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GROUNDWATER RESOURCES OF THE PLACITAS AREA, SANDOVAL COUNTY, NEW MEXICO: AN UPDATE

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Abstract—To manage water resources, reliable, timely, and plentiful water data are essential. The impact of groundwater use in the Placitas area, northeast of Albuquerque, New Mexico, is not entirely clear, as water-level records are imperfect, favoring some aquifers and certain time periods. The earliest U.S. Geological Survey (USGS) data is from 1975. USGS and other data fortuitously do not duplicate, but they also are noncontinuous and do not measure the same wells. However, New Mexico Office of the State Engineer (NMOSE) well record data for the entire area reveal a progressive increase in average well depths and declining depths to water over the past six decades, a record spanning from 1960 to 2023, with 1,664 entries. Specifically, these well records show that well depth increased from about 270 feet below ground level (ft bgl) in the 1960s and 1970s to approximately 420 ft bgl in 2023. Depth to water increased from 169 to 209 ft bgl in the same time period. The increase in well depth may better reflect a regional water level decline, which approaches 2.5 ft/yr.

A review of other state agencies' groundwater data indicates that total municipal and domestic groundwater withdrawals in the Placitas area may amount to between 616 and 1,285 acre-ft in 2020, substantially less than the more than 5,249 acre-ft/yr of domestic and municipal diversions on record. Roughly 75% of local residents are served by a community water system, with the remaining population relying on individual or shared domestic wells. Water rights records for irrigation, industrial, commercial, stock, and highway use total 3,936 acre-ft/yr. Estimated recharge in Placitas is as much as 3,216 acre-ft/yr; however, recharge may be unevenly distributed given the degree of hydrogeologic compartmentalization.

INTRODUCTION

Mutual domestic water consumer associations (MDWCAs; also known as public supply water systems or, here, community water systems) provide drinking water to about 87% of the U.S. population (Dieter et al., 2018). Rural areas likely depend less on these community water systems, leaving households that are not served by one to rely on individual or shared domestic wells. Yet as cities increasingly conserve water, how much water are rural residents using?

Water scarcity in New Mexico has led the New Mexico State Legislature to fund the New Mexico Water Data (NMWD; 2026) Initiative in 2019, which aims to both centralize water data and promote the gathering of additional data so water managers in the state can make informed decisions about managing diminishing resources. Groundwater use is especially scrutinized, as New Mexico has not been able to deliver adequate surface water from the Rio Grande to Texas, and water users in the state have increasingly relied on groundwater to meet their needs, leading to localized water level declines. The Placitas area of New Mexico has been listed as an example of such an area with water level declines (Follingstad et al., 2026). Placitas, an unincorporated area of Sandoval County, lies about 20 miles north of Albuquerque (Fig. 1) and has grown by more than 40% over the last 20 years (U.S. Census Bureau, 2025; data from 2000–2020). Johnson and Campbell (2008), incorporating a detailed geologic map, proposed a three-dimensional hydrogeologic framework and found depth to water in Placitas was variable, concluding that numerous faults in the area (Fig. 2) compartmentalize groundwater, which in some compartments may not be recharged quickly, causing localized water level declines. Only a few wells show a water level decline for 1998 and 1999, the period of record for the water level data (Johnson and Campbell, 2008); an almost equal number have water level increases. As additional local aquifer hydraulic data (NMOSE, 2010) and more extensive water level data (NMWD, 2026) are available, this paper aims to add to the Johnson and Campbell (2008) aquifer parameter dataset, update Placitas hydrographs, and provide a detailed look at the estimated water use in Placitas, which can then be utilized to make informed water management decisions.

HYDROGEOLOGY

Western Placitas is situated between 2 and 5 miles east of the Rio Grande within the Santo Domingo subbasin part of the Albuquerque Basin in the Rio Grande rift. In contrast, eastern Placitas (more than 5 miles east of the Rio Grande), is situated on geologic ramps and a mountain uplift block consisting of Paleozoic and Mesozoic sedimentary units overlying Proterozoic basement (Fig. 2). Groundwater in this area is replenished from Sandia Mountains recharge flowing north and west down to the Albuquerque Basin (e.g., Kelley and Northrop, 1975). Johnson and Campbell (2008) defined Placitas hydrogeology in terms of three hydrologic systems: a mountain hydrologic system (M1 through M4) consisting largely of high-elevation, Proterozoic-age granite overlain mostly by Pennsylvanian-age Madera Group limestone (and some Permian- to Triassic-age units), connecting to a "Mesozoic-age" ramp hydrologic system (R1 through R4) consisting mostly of Mesozoic-age sedimentary units, which connects to an Albuquerque Basin hydrologic system (B1 through B4), with basin sediments collectively mapped as Quaternary- and Tertiary-age Santa Fe Group.

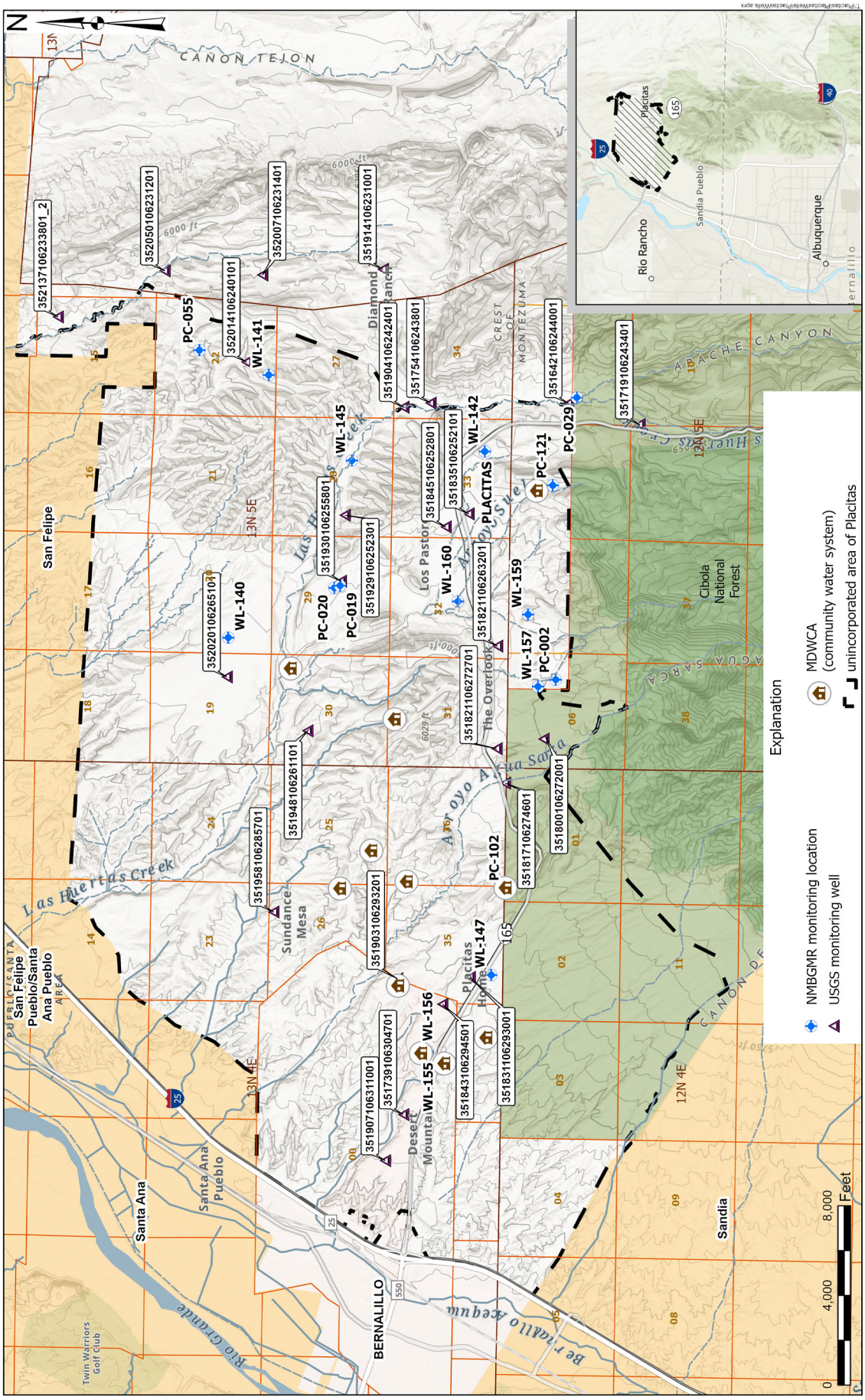


FIGURE 1. Map showing location of Placitas, wells with water level data, and local community water systems, southern Sandoval County, New Mexico.

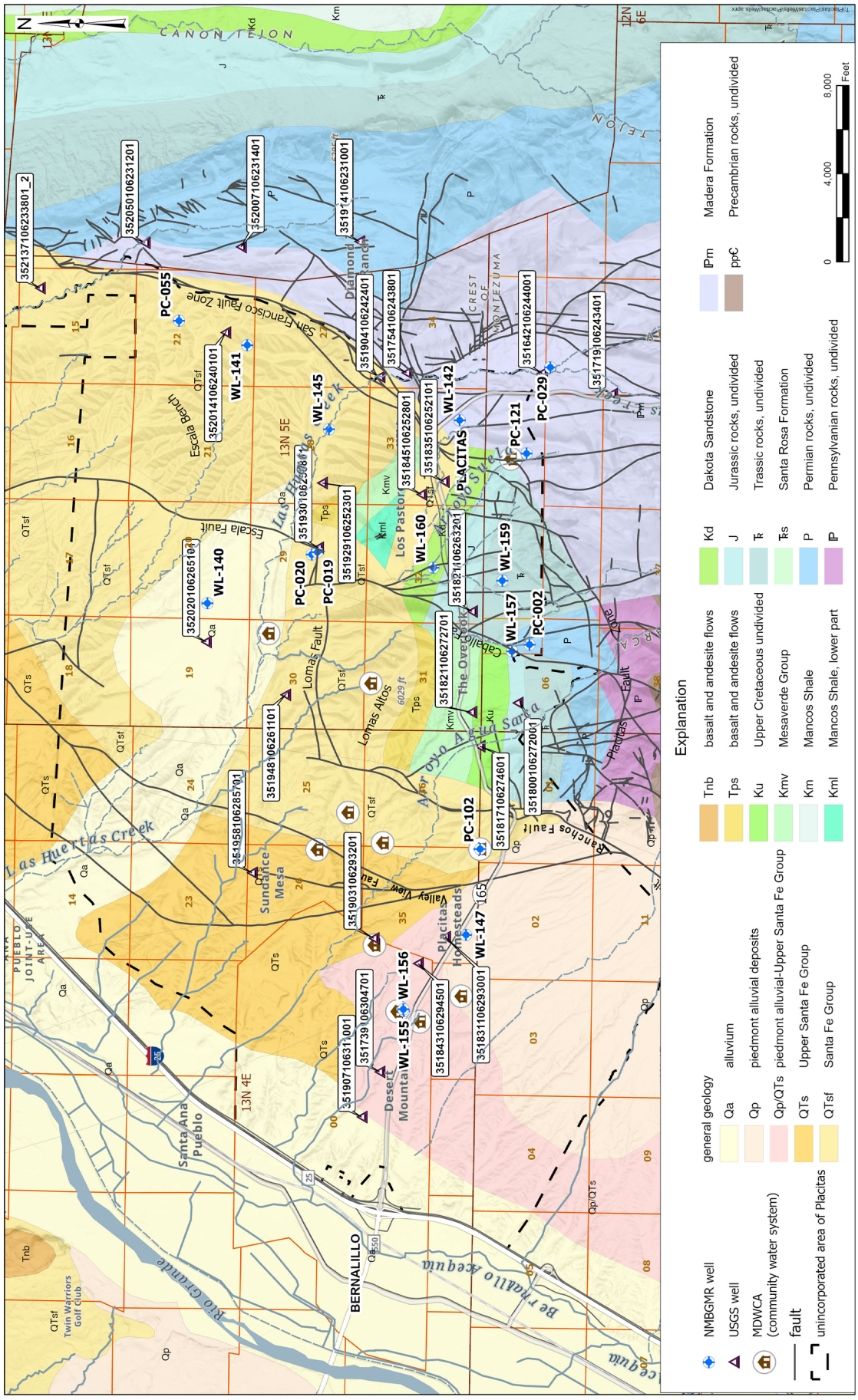


FIGURE 2. Map showing generalized geology in the Placitas area, southern Sandoval County, New Mexico.

Placitas's different hydrologic systems are separated by faults. Near the center of the study area (Fig. 2), the north-striking Ranchos fault (linking to the Rincon fault south of the study area) connects to the east-striking Lomos fault, which in turn connects to the north-striking Caballo and Escala faults; these faults separate the Albuquerque Basin hydrologic system to the west-northwest from the Mesozoic-age ramp hydrologic systems to the east-southeast. Upper Santa Fe Group sediments prevail west of the Ranchos fault, whereas a thin sliver of lower Santa Fe Group sediments exists east of the Ranchos fault in the Lomos Altos and Escala Bench blocks. Lower Santa Fe Group conglomerates are underlain by thick Mesozoic and Paleozoic units (e.g., Connell et al., 1995). Within western Placitas, Upper Santa Fe Group sediments mapped as Pliocene- to Pleistocene-age axial river deposits, part of the Sierra Ladrones Formation (QTsa; Connell et al., 1995 and Connell, 2008), grade eastward into piedmont-deposit-dominated units (QTsp; Connell et al., 1995). Sandstone, conglomerate, and mudstone characterize the axial river deposits, and mixes of pebbly sandstone and poorly sorted limestone and subordinate granite clast-supported conglomerate form alluvial fan deposits (Table 1). The overall thickness of Santa Fe Group sediments in western Placitas is about 3,300 ft near Interstate 25; Santa Fe Group sediments thin to the south, as estimated from a calibrated geophysical basin model (Grauch and Connell, 2013).

Well-record lithologic logs in western Placitas (NMOSE, 2026) reveal mostly gravel deposits, red clay, silty sand, and sandy silt. Limestone and limestone cobbles are noted in some logs. Connell et al. (1995) described poorly to well-cemented, pebble to cobble conglomerate, sandstone, and variable proportions of mudstone in the Sierra Ladrones Formation of western Placitas, where it is the primary aquifer. Between the Valley View fault and the Ranchos fault, the Sierra Ladrones Formation is mostly unsaturated, and Lower Santa Fe Group cemented conglomerates provide a small groundwater resource (Table 1; Connell et al., 1995).

Sedimentary units on the ramp structures dip north toward the Albuquerque Basin, and as a result units are older toward the Sandia Mountains and to the south (Table 2). The youngest ramp unit is the Cretaceous Menefee Group (R4), whereas the oldest fault-affected units in the Placitas area are Proterozoic-age granite, quartzite, and schist, which are the basement to the Sandia Mountains hydrologic system (Table 2; Johnson and Campbell, 2008). Not many wells are completed in the Proterozoic-age Sandia granite, but some (10–15%) of Placitas is underlain by shale-dominated units; the Permian-age Abo Formation, Triassic-age Petrified Forest Formation, Cretaceous-age Mancos Shale, and Menefee Formation (cf. Table 2) locally yield groundwater to wells but overall are poor aquifers. Besides the Santa Fe Group, aquifer units include the interconnected Cretaceous-age Dakota Formation and the Jurassic-age Morrison Formation, the Permian-age San Andres and Glorieta Formations, and the Pennsylvanian-age Madera and Sandia Formations (Table 2). In the Placitas area, 24 springs are mapped (Johnson and Campbell, 2008), most of which are associated with faults where likely aquifers and aquicludes are juxtaposed. See Johnson and Campbell (2008) for a more detailed description of the hydrogeologic framework of the area.

Aquifer Properties

Aquifer properties for the Placitas area are summarized from data compiled by Johnson and Campbell (2008) from pumping test data and show a transmissivity range between 4 and 13,700 ft^2/day for the four main aquifers present in the area, or an average of 1,100 ft^2/day across all aquifers (Table 3). The Santa Fe Group aquifer is the most productive aquifer and has the highest transmissivities, ranging from 10 to 13,700 ft^2/day, with an average transmissivity of 1,900 ft^2/day (Johnson and Campbell, 2008). Specific capacities for the Santa Fe Group average 7 gallons per minute per foot of drawdown (gpm/ft), but range from 0.3 to 31 gpm/ft of drawdown in the Placitas area. The other aquifers listed in Johnson and Campbell (2008) have insufficient data to provide average aquifer property data. The next most productive aquifer is the Madera Group, likely cavernous in the Placitas area (Titus, 1980), with a transmissivity range from 20 to 2,160 ft^2/day (Table 3). Permian units (San Andres, Yeso, and Abo Formations) locally supply water for domestic wells and have a range of transmissivities from 4 to 705 ft^2/day. The Mesozoic units, overall, make a poor aquifer, with an average transmissivity value of 22 ft^2/day. Excluding the Santa Fe Group, the average specific capacity for these bedrock aquifers is less than 3 gpm/ft of drawdown. For the Permian and Mesozoic units, hydraulic properties are an order

TABLE 1. Geologic units present in western Placitas, southern Sandoval County, New Mexico (see Fig. 2)

Age	Formation	Symbol	Thickness (ft)	Description
Quaternary	surficial	Qal, Qa, and Qv	7–105 (typically <15)	stream alluvium and older stream alluvium (gray and yellow-brown sand and gravel, with minor clay, silt, and loam)
	surficial	Qaf and Qf	7–120 (typically <12)	piedmont alluvium (younger and older granite/limestone gravel and sand)
	surficial	Qp and QTp	13–60 (typically <10)	pediment alluvium and pediment fan complexes (poorly sorted limestone conglomerate and brown loam)
Quaternary-Tertiary	Upper Santa Fe Group	QTsa/QTst/QTsp	0–3,300	axial river deposits/transitional/piedmont deposits (undivided silty [cross-bedded] mudstone, sandstone, and conglomerate)
Tertiary	Lower Santa Fe Group	Tsp	~1,500	older piedmont deposit of Lomos Altos coarse sandstone, conglomerate, and local siltstone

of magnitude less than for the Madera and Santa Fe Group aquifers. Core (2000) estimated hydraulic conductivities of between 0.001 and 4 ft/day with corresponding transmissivities between 0.4 and 1,200 ft²/day (Table 3).

Additional aquifer test data were compiled by the NM Office of the State Engineer in 2010 (NMOSE, 2010) and were reviewed for the Placitas area. This dataset likely overlaps some of the Johnson and Campbell (2008) data, as 15 of the 50 entries in the NMOSE (2010) database predate the year 2000. The range of transmissivities is between 0.3 and 37,000 ft²/day for the four main aquifers, or an average of 1,800 ft²/day across all aquifers (Table 4). The Santa Fe Group and Madera Group aquifers again have the highest average transmissivities. Santa Fe Group transmissivities ranged from 1 to 37,000 ft²/day and averaged 3,700 ft²/day. The specific capacity average for the Santa Fe Group is 1.2 gpm/ft of drawdown (Table 4). For the Madera Group aquifer, the range of transmissivities is 12 to 12,200 ft²/day, with an average of 3,800 ft²/day. The combined Abo/Yeso Formation dataset is from the Diamond Tail subdivision located within 1 mile of the San Francisco fault zone. Transmissivities in the combined Abo/Yeso Formation range from 0.3 to 705 ft²/day, with an average of 151 ft²/day. Mesozoic units, including the Menefee Formation, Mancos Shale, Morrison Formation, and Petrified Forest Formation have the lowest transmissivities and hydraulic conductivities. Transmissivities range from 2 to 338 ft²/day and average 62 ft²/day; the average hydraulic conductivity is 7 ft/day. The NMOSE (2010) data are mostly from hydrogeologic assessments in support of subdivisions, and the data may present biased (favorable values) for aquifer performance, as subdivision applications may exclude poorly performing wells to secure a favorable opinion for the developer. A well that cannot supply a subdivision may not be recorded in the dataset. Aquifer properties listed in Johnson and Campbell (2008) are corroborated by NMOSE (2010) data listed in Table 4.

Well Yield and Performance

Within a 4-mile radius of Placitas, there are 1,664 water rights records on file (NMOSE, 2026), listing 1,194 total wells with completion dates. It is estimated that 929 (78%) of these wells are domestic wells, with an unknown number of redrilled wells.

Wells with aquifer test data located in and around Placitas (NMOSE, 2010) produce on average about 20 gpm, with a maximum of 114 gpm reported. Most wells detailed in this dataset have casing diameters of less than 6.75 in. with screen lengths of less than 80 ft, reflecting the preponderance of

TABLE 2. Geologic units present in eastern Placitas, southern Sandoval County, New Mexico (after Connell et al., 1999; see Fig. 2

Age	Formation	Symbol	Thickness (ft)	Description
Cretaceous	Menefee	Kme	680–1,204	gray-tan cross-bedded silt- and sandstone, olive shale, and coal and iron concretions
	Point Lookout Sandstone	Kpl	240–315	gray-tan-yellow fine quartz sandstone (shale)
	upper Mancos Shale	Kmu	240–360	black-olive shale and minor gypsum-sandstone
	Hosta-Dalton Sandstone	Khd	210–370	yellow fissile medium sandstone
	Lower Mancos Shale	Kml	850	black-olive shale and minor silt-sandstone
	Dakota	Kd	75	medium-bedded orange quartz arenite with minor interbedded black shale
Jurassic	Morrison	Jm	780–850	four members: white sandstone, gray-green mudstone, gray-yellow-red fissile sandstone, purple-green-red mudstone with sandstone
	Todilto	Jt	50–65	gray fetid limestone with upper gypsum and basal black shale
	Entrada	Je	71–120	red-tan, fissile, cross-bedded, fine eolian quartz-sandstone (slope-forming)
Triassic	Petrified Forest	Trcp	1,430–1,650	reddish-brown mudstone interbedded with thin sandstone and conglomerate
	Agua Zarca	Trz	220	tan to white arenite to arkose with interbedded shale
	Moenkopi	Trm	45–100	maroon micaceous fine sandstone and siltstone
Permian	San Andres Limestone	Psa	80–130	gray-tan fractured (and cavernous) limestone and white sandstone
	Glorieta	Pg	50	white medium-grained sandstone
	Yeso	Py	500–680	orange-brown silty sandstone with limestone layers and gypsum and a lower orange-pink to white sandstone
	Abo	Pa	1,070	red mudstone, shale, and lenticular gray-orange sandstone
Upper and Middle Pennsylvanian	Madera	Pm	1,260	upper thin-bedded limestone, shale, and arkosic sandstone with lower massive gray limestone
	Sandia	Ps	49–193	brown mudstone; gray-green, thin-bedded limestone; and lower olive sandstone
Mississippian	Arroyo Penasco	Ma	90	gray limestone, red-green shale, siltstone, and lower purplish-green sandstone/conglomerate
Proterozoic	Sandia granite, metasedimentary units	Y-, X-	–	biotite granodiorite, green amphibolite, schist, and minor quartzite

TABLE 3. Summary of hydraulic properties in the Placitas area (after Johnson et al., 2008)

Well	Johnson et al. (2008) zone	Specific capacity (gpm/ft)	Transmissivity (ft^2/day)	Total screened area (ft)	Hydraulic conductivity (ft/day)
Santa Fe Group wells (n = 12)	B 2, 3, 4	0.3–31 (avg. 7)	10–13,700 (avg. 1,900)	10–100	0.1–460
Core model[1]	–	–	1,200	300[2]	4
Cretaceous wells (n = 2)	R3	0.2	avg. 22	20–40	avg. 0.8
Core model[1]	–	–	0.375	3002	0.00125
Permian (Abo) wells (n = 5)	M4	0.01–0.5 (avg. 0.2)	4–705 (avg. 181)	–	0.1–1.0
Madera wells (n = 3)	M1, M2	~3[3]	20–2,160 (avg. 910)	–	0.1–110
Core model [2]	–	–	37.5	300[1]	0.125

[1] Core, 2000
[2] model aquifer thickness
[3] Walton (1970) method

domestic and exploratory wells. The average screen length is 40 ft (45 total records; NMOSE, 2010). Community water systems in the Placitas area are numerous, as there are 11 listed in both the NMOSE (2026) database and with the New Mexico Environment Department (NMED; 2026; Fig. 1). These 11 community water systems are supplied by 32 wells, and at least 12 of those wells are currently listed as inactive (NMED, 2026). The NMED database lists well "flow rates," which likely refers to a pump capacity for each well. This is not the same as a well yield and does not accurately reflect aquifer capacity. However, in lieu of well-specific test data, the data reveal that 20 active potable water production wells in Placitas produce between 10 and 110 gpm, and average 46 gpm. Five community water systems have Santa Fe Group wells (9 wells), with an average listed flow rate of 72 gpm.

To compare, the Town of Bernalillo wells, west of the Rio Grande, have higher listed pump capacities of between 495 and 1,470 gpm, with an average of 930 gpm (NMED, 2026). The low production rates reported for Placitas wells are likely due to a combination of factors, including small well diameter limiting available pump size, possible local fault compartmentalization (or completion in faults) increasing drawdown, locally limited Santa Fe Group thicknesses, and possible pumping interference from numerous domestic wells in the area. Compared to domestic wells, the community water system wells are designed with longer screen intervals and generally have better well efficiency due to their different purposes (cf. NMOSE, 2010).

Water Levels in Placitas

Water level data from Johnson and Campbell (2008)

Johnson and Campbell (2008) concluded several areas in Placitas are sensitive to groundwater decline. Most critical is the Mesozoic ramp system (R1-4), connecting Albuquerque Basin sediments (B1-4) to the mountain hydrologic system (M1-4; Fig. 3). Within this system, Johnson and Campbell (2008) reported water level declines of up to 170 ft, with declines of 10 to 25 ft in the Tunnel Spring and Quail Meadow areas in south-central Placitas. Groundwater level data collected in Johnson and Campbell (2008) mostly span the years from 1997 to 1998 (two records encompass 1999; Table 5), with only five datasets having a measurement before 1980. Johnson and Campbell (2008) data tables (51 wells) show 17 water level declines, 14 flat or stable water levels, and 20 water level rises from 1997 to 1998 (Table 5). The defining characteristic of most hydrographs is a 10 to 80 ft change (drop or rise) in water level over only a few months (2–6 months during 1997–1999), with some of these large monthly water level changes occurring during August and September. The short period of record in Johnson and Campbell (2008) seems inadequate for establishing local groundwater trends.

TABLE 4. Summary of hydraulic properties in the Placitas area (after NMOSE, 2010)

Well	Johnson et al. (2008) zone	Specific capacity (gpm/ft)	Transmissivity (ft^2/day)	Total screened area (ft)	Hydraulic conductivity (ft/day)
SF[1] Group wells (n = 19)	B2, 3, 4	0.3–4 (avg. 1.2)	1–37,000 (avg. 3,700)	20–270 (avg. 71)	0.04–5,200 (avg. 530)
Mesozoic wells (n = 10)	R1, 2, 3; M5	0.01–10 (avg. 1.6)	2–338 (avg. 62)	20–60	0.1–44 (avg. 7)
Permian (Abo/Yeso) wells (n = 11)	M4, R1	0.01–4 (avg. 0.7)	0.3–705 (avg. 151)	20–60	not reported
Madera wells (n = 5)	M3, M4	0.1–30	12–12,200 (avg. 3,800)	20–26	12–32

[1]SF = Santa Fe Group sediments

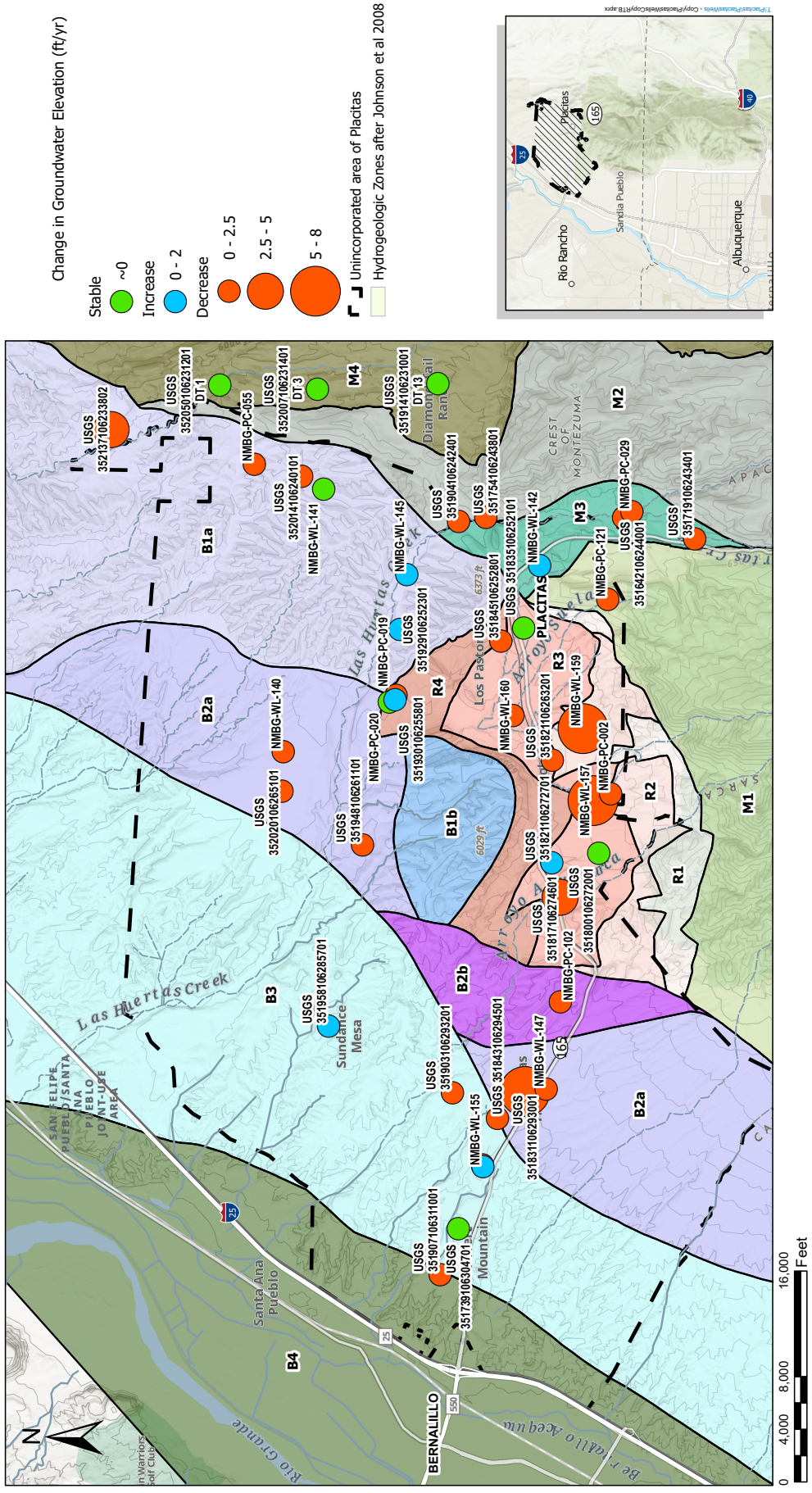


FIGURE 3. Change in water levels in Placitas wells (combined USGS and NMBGMR dataset) from 1962 to 2025 showing rises (blue), declines (red), and stable water levels (green), with mapped hydrogeologic zones from Johnson and Campbell (2008), southern Sandoval County, New Mexico.

Water level data from the USGS and NMBGMR

USGS water level data show depths to water varying between 20 and 450 ft bgl in the Placitas area (USGS, 2026) and contain five wells with data before 1985. A preponderance of these records are from between 2005 and 2014 (Fig. 4). One hydrograph has data to 2015. Depths to water in USGS monitored wells (n = 26) show variable trends, rising in 3 wells with at least a record of four measurements, showing no appreciable change in six wells, and in 17 wells showing a decline that averages 1.36 ft/yr, but ranges from 0.4 to 5.5 ft/yr for individual records. Several records show a 14-ft decline over 1 year (see Fig. 4 and Table 5).

Current NMBGMR data show 17 water level records in the Placitas area with 11 wells averaging a decline of 2.0 ft/yr (maximum 1984 to 2025; Table 5). Of these 17 records, eight wells also have records in Johnson and Campbell (2008). For this study, the Johnson record was combined with the more recent NMBGMR dataset (NMWD, 2026). Of the 17 total wells, 4 show a water level rise between 0.1 and 1.3 ft/yr, and 2 wells show stable water levels. One well shows a water level decline of almost 8 ft/yr (2019 to 2025). Two wells show water level rises and declines of over 10 ft in months; one well has a water level decline of 76 ft in just over 1 year (WL-159; Fig. 4). The combined water level record over the last 20 years includes a 4-year gap, but it suggests that in Placitas water

TABLE 5. Summary of water-level data in the Placitas area

Study; number of wells	Predominant period of record	Overall annual water level decline rate (ft/yr)	Water level rise (ft)	Water level flat (ft)	Water level decline (ft)
Johnson et al., 2008; 51	1997–1998	–	20	14	17
USGS, 2026; 26	2005–2014	1.4	3	6	17
NMWD, 2026; 17	2018–2025	2.0	4	2	11
NMOSE, 2026; 1,194	1960–2023	0.75–2.5[1]	–	–	n/a

[1]Highest decline is from well depth data assuming well depths are a proxy for water level

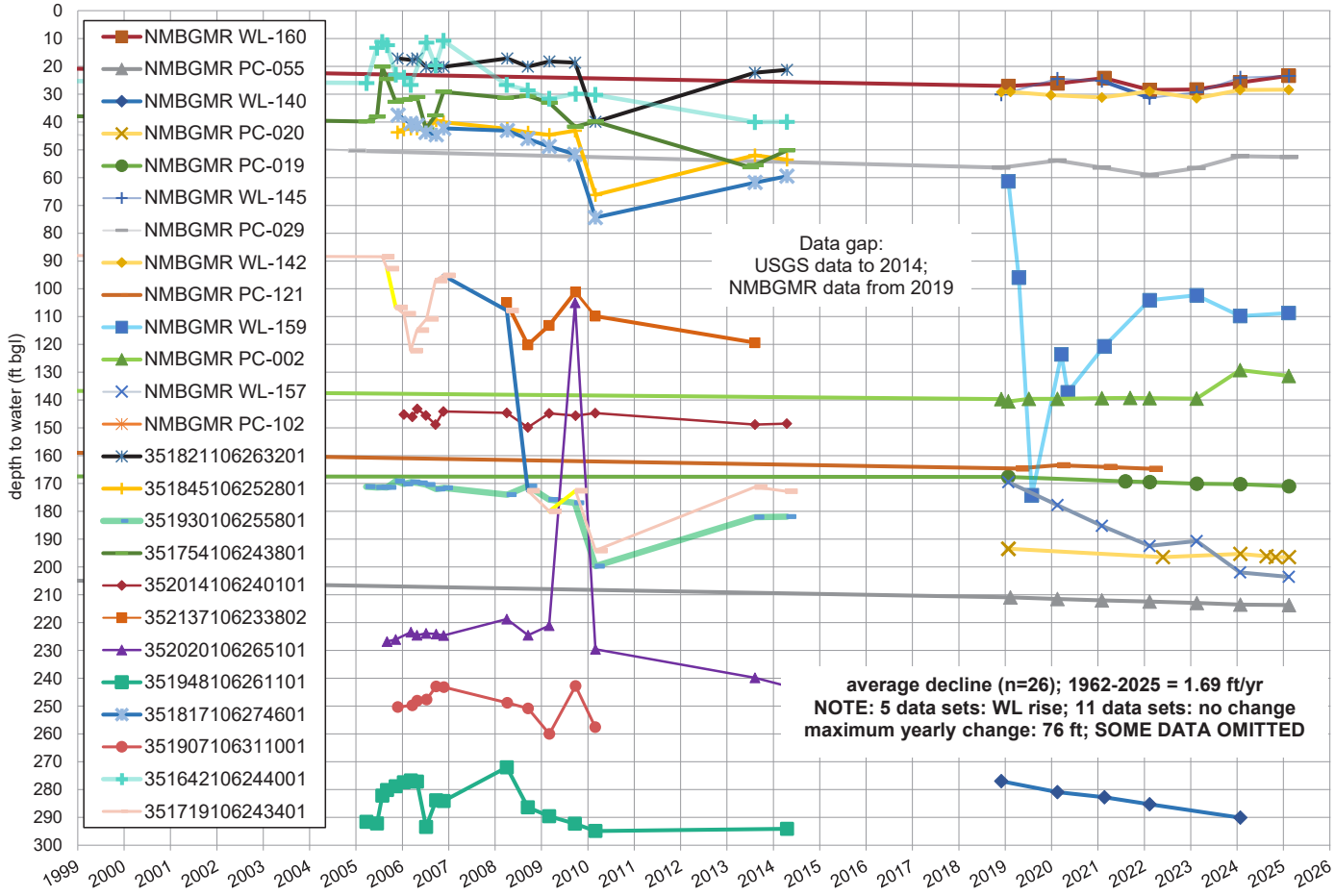


FIGURE 4. Hydrographs for select USGS- and NMBGMR-monitored wells in the Placitas area (1999–2025), southern Sandoval County, New Mexico.

levels change within months and since 2005 are in decline (an average of 1.69 ft/yr for 3 out of 5 wells, cf. Figs. 3 and 4). Spatially, the largest water level declines are in the Mesozoic ramp hydrogeologic zone R3 (Fig. 3); however, water level trends are mixed throughout Placitas, suggesting compartmentalization is common.

Water-level trends from NMOSE well records

The NMOSE-reported average depth to water within an approximately 4-mile radius of Placitas is 183 ft bgl, but it ranges from 0 to 760 ft bgl and reflects well records from 1928 to 2023 (95 years; NMOSE 2026). There are five well records prior to 1960. The use of well record data in this way must be taken with care, as well records are often of uncertain quality where location and lithologic information is unclear and occasionally incorrect. However, these well records can be useful in investigating the state of New Mexico's groundwater resources due to the significant volume of records that exist, often in areas where water level data are sparse. To make use of well record data for water level comparisons through time, this study assumed that the most accurate (and most relevant for water level studies) information on well records are the date and depth information. The date is likely accurate because timely well record filing is required by law, and depth is likely accurate because the driller has to bill for the footage drilled. Well record data from Placitas (NMOSE, 2026) were sorted into decadal bins, based on the finish date listed on the well record. Ten-year intervals span, for example, 2000 through 2009, and following sorting within each bin well depth and water level data from all well completions within each decade can then be compared. For the Placitas area, the following conclusions were reached with respect to well depth and water levels.

Water levels through the 1960s and 1970s show stability, averaging 162 ± 7 ft bgl (range from 155 to 169 ft bgl). In the 1980s, the average water level declined to 195 ft bgl, before stabilizing again over the next four decades to 2019 (177 to 195 ft bgl, with an average of 187 ± 8 ft bgl). In the 2020s, water levels declined further to an average of 209 ft bgl (about 2 ft/yr over the last 4 years). The 47-ft drop in average water level from 1960 to 2023 results in an average water level decline of 0.75 ft/yr (Table 5).

The total number of wells in Placitas can also be compared per decade. From 1970 to 2010, the number of wells has increased tenfold, from 103 to 1,020. Put another way, since the 1950s in the Placitas area, the number of wells has tripled every decade to 1989 (the 1960s, 1970s, and 1980s). In the 1990s it doubled, whereas in the 2000s it increased by 150%.

Well depth could perhaps also be used as a proxy for water level, if one assumes that an increasing well depth is chasing a declining water level in a potential aquifer and that a local well driller will complete a hypothetical domestic well only as deep as perhaps 100 ft into the aquifer. Comparing well depths per decade from well records in this manner reveals that the average well depth for the Placitas area was steady in the 1960s and 1970s (266 to 276 ft bgl) but increased steadily every decade since 1979. In the 1980s, it increased to 343 ft bgl, or a 27% increase. The average well depth again stabilized in the 1990s (perhaps mimicking the Johnson and Campbell [2008] water level data presented), before increasing in the 2000s to 387 ft bgl, stabilizing in the 2010s, and increasing in the 2020s to 424 ft bgl. This represents a total 58% increase in well completion depth since 1960. If the increase in well completion depth of 158 ft over the period of record from 1960 to 2023 represents a proxy for water level decline, this indicates a water-level decline of 2.5 ft/yr (Table 5).

Water Use in Placitas

Of the 1,194 wells in Placitas listed in the NMOSE (2026) database, 35 (3%) are listed for MDWCA, subdivision, or municipal use (Table 6). The 35 wells have 11 distinct owners, matching the 11 listed MDWCAs on file with the NMED (2026) Drinking Water Watch, an online resource summarizing community water system and water quality data for consumers. Although the NMED data are not always current and may not reflect exact operational realities, they are useful. The aggregate of the average daily production for the 11 MDWCAs in the Placitas area is listed as 263,000 gallons per day for 3,798 people served, or 1,379 connections (about 70 gallons per capita per day [GPCD]). Over 1 year, this average daily use amounts to 294 acre-ft/yr, below the NMOSE (2026) indicated

TABLE 6. Summary of water-use data in the Placitas area (after NMOSE, 2026)

Number of wells	Use category	Minimum use (acre-ft/yr)	Maximum use (ac-ft/yr)	Paper water rights (acre-ft/yr)	Use per person per day (GPCD)
929	domestic	155.25	557	3,976.700	<300
35	MDWCA	294	328	463.868	~70
222	multiple	166.5	399.6	808.000	unknown
18	irrigation, industrial, highway, stock, commercial	unknown	unknown	3,936.66	n/a

GPCD—gallons per capita per day
MDWCA—Mutual Domestic Water Consumers Association (public supply water system)
n/a – not applicable

water right of 464 acre-ft/yr. The NMOSE *New Mexico Water Use by Categories 2020* publication (Valdez et al., 2024) notes an aggregate Placitas MDWCA use (in 2020) of 328 acre-ft/yr, or within 10% of the average daily production listed in the Drinking Water Watch (NMED, 2026).

Taking the total population of Placitas (5041; U.S. Census Bureau, 2025) and subtracting the population served by community water systems leads to 1,243 people served by domestic wells or shared domestic wells. If on average two people live in each house, that amounts to a minimum of about 621 active and possibly in-service domestic wells. From the NMOSE database of 1,194 total wells with finish dates in Placitas, about 929 individual domestic wells are estimated to exist at a maximum. This suggests there are between 621 and 929 active single-home domestic wells. If each domestic well is permitted to use a maximum of 0.6 acre-ft/yr, per Sandoval County Planning and Zoning (2021) ordinances, and a minimum of 0.25 acre-ft/yr, per restrictive covenants adopted by some subdivisions, then total domestic well water use is between 155 acre-ft/yr (621 domestic wells pumping 0.25 acre-ft/yr) and 557 acre-ft/yr (929 domestic wells pumping 0.6 acre-ft/yr) of groundwater (between 111 and over 300 GPCD) in Placitas. The likely use of the lower number (0.25 acre-ft/yr per well, or 111 GPCD), could be evaluated further using monthly pumping records on file with the NMOSE, but that was not attempted for this study. The 621 to 929 active domestic wells have 3,977 acre-ft/yr of paper water rights (Table 6).

Shared domestic well water use can be similarly calculated if it is assumed each well serves on average three homes (likely between two and five) and does not use the full permitted 3 acre-ft/yr. If it is also assumed each well uses either a minimum of 0.25 or a maximum of 0.6 acre-ft/yr per home, then total shared domestic well groundwater use in Placitas is between 166.5 and 399.6 acre-ft/yr (Table 6), rather than the full permitted 808 acre-ft/yr on record for 222 shared wells.

NMOSE records list 1,194 likely completed wells in Placitas but a total of 1,664 (paper) records of water rights, totaling 9,185 acre-ft/yr. These records contain many duplicates, as some entries list supplemental wells with the same diversion amount as an original well. Also listed are 49 "agricultural" use permits (irrigation, industrial, highway, stock, and commercial), with 18 likely completed wells, for a total of 3,937 acre-ft/yr, with five separate users owning 80%.

Recharge Estimates

Johnson and Campbell (2008) detailed a 500 acre-ft/yr contribution (in each water year 1998 and 1999) from just three mountain hydrologic system springs (Ciruela, spring #3, and El Oso), while Las Huertas Creek contributions to the groundwater system are estimates at 215 gpm (347 acre-ft/yr on January 27, 1998). With Johnson and Campbell (2008) listing a total of 40.2 mi^2 of recharge area (in 3 basins) for the Placitas area and recharge of between 0.15 in. (in Albuquerque) and 6.6 in. (at Sandia Crest), this calculates to a low recharge estimate of 322 acre-ft/yr and a high recharge estimate of 3,216 acre-ft/yr (1.5 in. basin-wide). An average or midrange recharge estimate (with 0.45 in. of recharge per square mile) is 965 acre-ft/yr, which seems low given that the above contributions already total 847 acre-ft/yr.

DISCUSSION

Transmissivity values given by Johnson and Campbell (2008) are similar to a larger dataset published by the NMOSE (2010; Table 4). Specific capacity and conductivity values vary, likely due to variations in pumping test length, and variations in screen length for the tested wells, if the screen length is taken as the aquifer thickness. While it is common for domestic wells to have an average screen length of 20 ft, public supply water system wells commonly have longer screen lengths (100 to 150 ft), thereby decreasing conductivity values at low pumping rates. Whereas the Johnson and Campbell (2008) conductivities for the Madera Limestone (910 ft^2/day and the Santa Fe Group (1,900 ft^2/day) are comparable, the newer dataset reveals a nearly equivalent average transmissivity of 3,800 to 3,700 ft^2/day. Permian sedimentary rocks have an order of magnitude lower average transmissivity of 151 ft^2/day, which Johnson (2008) estimated at 181 ft^2/day (average transmissivity). Mesozoic-age units have the lowest average transmissivity of 62 ft^2/day, more than the 22 ft^2/day estimated by Johnson and Campbell (2008). As the NMOSE (2010) dataset is larger, this increases the robustness of the average aquifer parameters presented above.

Water level data presented by Johnson and Campbell (2008) for the Placitas area for 1997 and 1998 are inadequate to determine long-term water level trends, especially since large water level variations over months suggest Placitas wells are influenced by nearby recharge, or lack thereof, which is characteristic of groundwater systems within proximity of recharge areas. A USGS study from Tijeras Canyon (15 miles south of Placitas) suggests residence times for groundwater samples measured with stable isotopes are short, between 1 month and 4 months, and dependent mostly on mountain snowpack (McCoy and Blanchard, 2008). When there is little snowpack in the Sandia Mountains, it is reasonable to conclude that some wells in Placitas have large water level declines, especially where wells are completed in small hydrogeologic compartments, as proposed by Johnson and Campbell (2008). These fault-bound wells have limited access to recharge within the ramp hydrogeologic zone and therefore experienced severe water level fluctuations.

The larger USGS water level dataset spanning mostly from 2005 to 2014 (USGS, 2026) is more indicative (compared to Johnson and Campbell, 2008) of recent water level declines in the area, which average 1.36 ft/yr. An even more recent dataset from the NMBGMR, which includes some of the original Johnson and Campbell (2008) data suggests a steeper water level decline of 2.01 ft/yr to 2025, with an average decline of 1.69 ft/yr for the combined data. The data also show the largest decline was for a well completed in the Triassic-age Chinle shale of the ramp hydrogeologic zone R3. Other shale-dominant unit data show more variation. Unfortunately, all the water level data accessed are limited in time and have incomplete

lithologic and well completion information. Attempts to locate well records for these missing water level records only highlighted the lack of accuracy in well records, especially where it concerns lithology or accurate well locations.

The largest dataset of NMOSE (2026) well records presents a unique opportunity to test whether 1,194 wells completed mostly between 1960 and 2023 show a collective decline in water level. At least 0.75 ft/yr is indicated by just the average reported water levels from well records across all aquifers, and this may be an underestimate, as well depth data show a steeper decline. If well depth is taken as a proxy for water level, the increase in well depth for wells drilled from 1960 to 2023 suggests that water levels in the Placitas area have declined up to 2.5 ft/yr. Such compilation of well completion data (NMOSE, 2026) may introduce biases. For example, more wells may be represented in areas where a redrill of an existing well is necessary, thus biasing data in those areas where, for example, compartmentalization of the groundwater is present, thus emphasizing water level declines. Similarly, existing land use biases (conservation land, U.S. Forest Service land) exclude certain areas in Placitas and may favor some areas with more wells, thus introducing a geographic bias to the data. The lesser initial water level decline indicated by a comparison of well record water levels may also be due to well record errors. It could be that well record water levels are imprecise and dictated by drillers who may misreport higher water levels in just-completed wells rather than as a measure of a diminishing resource. Perhaps, then, the average water level drop in the Placitas area, indicated using well depth data, is reasonable.

On paper, the number of total listed water rights for Placitas area wells is large—9,185 acre-ft/yr. Agricultural and industrial water rights account for 43% of that total (3,937 acre-ft/yr). Adding domestic (3,977 acre-ft/yr), shared (808 acre-ft/yr), and community water system use (464 acre-ft/yr) yields 5,249 acre-ft/yr, or 57% of paper water rights (Table 6). However, this could be 10 times the amount calculated as the minimum domestic, shared, and municipal use for Placitas. The calculated domestic, shared, and municipal groundwater use in the entire Placitas area (community water systems, shared wells, and domestic wells) is estimated to lie between 616 and 1,285 acre-ft/yr, with a likely use under 1,000 acre-ft/yr, or 20% of the paper rights enumerated above. *New Mexico Water Use by Categories 2020* (Valdez et al., 2024) puts the aggregate community water system use in Placitas in 2020 at 328 acre-ft/yr, quite near the 294 acre-ft/yr calculated from NMED (2026) data. This may be no coincidence, as the agencies might share data. However, at face value the data from the two agencies suggest community water system water use calculation are robust. The 2020 U.S. Census lists 5,041 persons in Placitas and suggests that 75% of people in Placitas are served by an MDWCA. The average per person water use for the MDWCA-served population of Placitas is 74 GPCD. USGS estimates 103 GPCD for domestic wells in the Rio Grande aquifer system (Maupin and Arnold, 2010). Nationally, this number is 77 GPCD (Dieter et al., 2018). This makes community water system water use in the Placitas area also seem reasonable. While it is possible that some (domestic) well owners pump their well for the full 3 acre-ft/yr, many domestic well owners, being fully aware of their tenuous groundwater situation, pump less than the county-allowed maximum of 0.6 acre-ft/yr. Some residents may pump less, adhering to the 0.25 acre-ft/yr that restrictive subdivision covenants impose. Placitas per capita water use for metered domestic wells amounted to between 0.10 and 0.21 acre-ft/yr (Lewis, 2026) and suggests responsible groundwater use may be typical for Placitas.

If the three springs and Las Huertas Creek runoff listed by Johnson (2008) are assumed to comprise a portion of groundwater recharge supplying the Placitas area, then this contributes 847 acre-ft/yr (Johnson and Campbell, 2008). This figure compares well to an estimated total recharge of 965 acre-ft/yr if the average basin-wide recharge is 0.45-in. over 40.2 mi^2. Comparing these recharge estimates to Sanford et al. (2004), who used a hydrochemical dataset to calibrate the Middle Rio Grande Basin groundwater flow model, leads to revised recharge rates of between 0.16 and 0.18 m^3/s (Sanford et al., 2004), equating to a recharge rate of 217 acre-ft/yr per mile of mountain front. For the approximately 8 mi of estimated Placitas mountain front, this equates to approximately 1,740 acre-ft/yr of recharge. This is double the documented runoff of 847 acre-ft/yr in Johnson and Campbell (2008) and almost double the midrange recharge estimate presented above. It suggests that recharge in the Placitas area is perhaps as high as 0.815 in./mi^2, not accounting for possible septic system return flow.

The water level data presented here combined with the contention that recharge possibly exceeds domestic and community water system use leads to the question of why water levels are declining if there is sufficient recharge. Water levels are not declining uniformly in Placitas, and this was recognized by Johnson and Campbell (2008). Water level fluctuations are not only temporal in Placitas; they are also spatial. Some well owners have plenty of groundwater resources, some are affected by extreme water level fluctuations, and some have declines. It should be noted that as the population of Placitas rises, disturbing recharge through paving, channeled streamflow, and other activities should be discouraged, as this may have a large effect on water levels in some areas.

CONCLUSIONS

Placitas pumping test data were reviewed and revealed a range of transmissivities between 0.3 and 37,000 ft^2/day (1,800 ft^2/day average) for the four main aquifers (NMOSE, 2026). Santa Fe Group and Madera Limestone aquifers have the highest average transmissivity, whereas Mesozoic units, including the Menefee Formation, Mancos Shale, Morrison, and Petrified Forest Formations, have the lowest transmissivities. Recent water level data show an average water level decline of 2.0 ft/yr in Placitas (to 2025; 11 wells). Four wells show a water level rise between 0.1 and 1.3 ft/yr, and two wells show neither decline nor rise. One well shows a water level decline of almost 8 ft/yr (2019 to 2025). Early 2000s (2005 to 2014) depth to water in 26 USGS-monitored wells show variable trends, rising in 3 wells, with no change in 6 wells, and declining by 1.36 ft/yr in 17 wells. Water level declines range from

0.4 to 5.5 ft/yr to 2014. One record shows a 14-ft decline over a year, matching data from Johnson and Campbell (2008) that showed 10- to 76-ft water level declines and rises over months. Using NMOSE well-record-displayed water level data sorted by completion decade to figure out water level trends for Placitas reveals a water level decline of 0.75 ft/yr from 1960 to 2023. Taking the average well depth as a proxy for water level decline shows increasing average well depths over the same period to 424 ft bgl and approximates a water level decline of 2.5 ft/yr. Within the 63-year time period, the number of wells completed in Placitas has increased tenfold, from 103 to 1020, of which currently 78% are domestic or shared domestic wells.

Summarizing NMED (2026) daily use data suggests community water systems in Placitas use 294 acre-ft/yr and supply about 75% of the households in Placitas with drinking water. The remaining Placitas population is served by individual and shared domestic wells. Individual wells likely number between 621 and 929 and use between 155 and 557 acre-ft/yr. Shared wells number 222 and use between 167 and 400 acre-ft/yr. The total Placitas population uses between 616 and 1,285 acre-ft/yr, with some of that water returning to the aquifer as return flow, confirmed by geochemical data indicating that some wells in Placitas have nitrate issues (Johnson and Campbell, 2008). Estimates of recharge to the aquifer range from 322 acre-ft/yr to 3,216 acre-ft/yr and likely average around 1,740 acre-ft/yr.

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