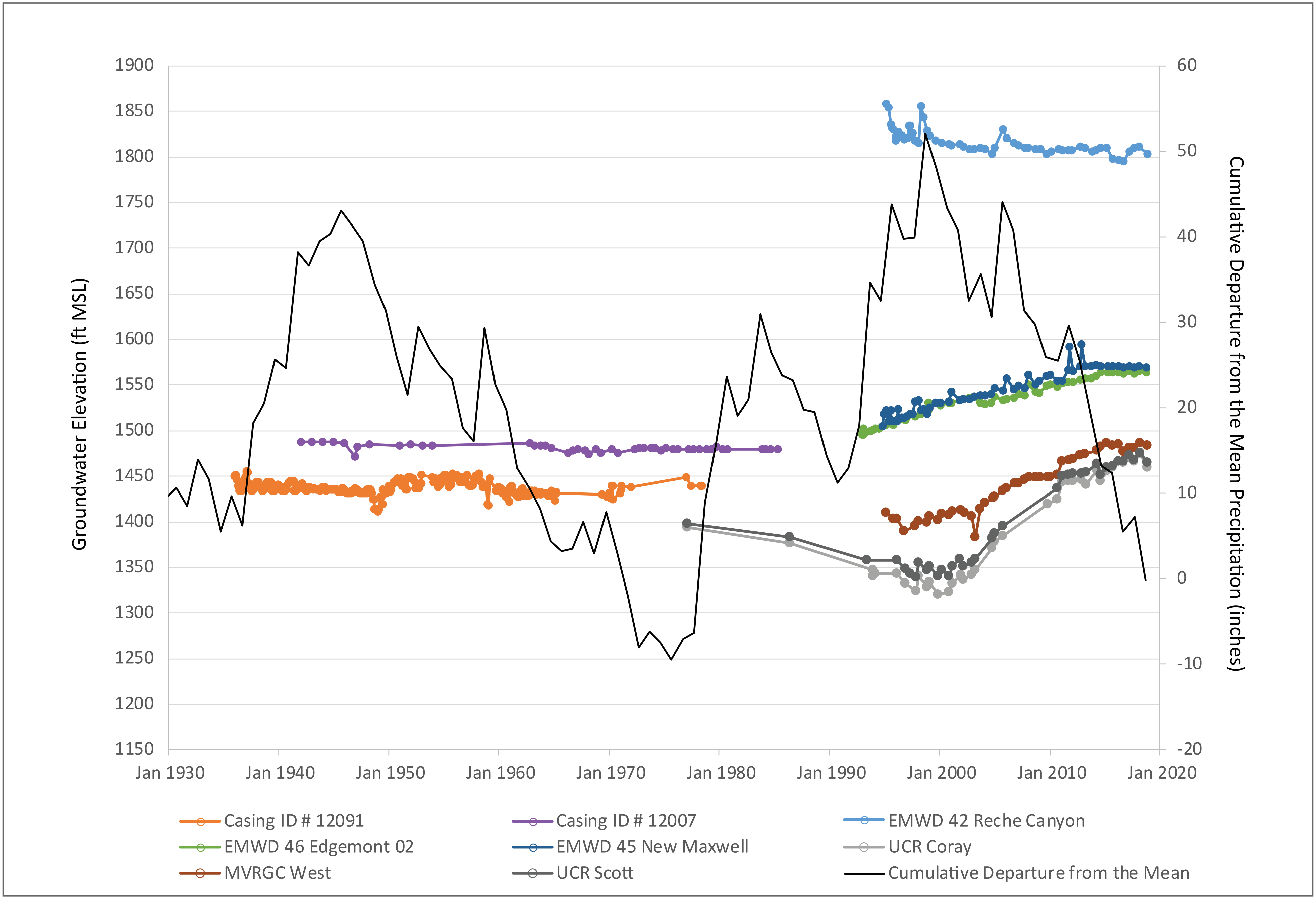

SOURCE: EMWD

emwd EASTERN MUNICIPAL WATER DISTRICT

FIGURE 2-32

Groundwater Elevation Hydrographs in the Moreno Valley Groundwater Production Area

Groundwater Sustainability Plan for the San Jacinto Basin

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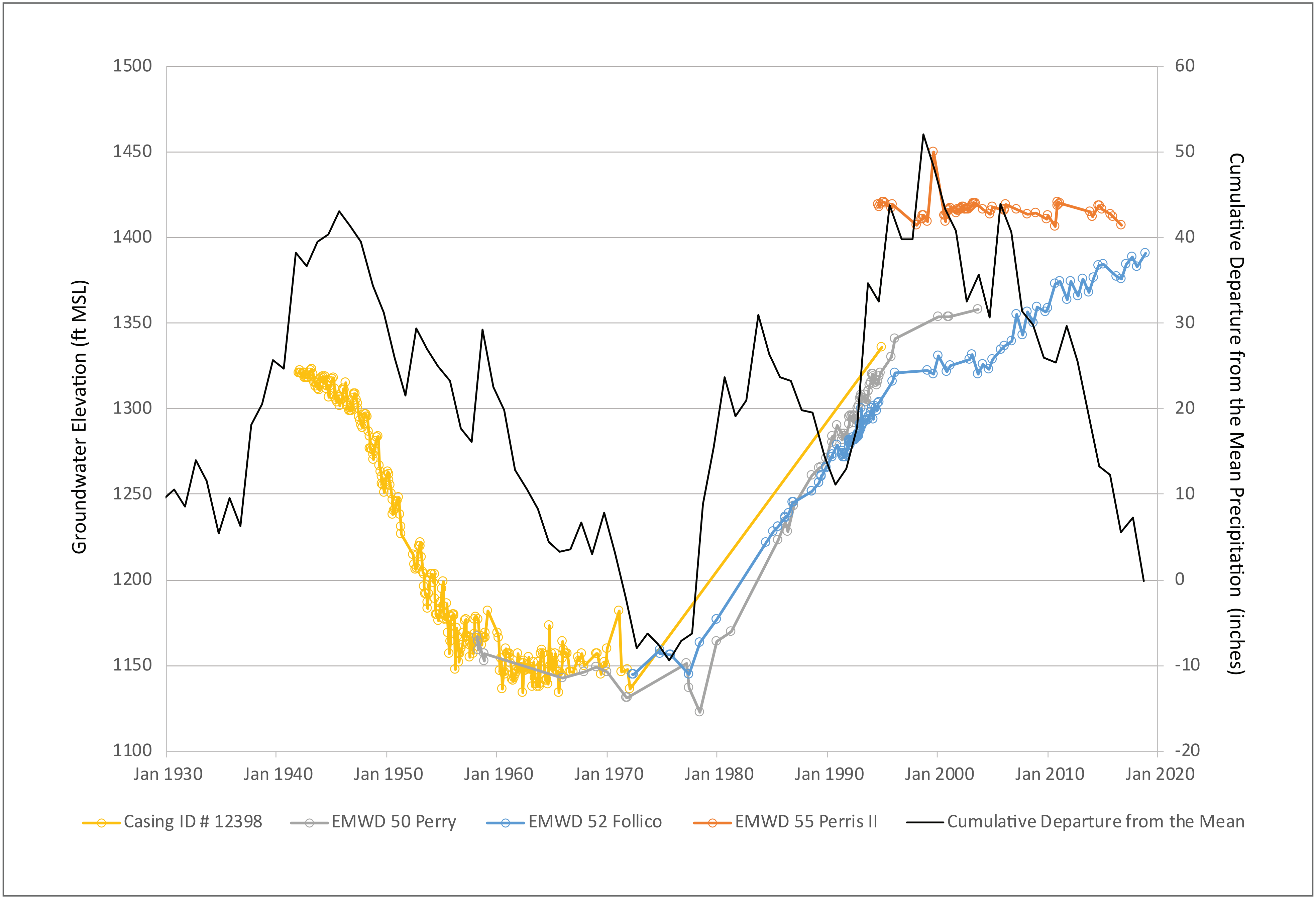

SOURCE: EMWD

emwd EASTERN MUNICIPAL WATER DISTRICT

FIGURE 2-33

Groundwater Elevation Hydrographs in the North Perris Groundwater Production Area

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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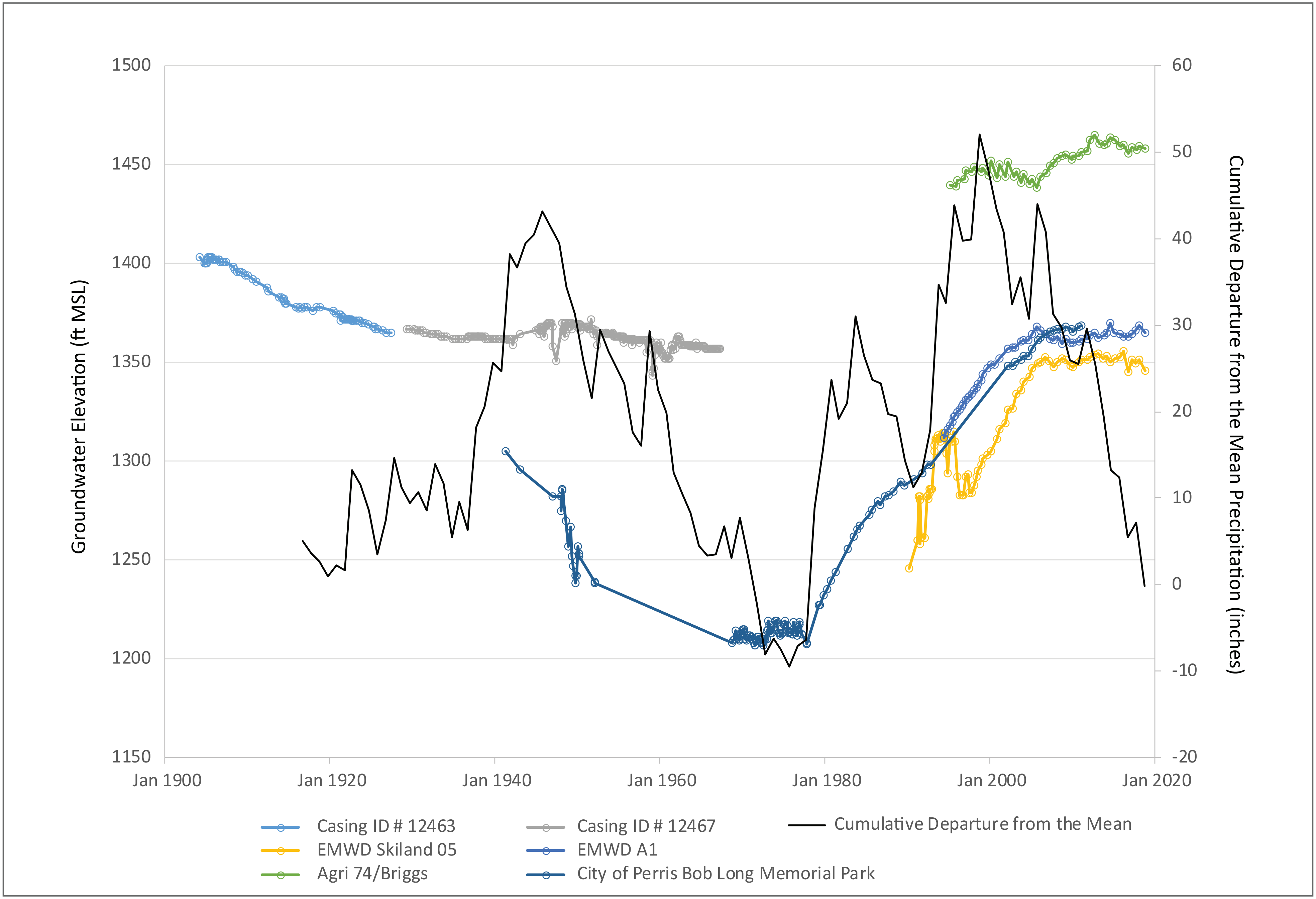

SOURCE: EMWD

EMWD EASTERN MUNICIPAL WATER DISTRICT

FIGURE 2-34

Groundwater Elevation Hydrographs in the South Perris Groundwater Production Area

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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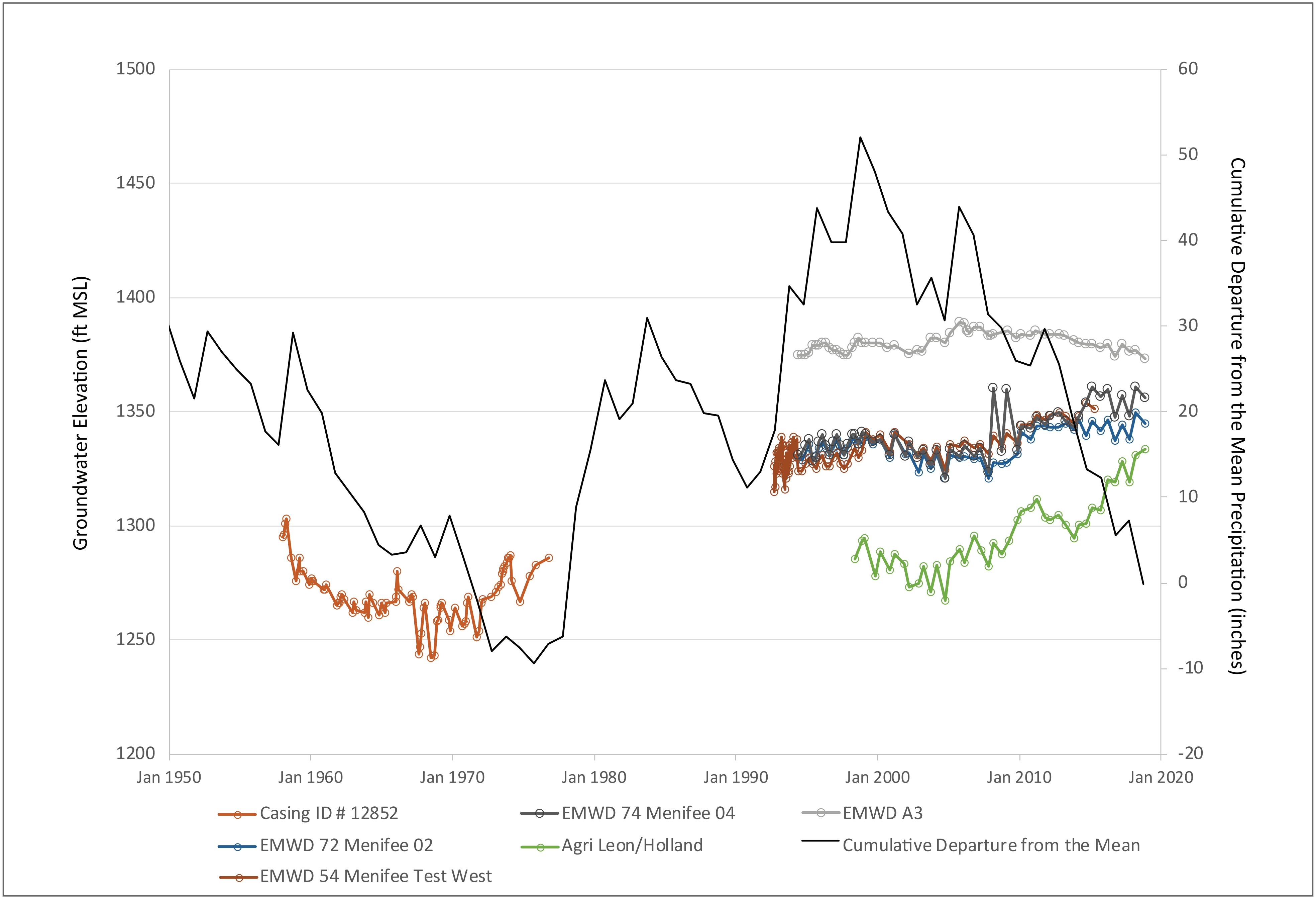

SOURCE: EMWD

FIGURE 2-35

Groundwater Elevation Hydrographs in the Menifee Groundwater Production Area

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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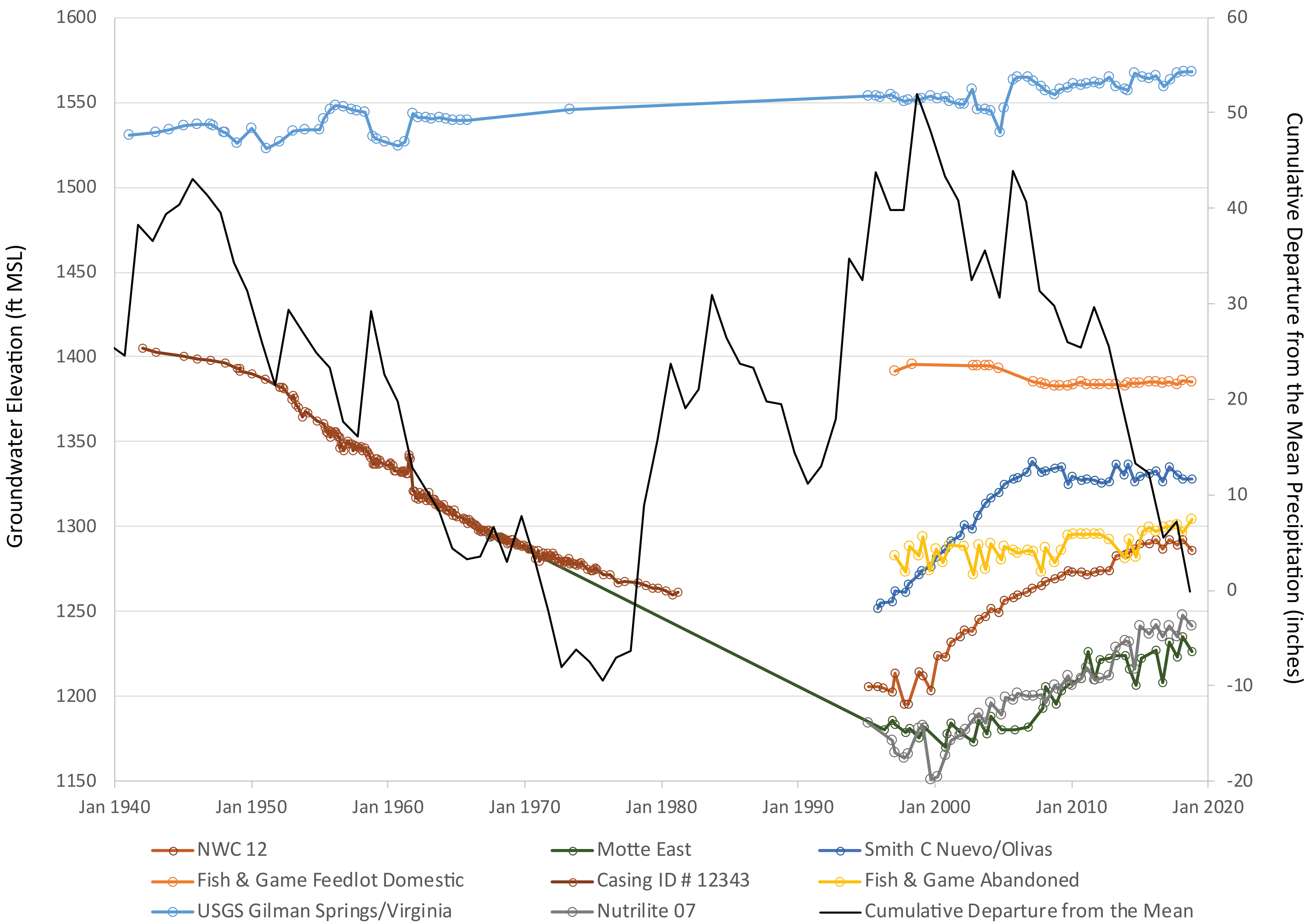

SOURCE: EMWD

FIGURE 2-36

Groundwater Elevation Hydrographs in the Nuevo/Lakeview Groundwater Production Area

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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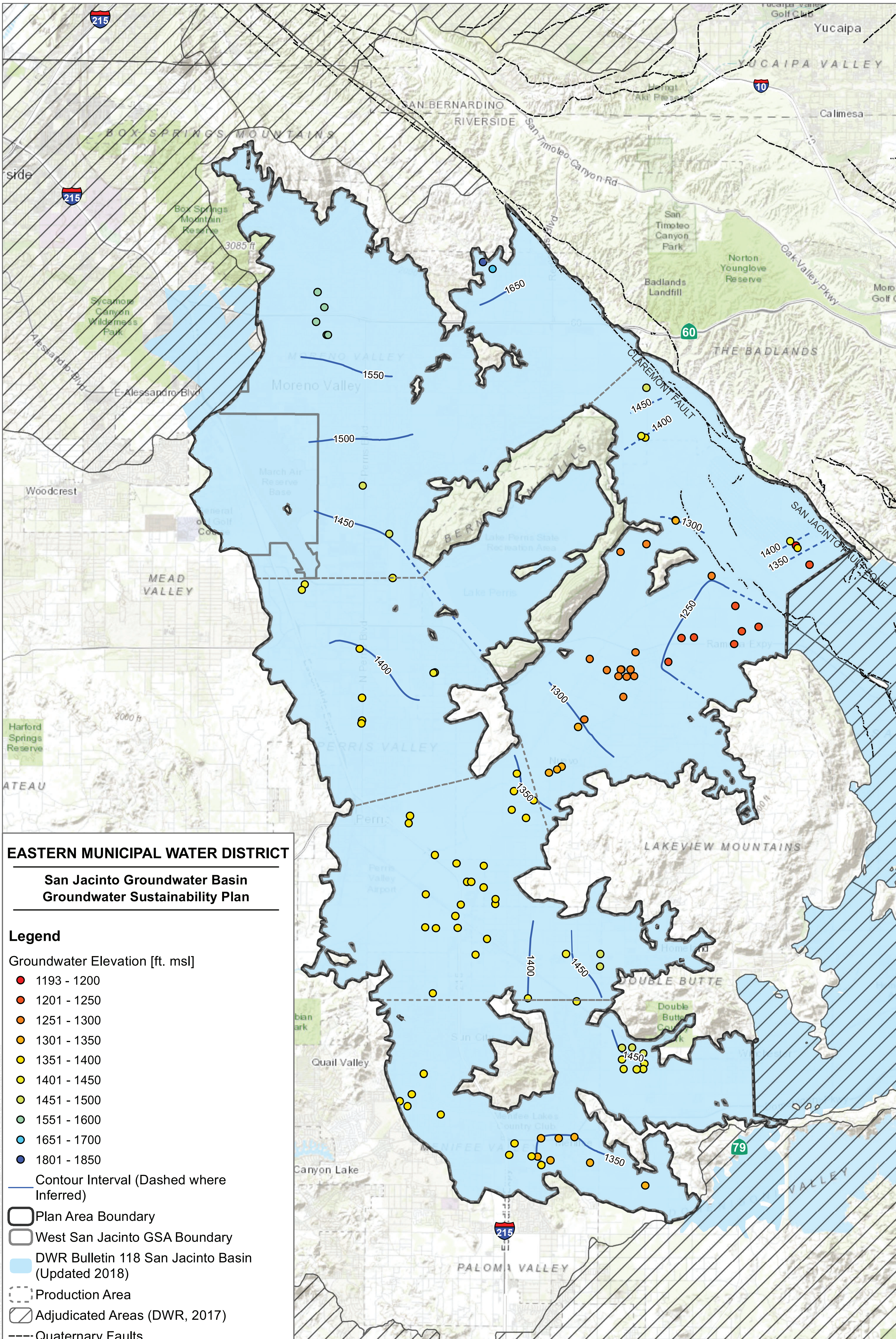
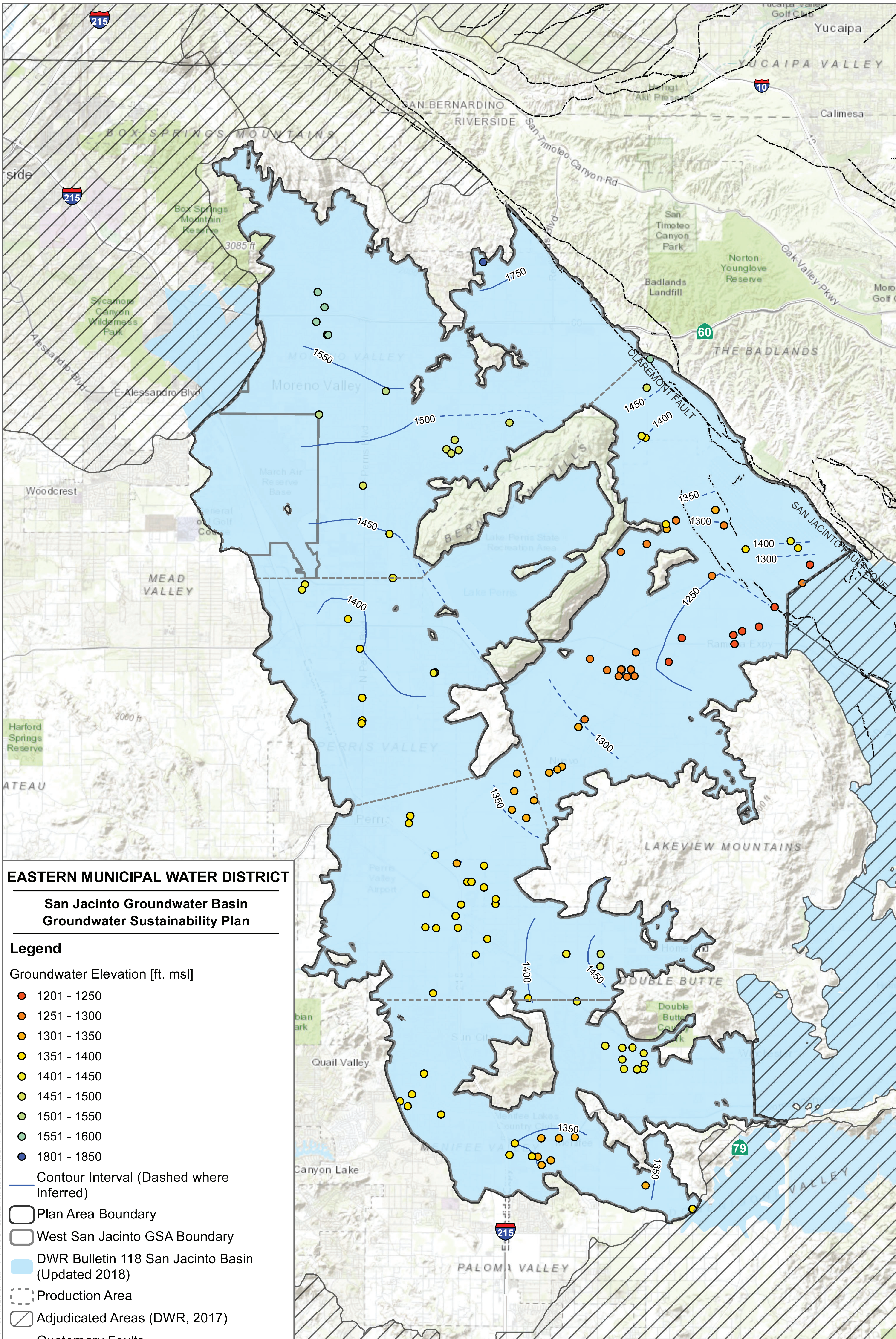


SOURCE: Data provided by EMWD - contoured using Triangulated Linear Interpolation Scheme, Esri, California Department of Water Resources

FIGURE 2-37

Spring 2018 Groundwater Elevations

INTENTIONALLY LEFT BLANK



SOURCE: Data provided by EMWD - contoured using Triangulated Linear Interpolation Scheme, Esri, California Department of Water Resources

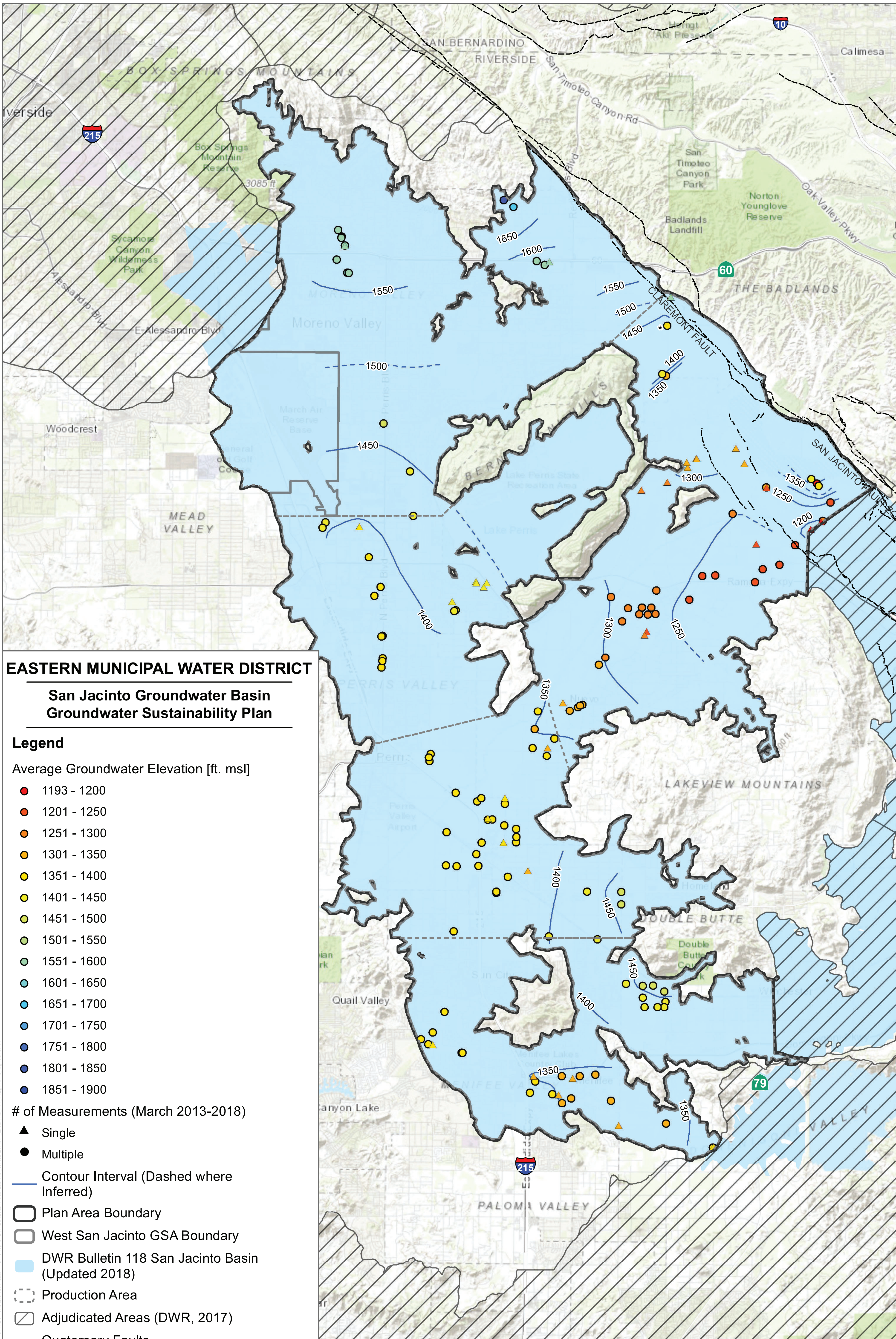
emwd EASTERN MUNICIPAL WATER DISTRICT

0 1 2 Miles

FIGURE 2-38

Fall 2018 Groundwater Elevations

INTENTIONALLY LEFT BLANK



SOURCE: Data provided by EMWD - contoured using Triangulated Linear Interpolation Scheme, Esri, California Department of Water Resources

FIGURE 2-39

Spring 2013-2018 Average Groundwater Elevations

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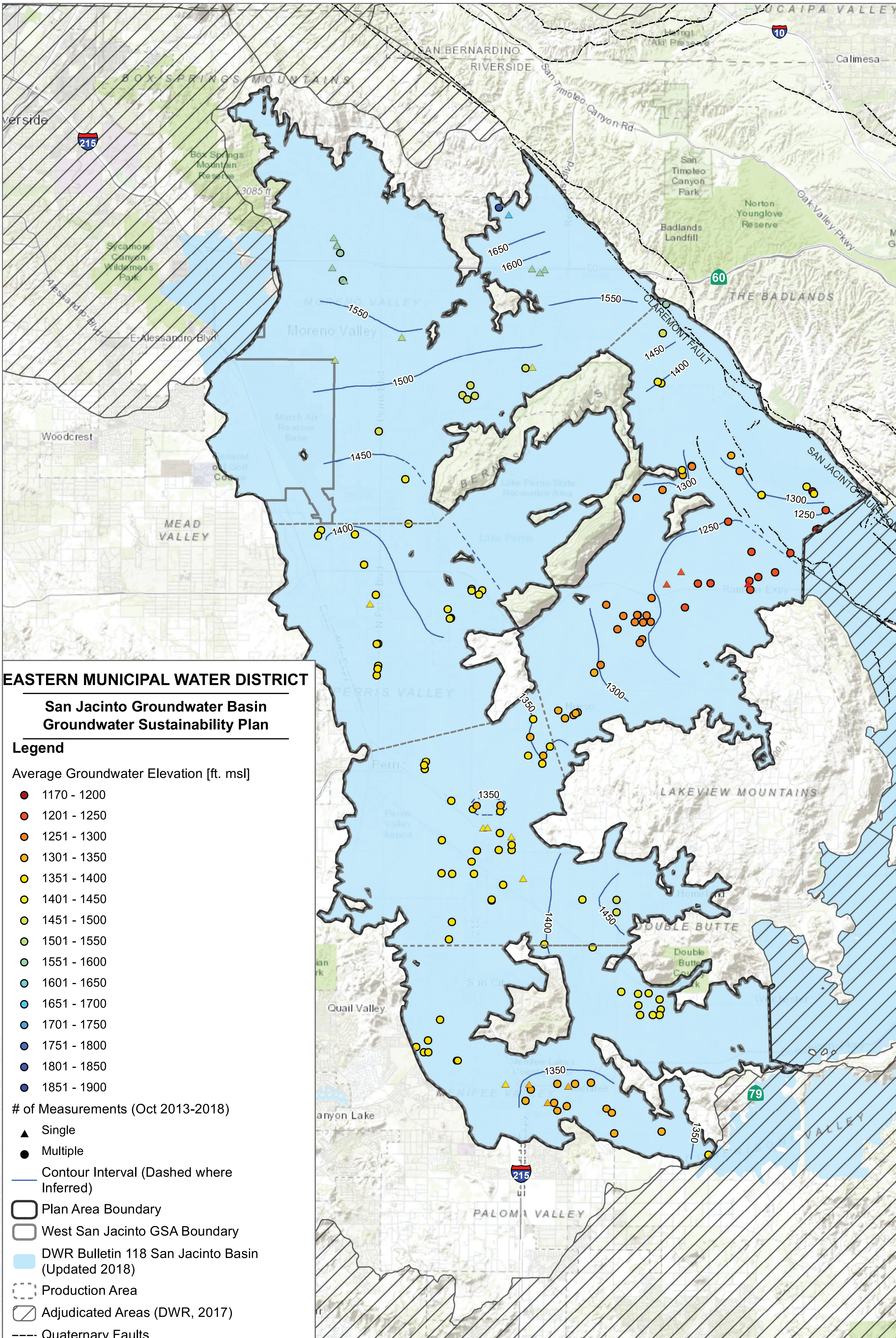

SOURCE: Data provided by EMWD - contoured using Triangulated Linear Interpolation Scheme, Esri, California Department of Water Resources

emwd EASTERN MUNICIPAL WATER DISTRICT

0 1 2 Miles

FIGURE 2-40

Fall 2013-2018 Average Groundwater Elevations

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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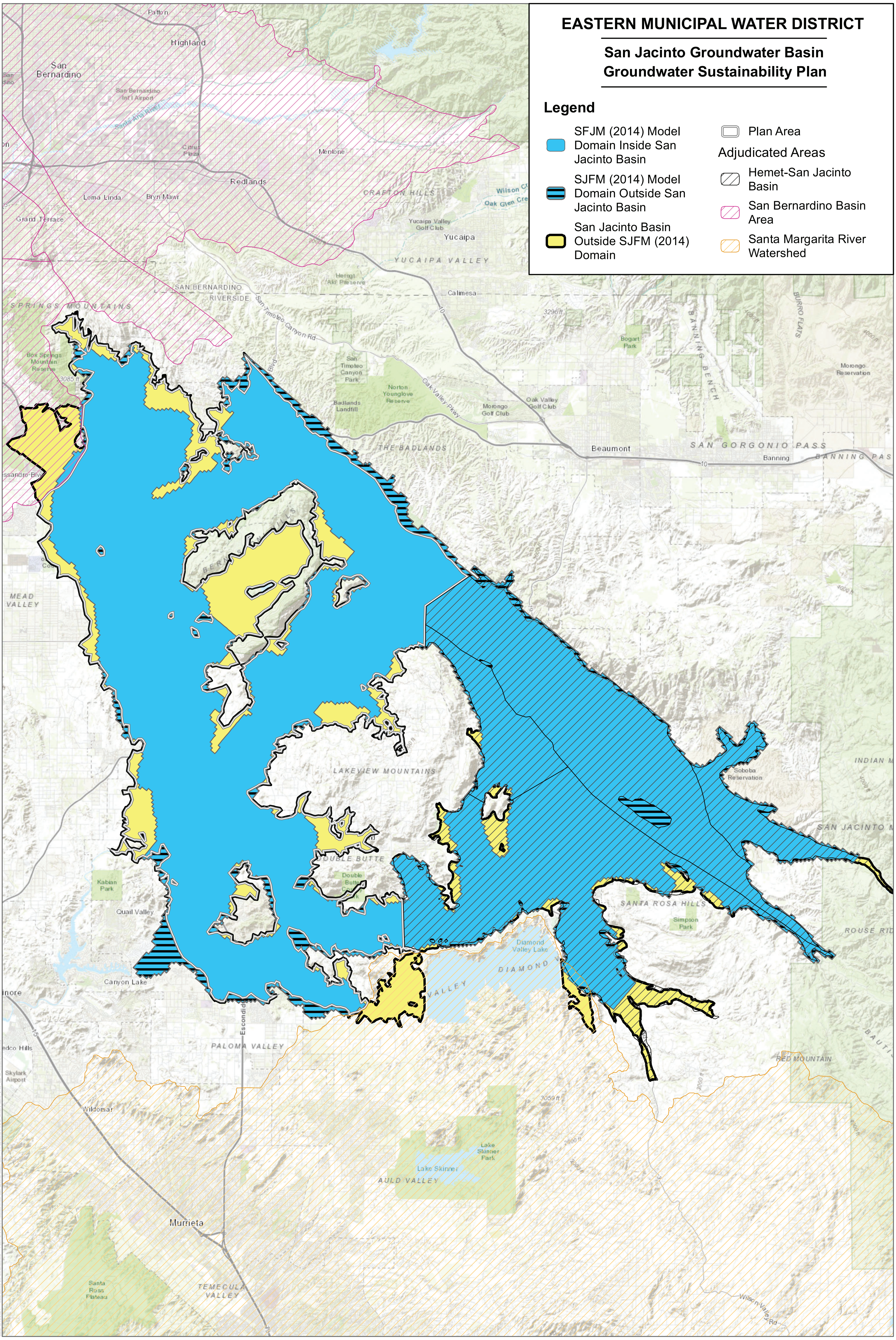

SOURCE: EMWD, Esri

emwd EASTERN MUNICIPAL WATER DISTRICT

FIGURE 2-41

San Jacinto Groundwater Flow Model (SJFM-2014) Extent

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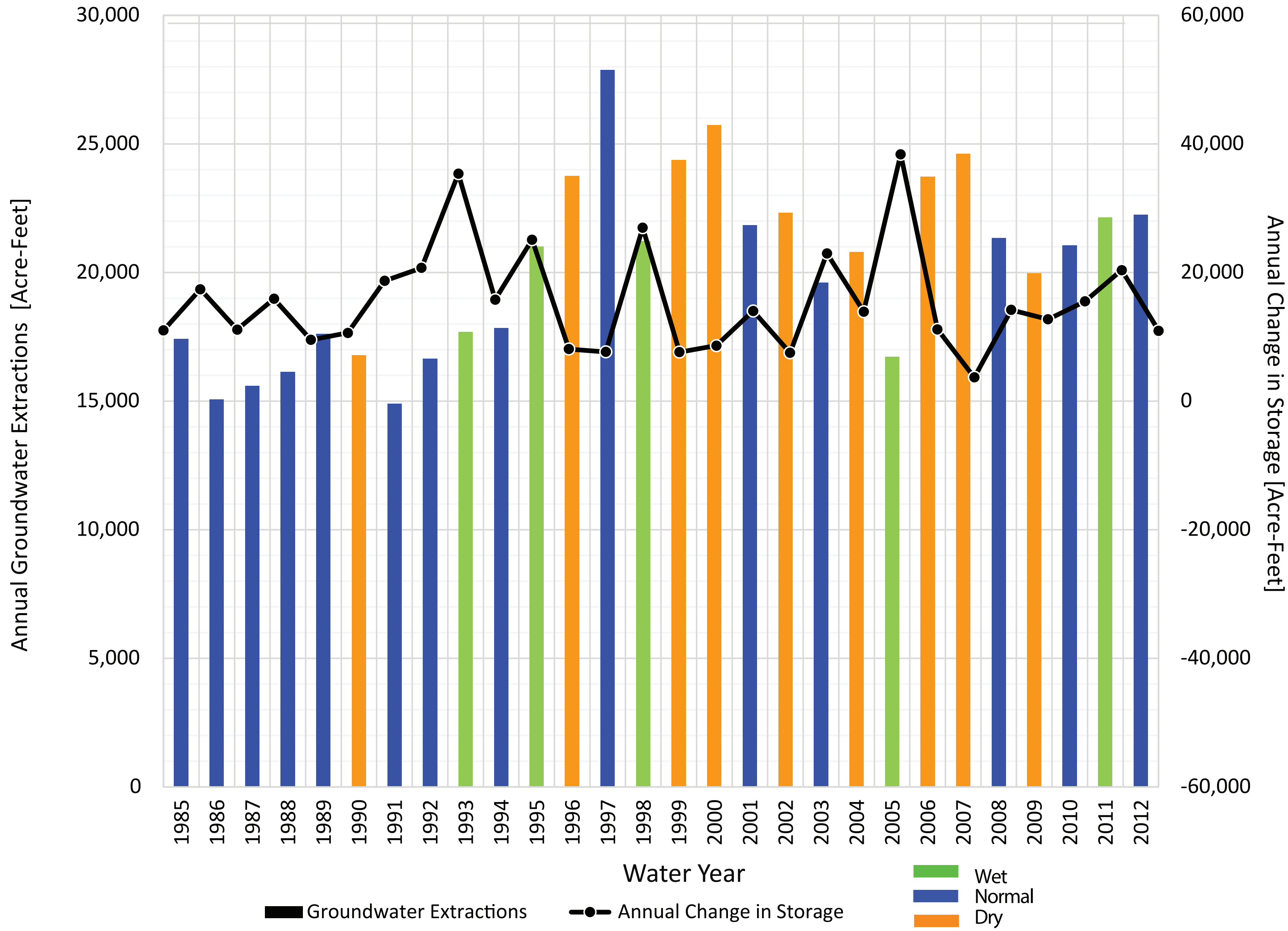

Notes:

(1) Water year is October 1 to September 30
(e.g. water year 2012 is Oct. 1, 2011 to Sept. 30, 2012)
(2) Water Year Type is based on Lake Perris Rain Gauge (Gauge ID: 151) Precipitation
(3) Dry Water Year Type: Measured Precipitation < 6.5 inches per water year
(4) Normal Water Year Type: 6.5 inches< Measured Precipitation < 11.5 inches per water year
(5) Wet Water Year Type: 11.5 inches per water year < Measured Precipitation

SOURCE: San Jacinto Flow Model (2014)

EMWD EASTERN MUNICIPAL WATER DISTRICT

FIGURE 2-42

Historical Annual Change in Groundwater in Storage in the Plan Area

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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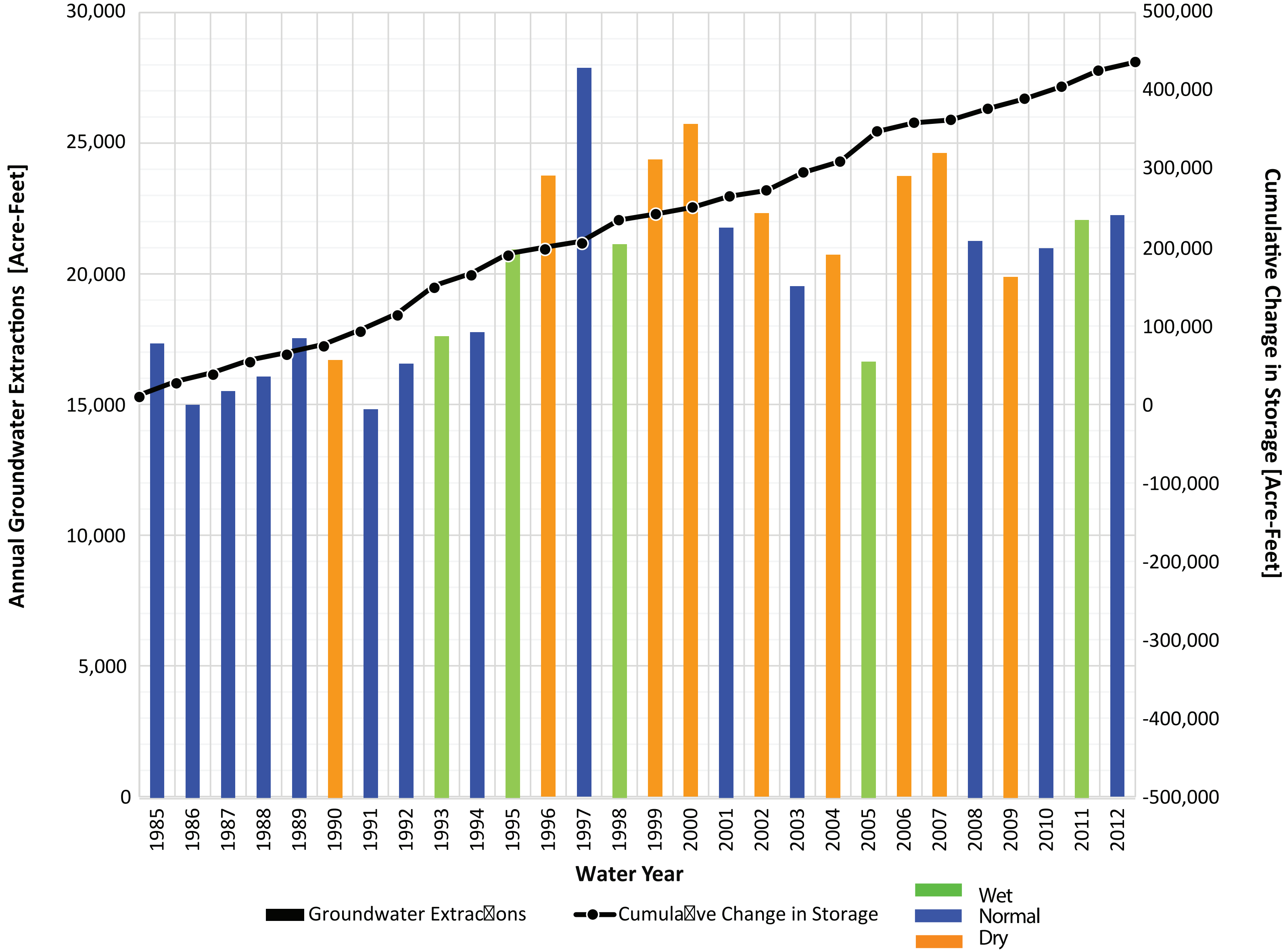

Notes:

(1) Water year is October 1 to September 30
(e.g. water year 2012 is Oct. 1, 2011 to Sept. 30, 2012)
(2) Water Year Type is based on Lake Perris Rain Gauge (Gauge ID: 151) Precipitation
(3) Dry Water Year Type: Measured Precipitation < 6.5 inches per water year
(4) Normal Water Year Type: 6.5 inches< Measured Precipitation < 11.5 inches per water year
(5) Wet Water Year Type: 11.5 inches per water year < Measured Precipitation

SOURCE: San Jacinto Flow Model (2014)

EMWD Eastern Municipal Water District

FIGURE 2-43

Historical Cumulative Change in Groundwater in Storage in the Plan Area

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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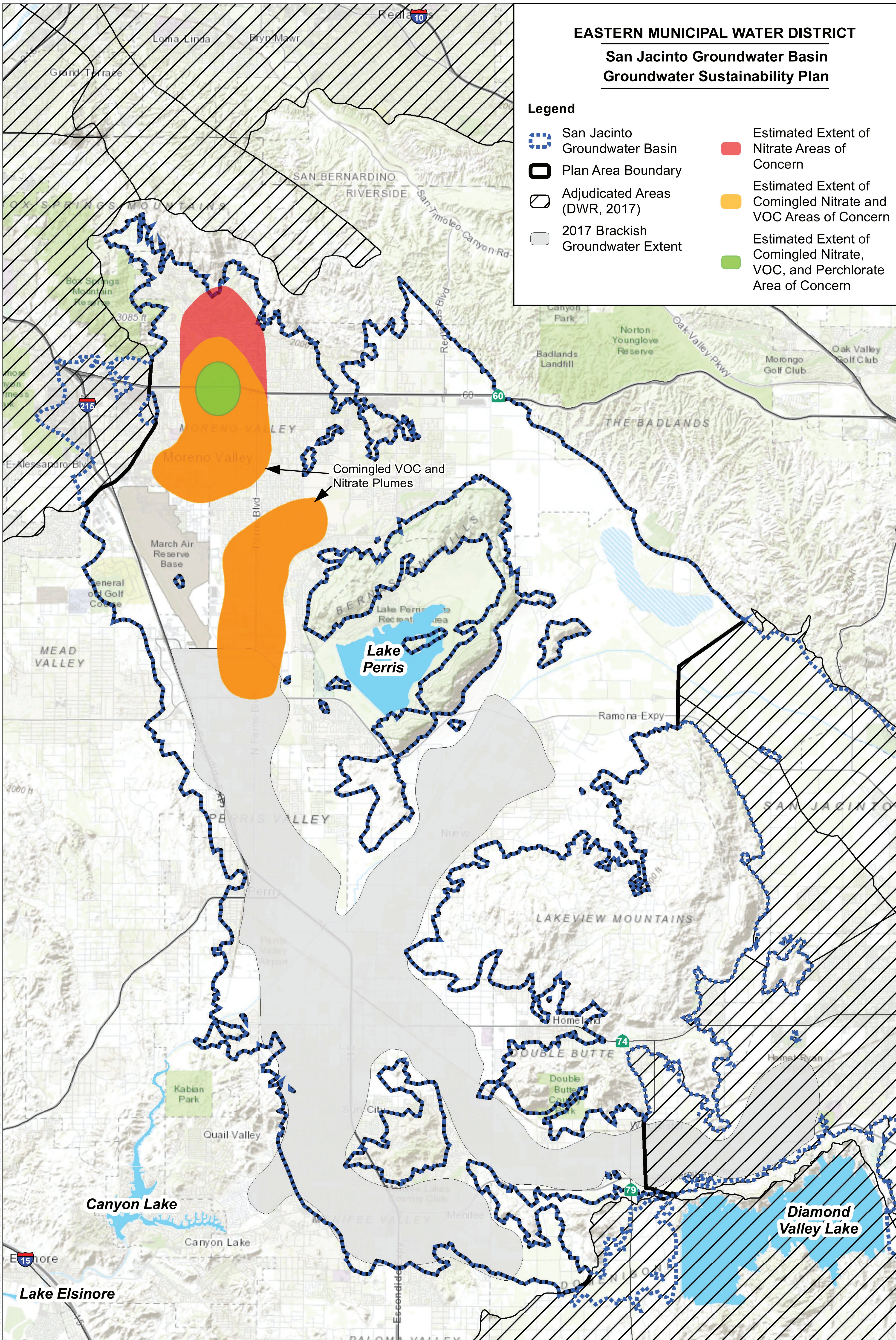

SOURCE: EMWD

emwd EASTERN MUNICIPAL WATER DISTRICT

0 1 2 Miles

FIGURE 2-44

Non-point Source Contaminant Extent

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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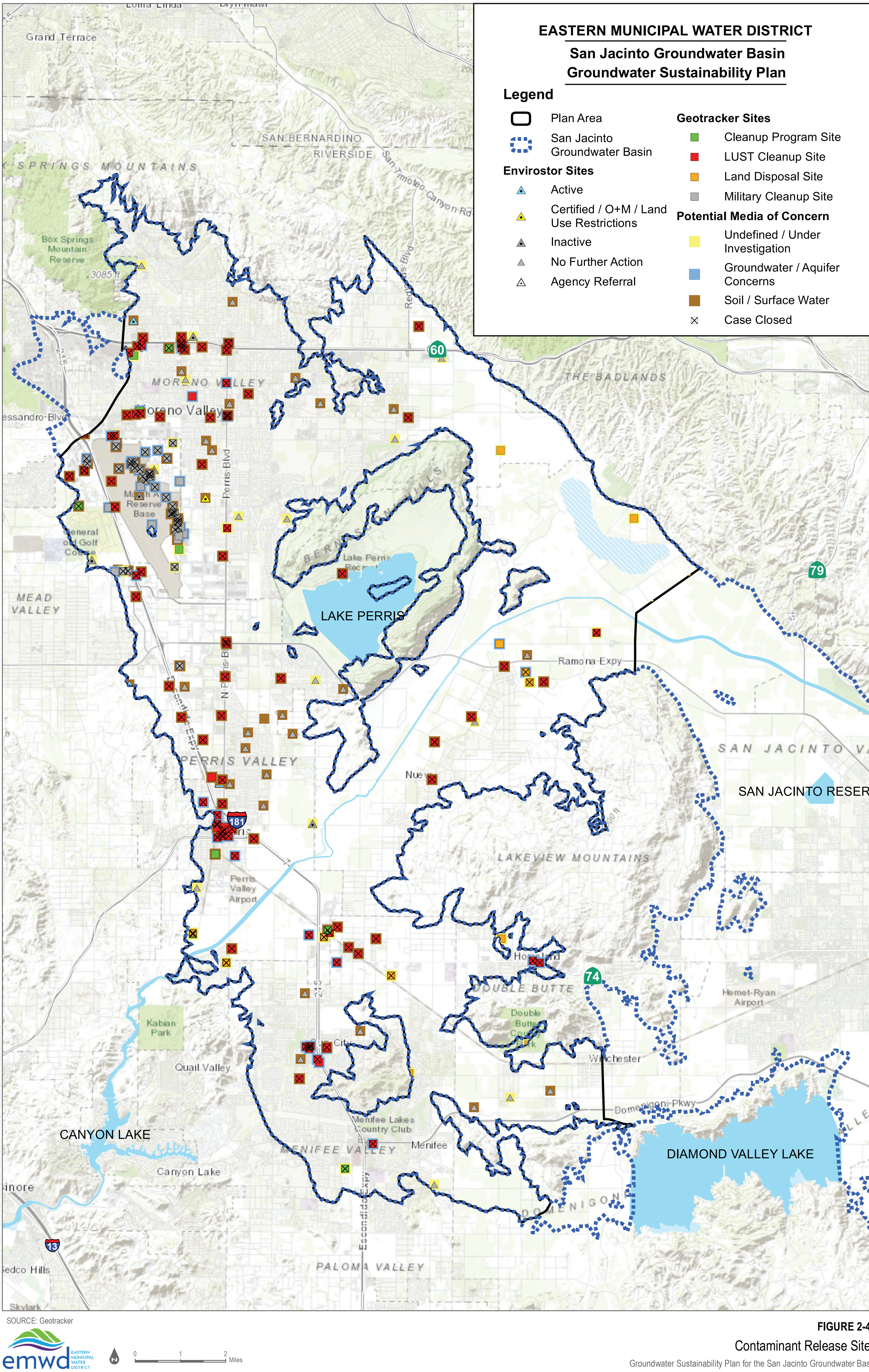

FIGURE 2-45

Contaminant Release Sites

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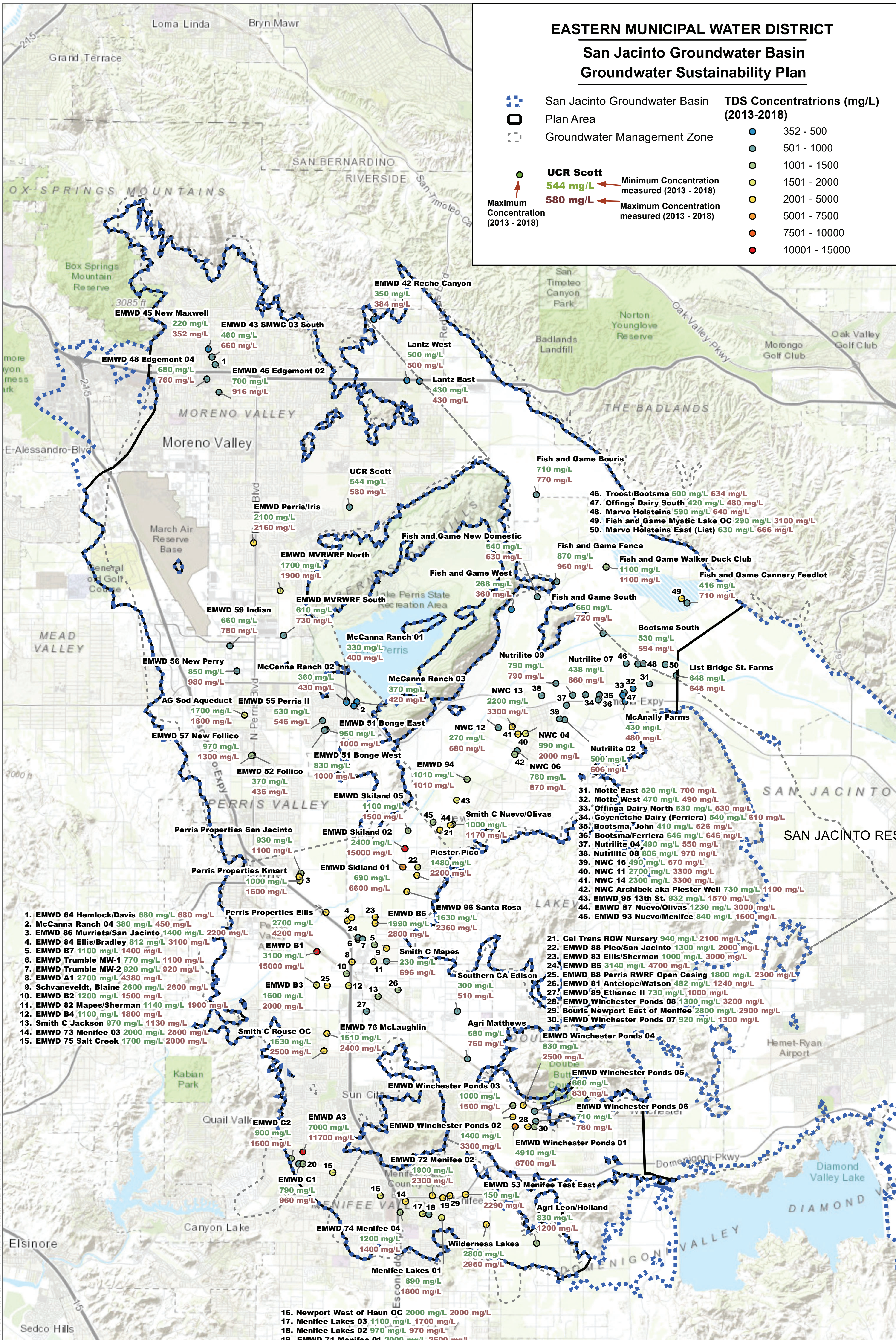


SOURCE: Data provided by EMWD

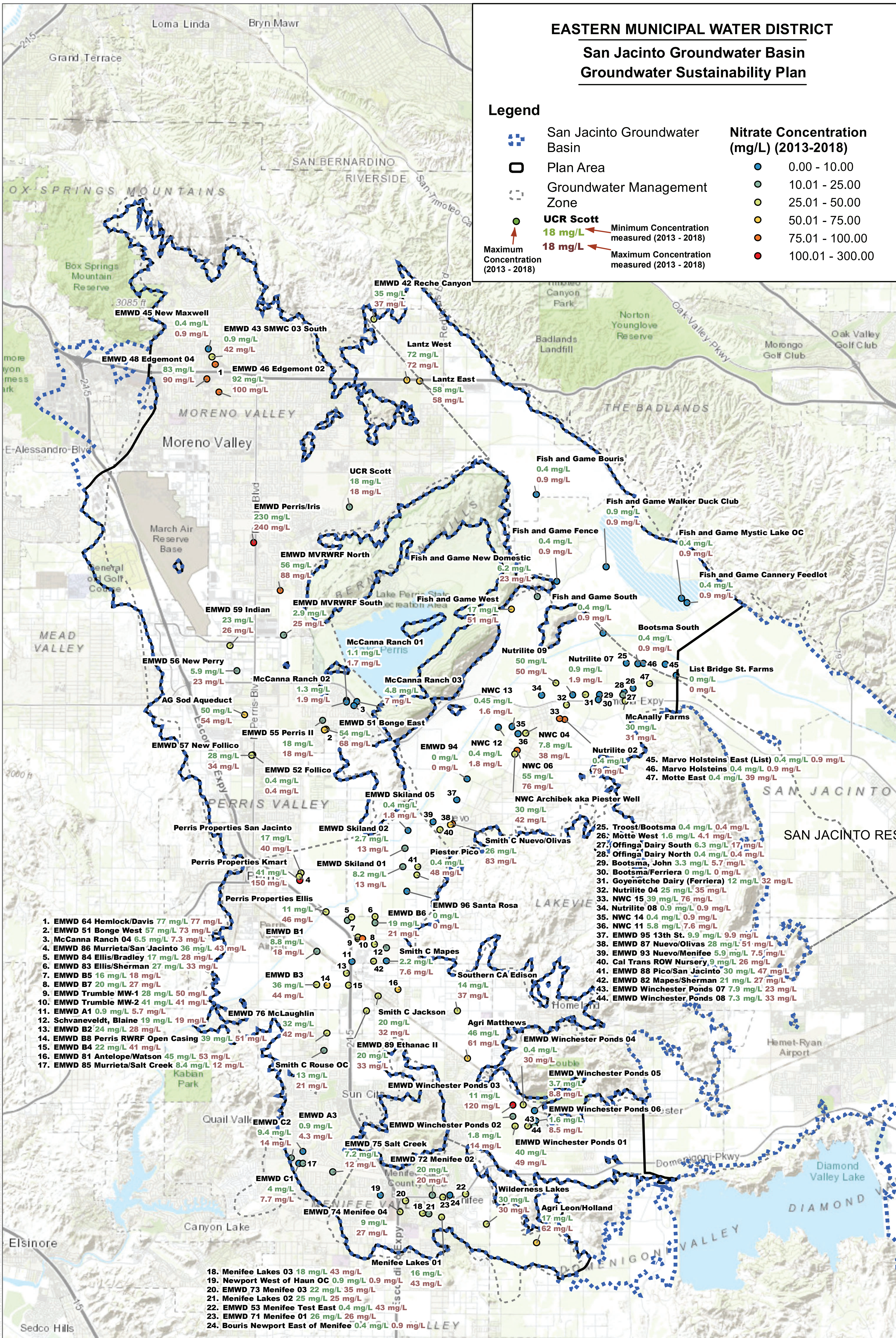
FIGURE 2-46

TDS Concentrations (2013-2018)

emwd EASTERN MUNICIPAL WATER DISTRICT

0 5,000 10,000 Feet

INTENTIONALLY LEFT BLANK



SOURCE: Data provided by EMWD

FIGURE 2-47

Nitrate Concentrations (2013-2018)

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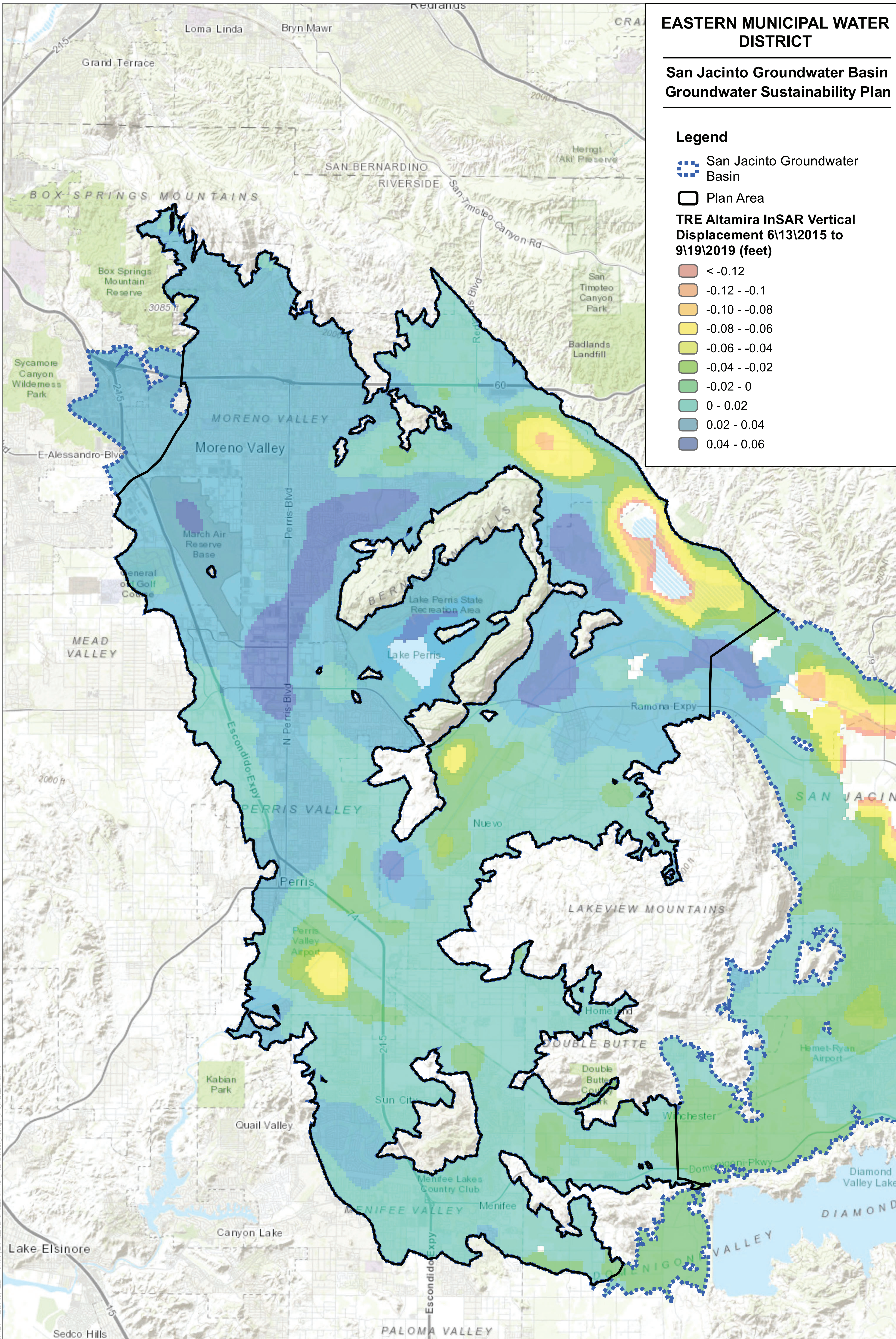


SOURCE: DWR, EMWD, Esri, TRE Altamira

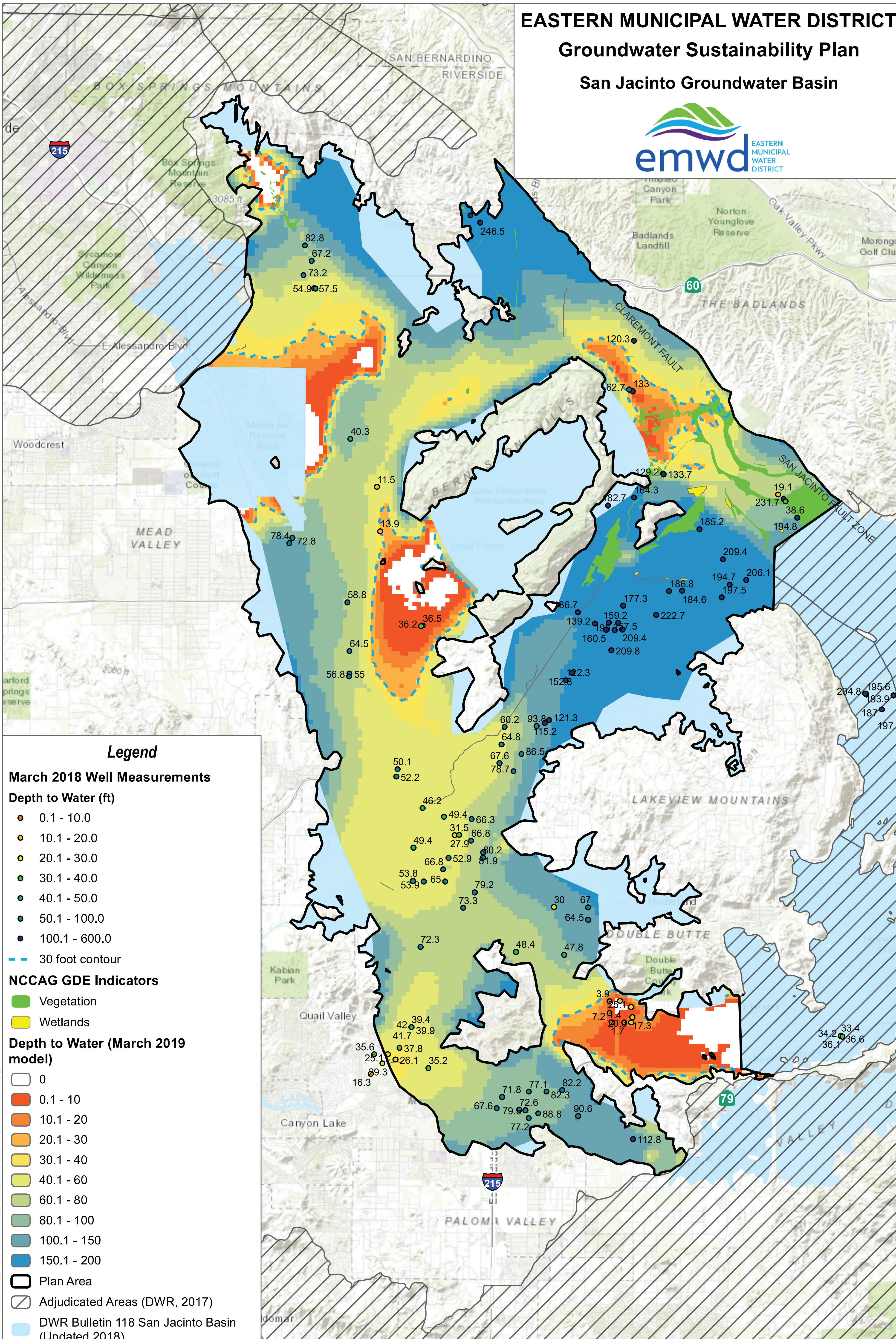
emwd EASTERN MUNICIPAL WATER DISTRICT

0 1 2 Miles

FIGURE 2-48

Land Subsidence

INTENTIONALLY LEFT BLANK



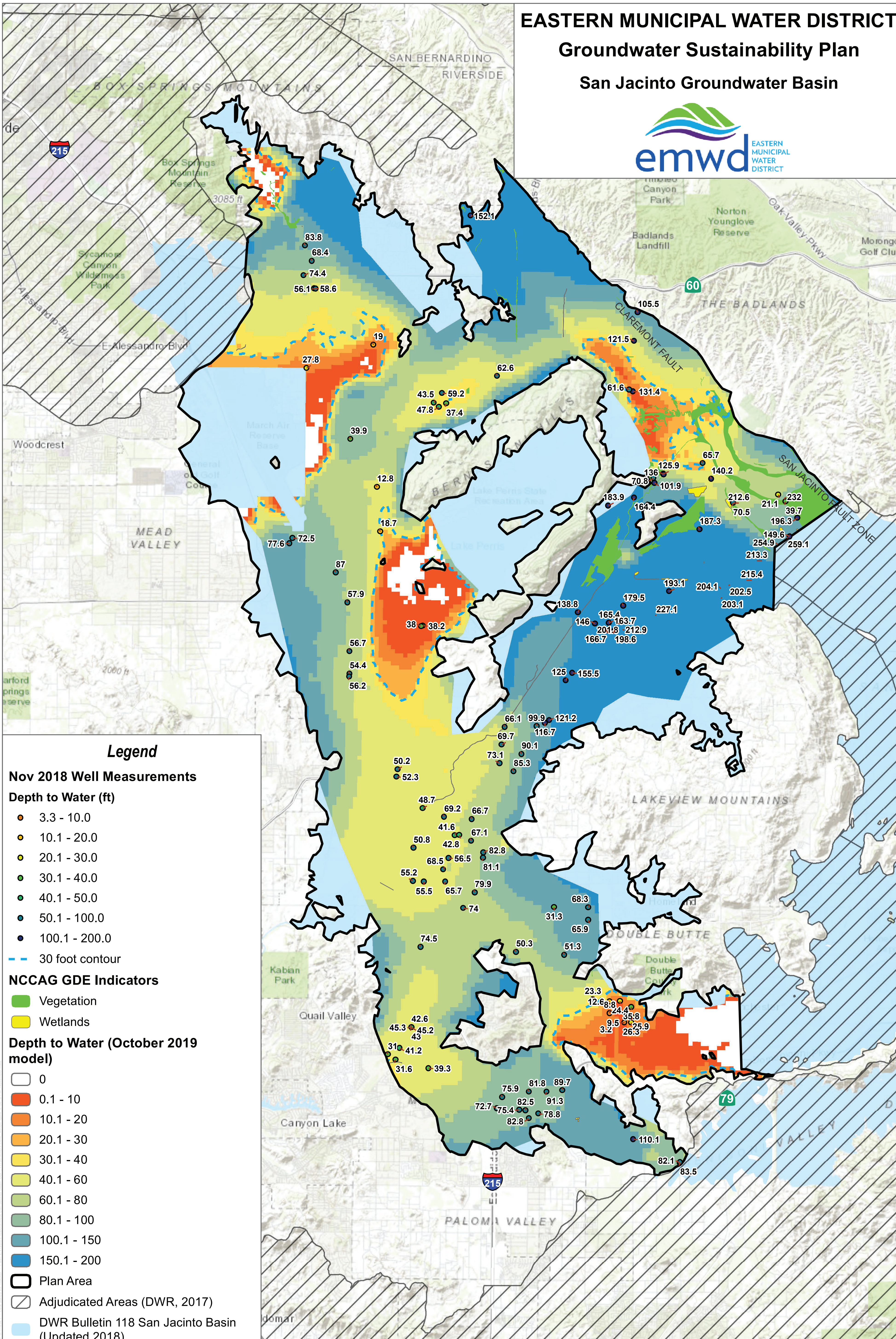
SOURCE: SJFM-2014, Data provided by EMWD

DUDEK 0 1 2 Miles

FIGURE 2-49

Depth To Water March 2018

INTENTIONALLY LEFT BLANK



SOURCE: SJFM-2014, Data provided by EMWD

DUDEK

0 1 2 Miles

FIGURE 2-50

Depth To Water November 2018

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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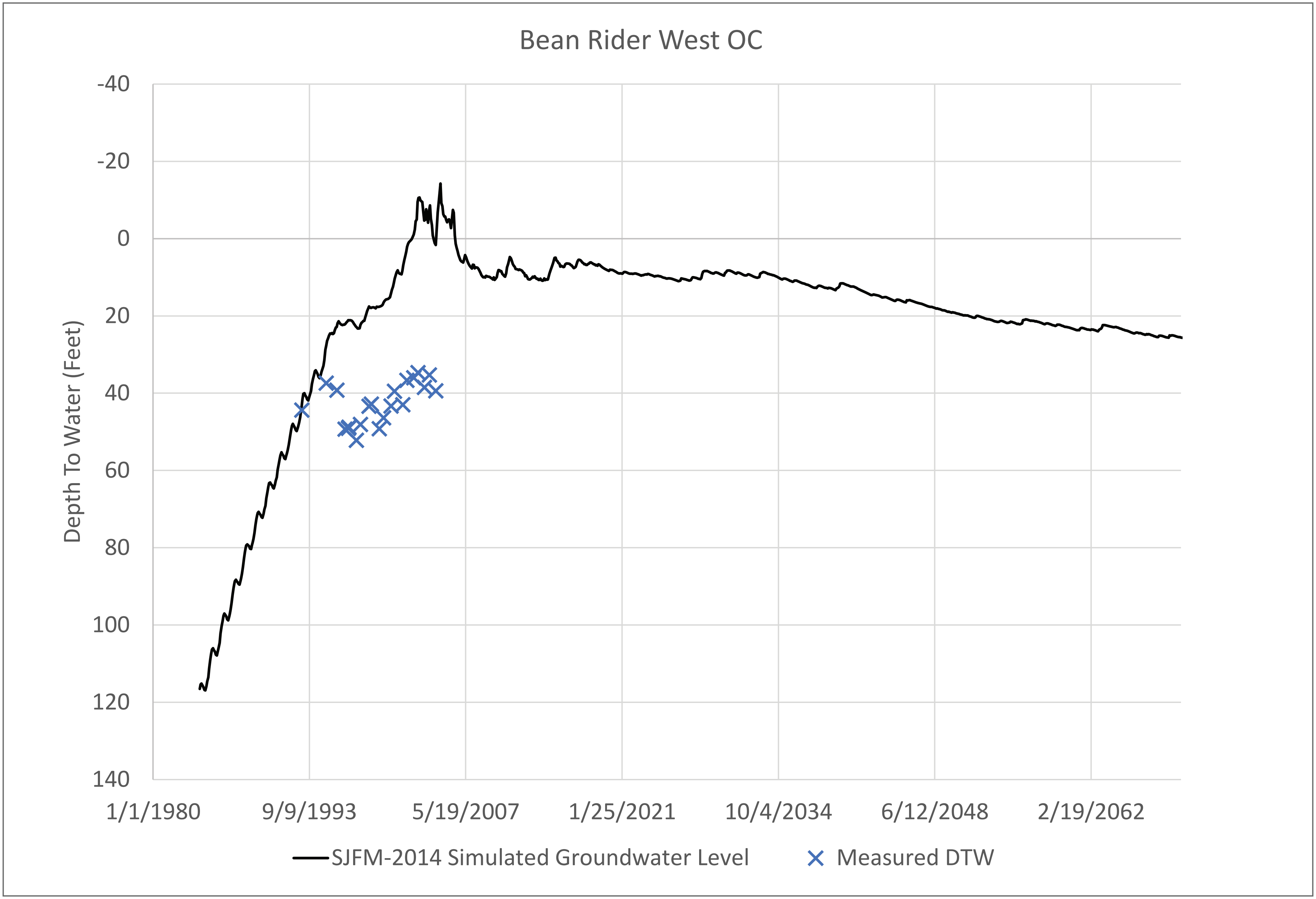

SOURCE: EMWD

emwd EASTERN MUNICIPAL WATER DISTRICT

FIGURE 2-51

Simulated and Observed Depth to Water at Bean Rider West OC

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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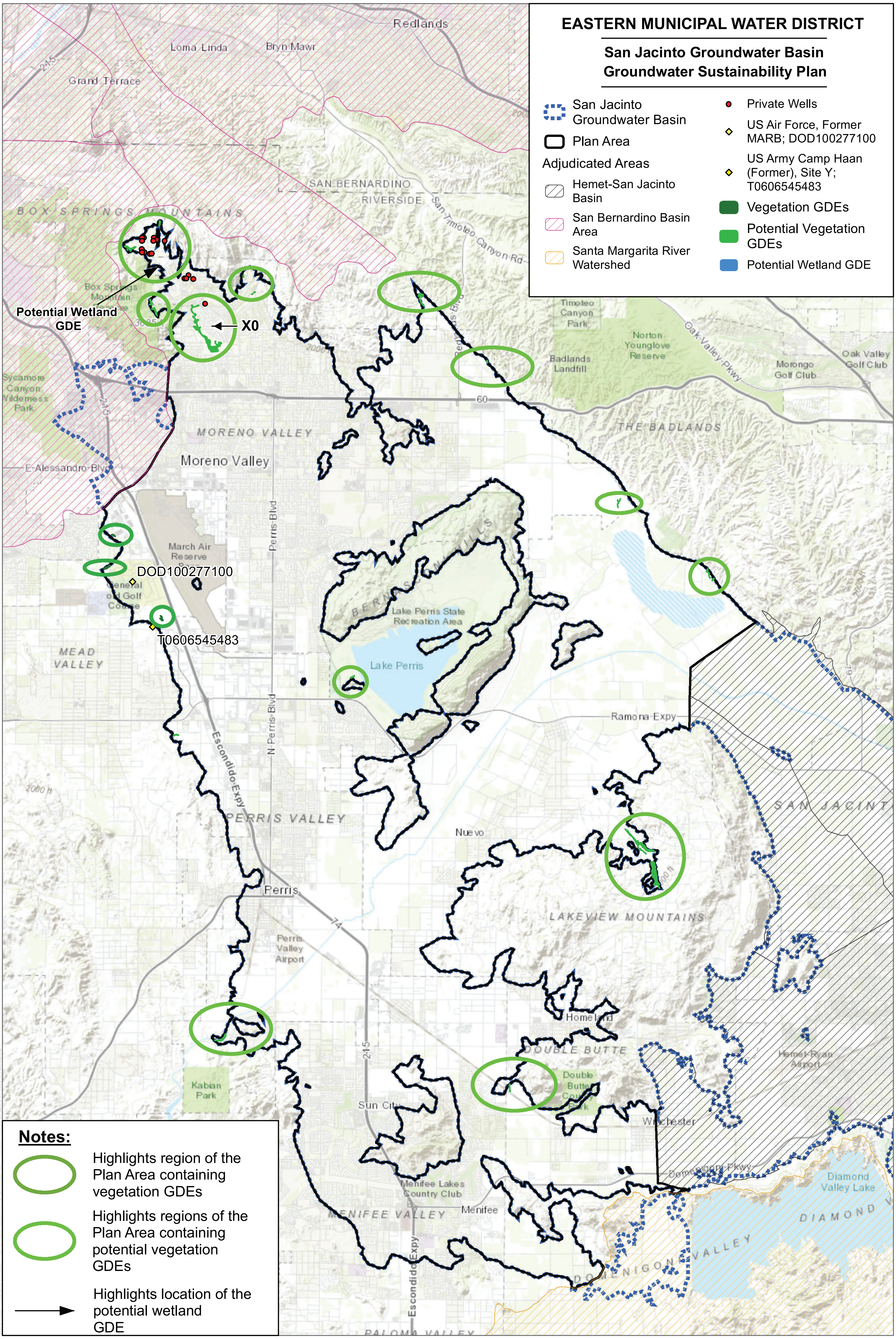

SOURCE: EMWD, Esri

emwd EASTERN MUNICIPAL WATER DISTRICT

0 1 2 Miles

FIGURE 2-52

Groundwater Dependent Ecosystems in the Plan Area

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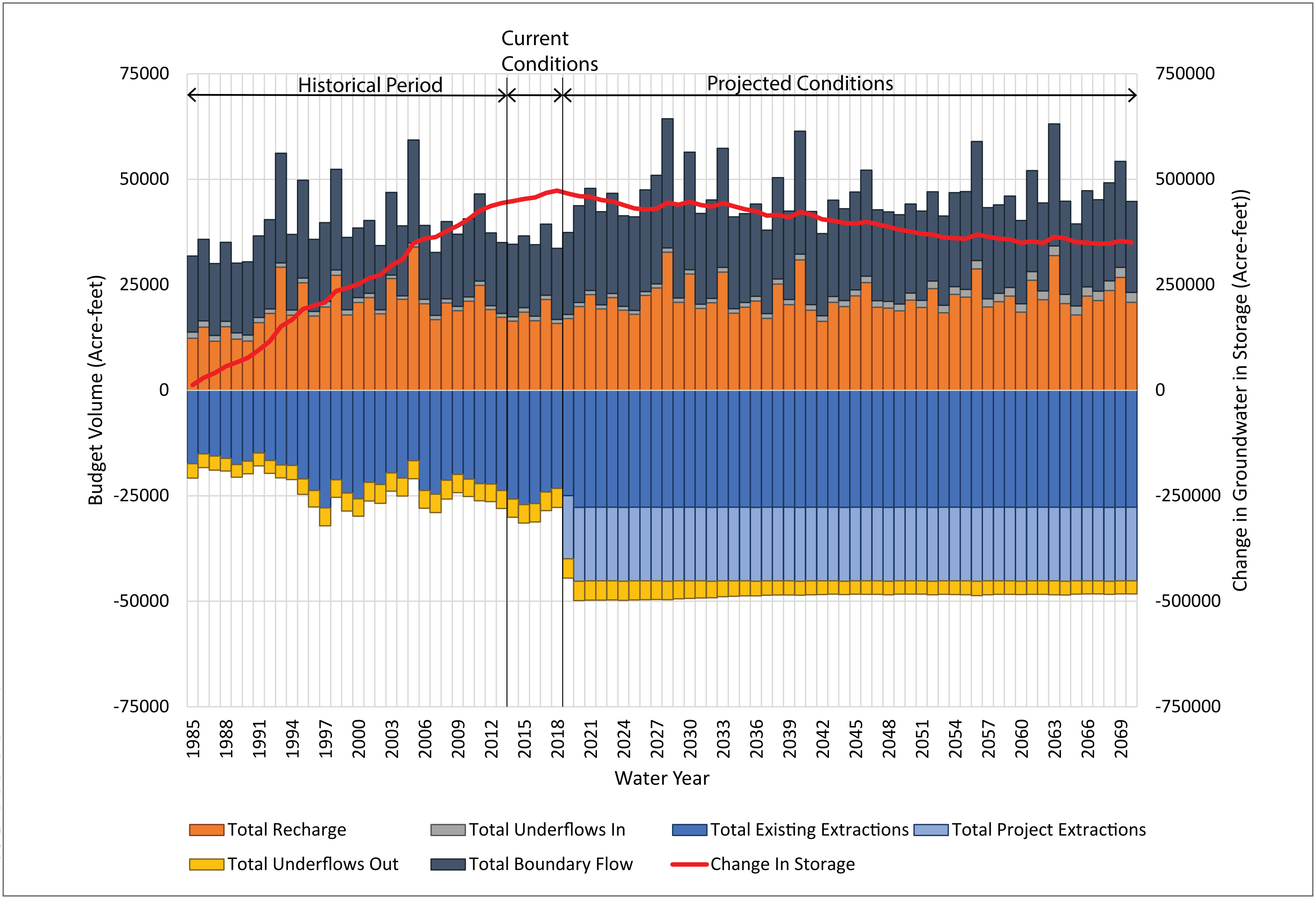

SOURCE: San Jacinto Flow Model (2014)

FIGURE 2-53

Water Budget for Historical, Current, and Projected Future Baseline Conditions in the Plan Area

Groundwater Sustainability Planf or the San Jacinto Groundwater Basin

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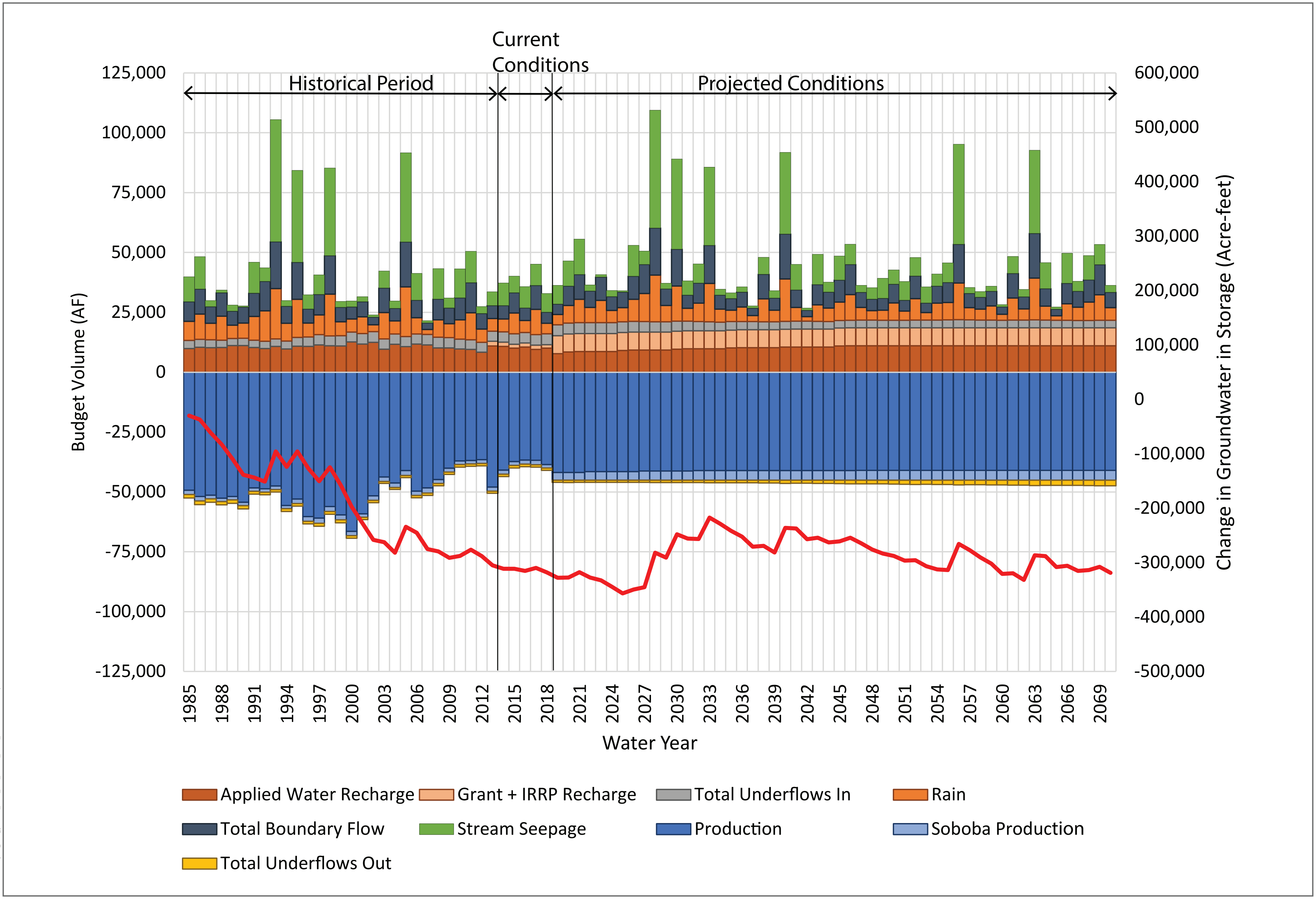

SOURCE: San Jacinto Flow Model (2014)

EASTERN MUNICIPAL WATER DISTRICT

FIGURE 2-54

Water Budget for Historical, Current, and Projected Future Baseline Conditions in the Hemet-San Jacinto Management Area

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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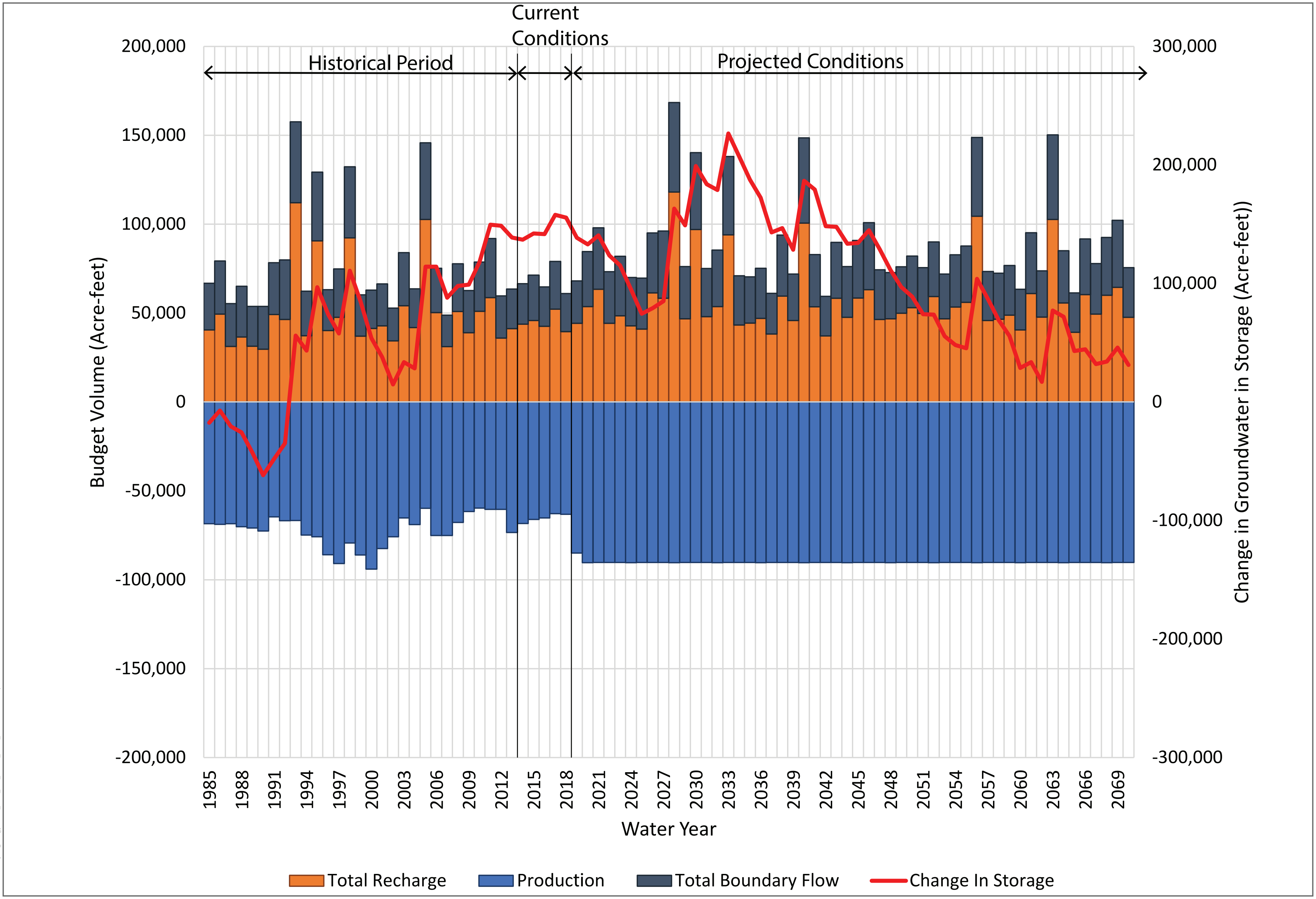

SOURCE: San Jacinto Flow Model (2014)

EASTERN MUNICIPAL WATER DISTRICT

FIGURE 2-55

Water Budget for Historical, Current, and Projected Future Baseline Conditions in the San Jacinto Groundwater Basin

Groundwater Sustainability Plan for the San Jacinto Groundwater Basin

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