APPENDIX HY-1
Water Supply Assessment

Sacramento Municipal Utility District Oveja Ranch Solar Project Water Supply Assessment

March 2025

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Sacramento Municipal Utility District
Oveja Ranch Solar Project
Water Supply Assessment

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ACRONYMS AND OTHER ABBREVIATIONS

AF	acre-feet
AFY	acre-feet per year
BESS	battery energy storage system
CEQA	California Environmental Quality Act
DWR	California Department of Water Resources
EPA	U.S. Environmental Protection Agency
eWRIMS	Electronic Water Rights Information Management System
gpm	gallons per minute
GSAs	groundwater sustainability agencies
GWTP	groundwater treatment plants
hp	horsepower
MW	megawatt
NRCS	Natural Resources Conservation Service
O&M	operation and maintenance
PV	photovoltaic
SB	Senate Bill
SCWA	Sacramento County Water Agency
SGMA	Sustainable Groundwater Management Act
SMUD	Sacramento Municipal Utility District
SWRCB	State Water Resources Control Board
USGS	U.S. Geological Survey
WTP	water treatment plant
WY	water year

1 INTRODUCTION

1.1 PURPOSE OF THE DOCUMENT

California Water Code §10910 (also known as Senate Bill (SB) 610 or the Water Supply Assessment statute) requires that a specific analysis of whether there is a sufficient water supply available to serve the proposed project as part of the approval for certain types of projects. Per the statute, a water supply assessment is required for development projects that are subject to the California Environmental Quality Act (CEQA) and considered a “project” under California Water Code §10912. For new industrial facilities, a project is defined as a proposed industrial, manufacturing, or processing plant, or industrial park planned to house more than 1,000 persons, occupying more than 40 acres of land, or having more than 650,000 square feet of floor area. Because the Oveja Ranch Solar Project (proposed project) would be considered a “project” under California Water Code §10912(a)(5), it is subject to SB 610 requirements including preparation of a water supply assessment.

This water supply assessment has been prepared in accordance with California Water Code §10910 *et seq.* to identify water demands for the proposed project and identify if there are sufficient supplies to serve the project demand over the next 35 years.

1.2 PROJECT BACKGROUND

Sacramento Municipal Utility District (SMUD) proposes to build and operate a photovoltaic (PV) solar power and battery storage renewable energy generation facility interconnected to SMUD’s distribution grid in unincorporated southeastern Sacramento County, south of the City of Rancho Cordova and north of Wilton (Figure 1). SMUD is proposing to construct PV solar panels, a battery energy storage system (BESS), a substation, and new and upgraded distribution lines to interconnect the project to SMUD’s existing distribution system. Figure 2 provides a conceptual site layout for the solar and battery storage facility and supporting infrastructure.

The project site is approximately 534 acres; the northern area (80 acres total) and the southern area (454 acres total) which are not directly adjoining properties but would be connected by a 0.5-mile-long collector line. The solar panels and associated infrastructure would be located on approximately 400 acres of leased land within the project site and the proposed overhead distribution line route would encompass up to 3.5 miles of new overhead distribution lines and reconductoring of up to 4 miles of existing lines outside of the 400 acres.[1] The project would deliver up to 75 megawatts (MW) of PV energy generation and support SMUD’s 2030 Zero Carbon Plan.

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[1] Reconductoring is the process of replacing wires on an existing electric circuit to update them to meet capacity needs; reconductoring often requires the existing poles to be replaced.

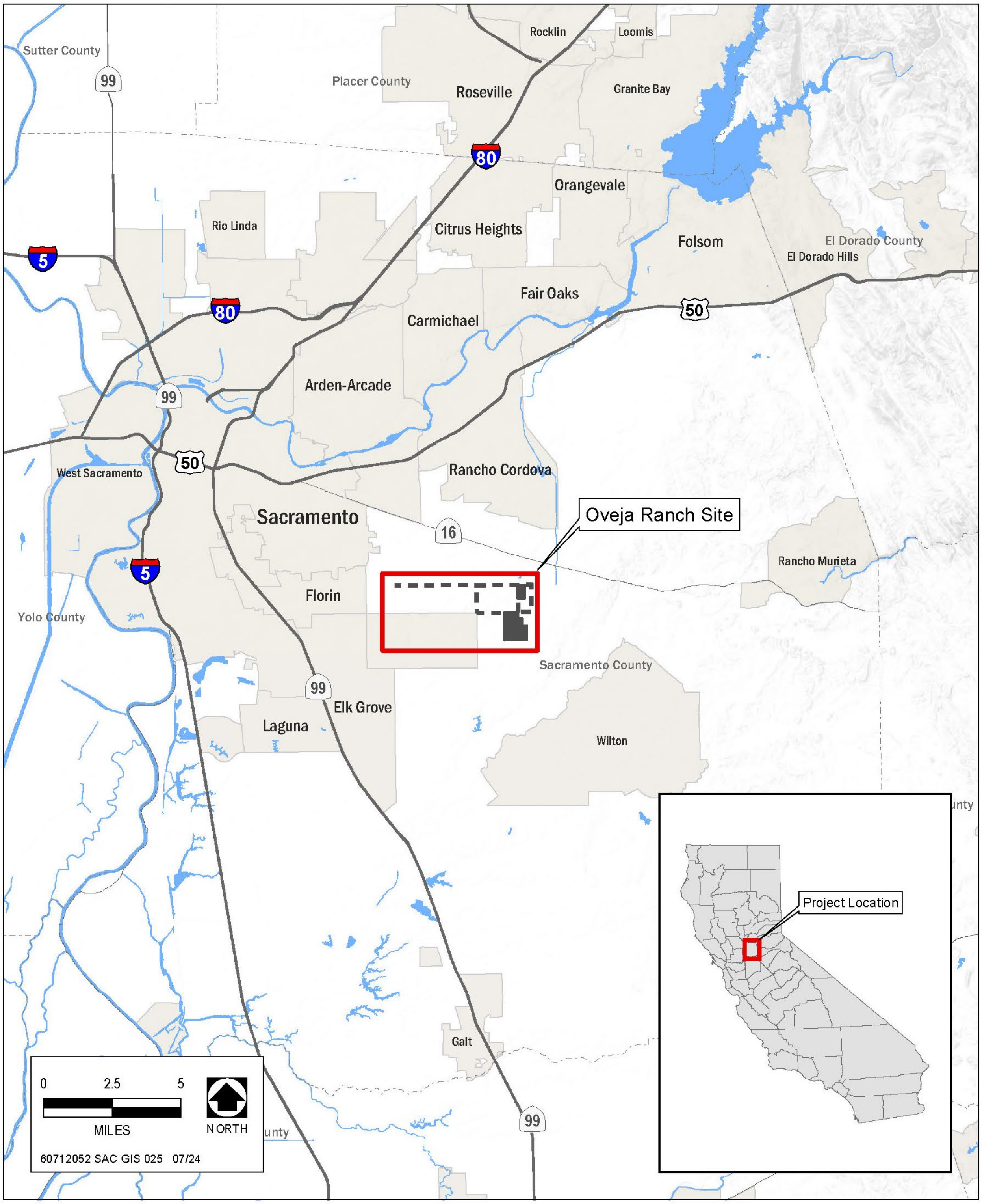

Figure 1. Project Vicinity

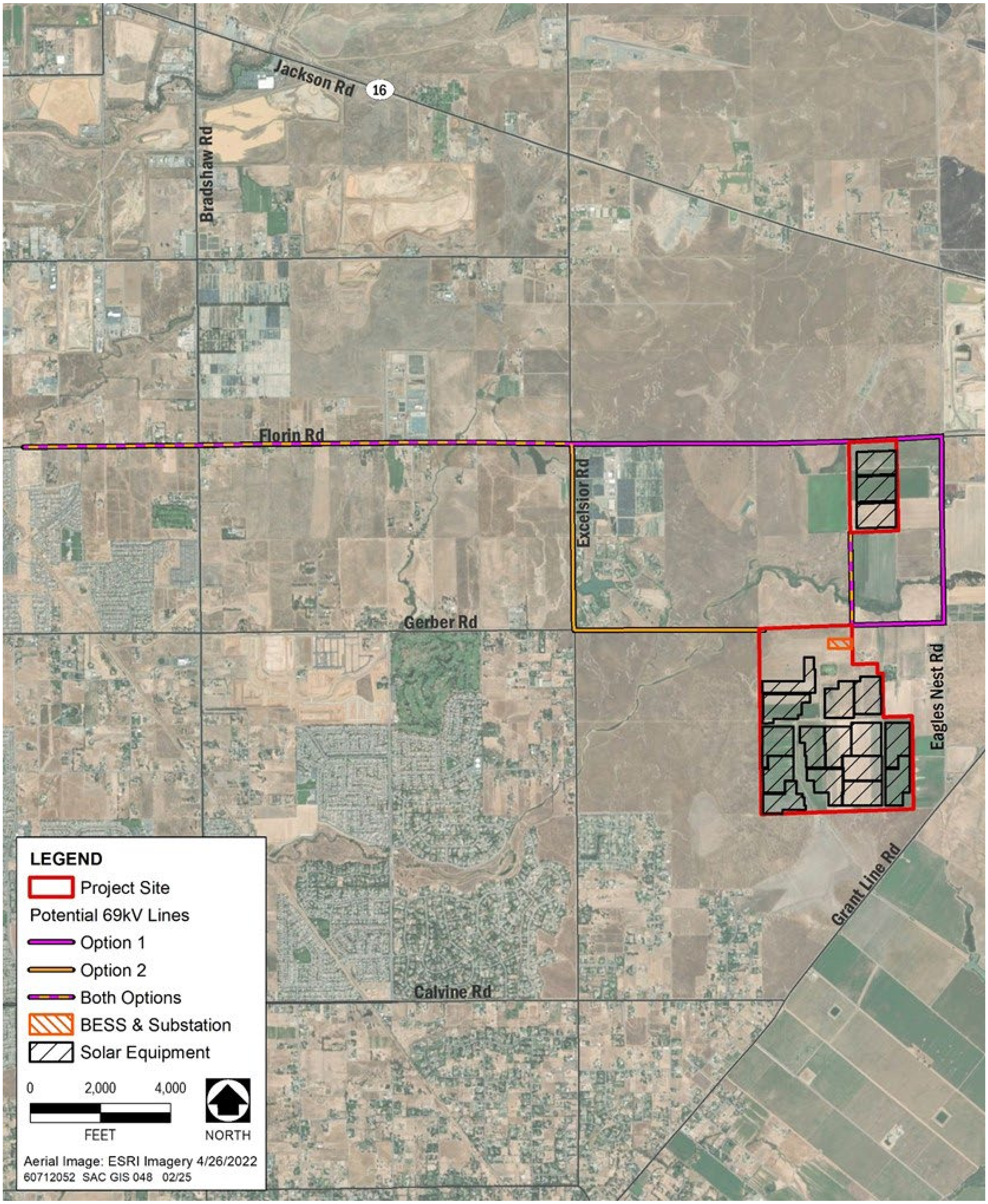

Figure 2. Proposed Site Components

The project site's current and historic use is agricultural production. The majority of the project site has been used for irrigated pastures for crops and forage ground for livestock. Crops have included sudan grass for seed, corn for grain, summer and winter hay, and triticale grain. Irrigated pasture has been used for ewes/lambs. The southern half of the project site includes, in its northern extent, an area used for dryland grazing which includes a 19-acre vernal pool area. Table 1 describes the existing agricultural land use at the project site.

Table 1. Existing Land Use for at the Northern Area, Southern Area, and Distribution Line Options

Land Cover Type	Northern Area (acres)	Southern Area (acres)	Distribution Lines (acres)	Total (acres)
Roads, Disturbed, Developments	0.00	1.34	69.31	70.66
Cropland	79.71	305.37	0.79	385.87
Irrigated Pasture	0.00	102.93	0.00	102.93
Valley Grassland	0.00	31.03	32.82	63.85
Riparian	0.00	0.00	0.90	0.90
Blackberry thickets	0.00	0.00	0.06	0.06
Total Area	79.71	440.68	103.88	624.27

Note: Based on the AECOM's *Final Aquatic Resources Delineation Report* (September 2024); Note: acreage does not include aquatic resources types in the project site.

Agricultural wells are currently in use at the project site and within the project vicinity. Table 2 lists active wells at and near the northern and southern area of the project site. Figure 3 shows the location of these wells with respect to the project area. These active agricultural wells provide water for irrigation. Two of these wells are located within the southern area of the project site: Well 2730064 and Well 2628266. These wells are referred to herein as the "onsite wells." Four other agricultural wells are located within the project vicinity including one well located approximately 0.2 miles east of the northern area near Eagles Nest Road. These wells are referred to as the "local wells."

Table 2. Active Agricultural Wells at and near the Northern and Southern Area

Well No. (Other Name)	Yield (gpm)	Horsepower (hp)	Notes
2627257 (Jack's)	330	60	Located approximately 0.2 mile east of the northern area
2652969	1,400	100	Located approximately 1 mile east of the northern area and southern area
2627908 (GSP 244)	500	30	Located approximately 0.3 mile east of the southern area
2647312	500	30	Located approximately 0.1 mile east of the southern area
2730064 (Far Pond)	771	50	Onsite well located in the southern area
2628266 (Southwest)	605	40	Onsite well located in the southern area

hp = horsepower; gpm = gallons per minute

Source: SMUD 2025

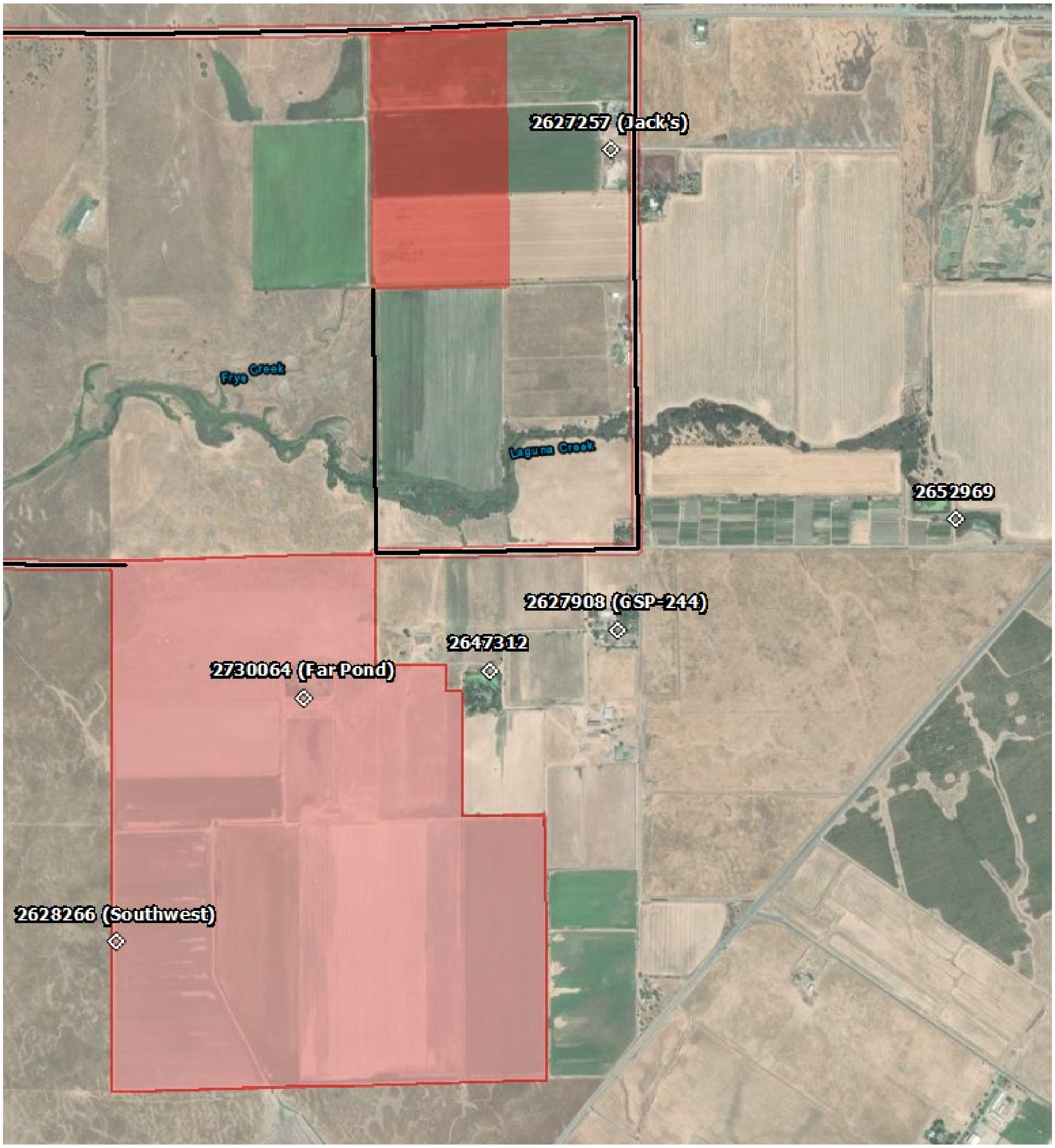

Figure 3. Groundwater Wells near the Northern and Southern Area

Construction of the project would take approximately 18 months to 2 years. Construction mobilization would include preparing and constructing site access road improvements, establishing temporary construction trailers and sanitary facilities, preparing initial construction staging areas, and preparing water access areas near existing onsite wells. The project would utilize two existing onsite groundwater wells (Well 2730064 and Well 2628266) and one local well (Well 2627257) for construction and operations. These are the same wells used for agricultural production.

Once site mobilization is complete, including construction staging and establishment of the temporary construction office, construction of the PV solar panels, battery storage facilities, substation and interconnection facilities would commence. The expected number of construction workers onsite daily would vary by construction phase, with an expected daily average of 13 workers and a peak of 15 daily workers for the initial construction phase (site preparation) to up to a daily average of 219 workers and a maximum of 263 daily workers during the main construction phase (building/infrastructure construction). The number of personnel onsite during nighttime construction would depend upon the nature of the construction activity or materials being delivered to the site.

Once construction is complete, the project would operate 7 days per week. One regular onsite employee may be required for approximately half the work week, and some personnel may visit the site to monitor, maintain and, if needed, repair the system. The substation may include a site control center building. The building would be less than 3,600 square feet in size and designed to meet federal, state and local building standard, electrical and fire codes, and may include adjacent parking for employees. During operations, portable sanitary facilities would be utilized. Access to potable water would be via water delivery, if needed. PV panels may be periodically washed with water during project operation, as needed. To conservatively estimate potential panel washing operational water use, it is estimated that solar panels would be washed once per year in case of excessive soiling and that well water would be used.

After construction is complete, the project would continue to use the land for agricultural activities through continued irrigation of the pastures within the project site for the cultivation of forage ground for grazing and the potential planting of pollinator friendly vegetation. Vegetation would grow under and between the solar panel modules to prevent erosion and provide forage for sheep to graze. The grazing lands would be irrigated using the existing flood irrigation system, which would be preserved to ensure that it remains functional during project operations.

At the end of the project’s useful life (anticipated to be 34 years and 11 months), the solar panels and associated infrastructure would be decommissioned. Currently, standard decommissioning practices include dismantling and repurposing, salvaging/recycling, or disposing of the solar energy improvements, and site stabilization. Additional environmental analysis will be conducted prior to decommissioning when the future land use of the site is known.

2 PROJECT WATER DEMAND

2.1 CONSTRUCTION WATER DEMAND

Water would be used during construction for the following activities:

- Dust control,
- Compaction/backfill,
- Pouring concrete foundations for the inverter enclosures and transformers, the BESS, the generation substation, and the interconnection and connection poles and for use at the associated concrete washout stations, and
- Potable water and sanitary facilities would be needed for the temporary construction office and the expected average workforce of up to 263 persons.

Water used for dust control and for compaction/backfill is expected to be sourced from two onsite wells and one local well. Non-potable water used for concrete foundations and concrete washout stations are assumed to be sourced from these same wells. Non-potable water used for temporary sanitary facilities is expected to be trucked to the project site. Potable water used for the temporary construction office and the construction work force is also expected to be trucked to the site.[2]

The primary water demand during construction would be for compaction and dust control. It is estimated that these construction activities would require approximately 15 acre-feet of non-potable water from on-site wells (see Appendix A).

2.2 OPERATION AND MAINTENANCE WATER DEMAND

Water would be used for the following operations and maintenance activities:

- PV panels would be periodically washed with water during project operation. To conservatively estimate potential panel washing operational water use, it is estimated that solar panels would be washed once per year in case of excessive soiling.
- The site control center building would have portable sanitary facilities. Water used for hand washing and sanitary purposes is assumed to be trucked to the site.
- In addition, pumped groundwater would be needed to support compatible agricultural activities such as grazing, possible crop production, and the potential installation of pollinator friendly vegetation.

Water used for washing of the PV panels during the operation and maintenance phase of the project would be sourced from groundwater pumped from existing wells. It is estimated that

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[2] For the purposes of a water supply assessment, hauled water is not considered as a source of water (California Water Code §10910(i)).

1 acre-foot of water will be used for washing the solar panels once a year (estimated by SMUD [2025]).

Portable sanitary facilities at the site control center building are assumed to be used by the one regular onsite employee and by personnel that would visit the site to monitor, maintain, and repair the system. Sanitary water use in industrial settings can be estimated at 10 to 25 gallons per person per shift or 20 and 35 gallons per day per employee for domestic demands for facilities connected to the sanitary sewer (U.S. Environmental Protection Agency [EPA] 2021). This site is assumed to have portable sanitary facilities only (i.e., no connection to the sanitary sewer). Assuming a conservative average of two employees each using 35 gallons of water per day, estimated water use would be less than 0.1 acre-feet per year (AFY). It is expected that this water would be trucked to the site.

Groundwater would be used to support agricultural activities such as grazing, possible crop production, and/or establishment of pollinator habitat. For this analysis, it is conservatively assumed that approximately 775 AFY of pumped groundwater would continue to be used in a variety of future agricultural activities at the project site.[3]

Note that sheep grazing is one of the activities being planned in fenced areas near and under the solar arrays. Although sheep obtain most of their water requirements from forage consumption, stockwatering of 0.5 to 1 gallons of water per head per day may be needed (Natural Resources Conservation Service [NRCS] 1979). Assuming seven ewes per acre over 103 acres with additional water requirements of 1 gallon per ewe per day, sheep supported on the solar fields would consume up to 0.8 AFY of pumped groundwater.

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[3] Existing agricultural use from the two onsite wells and the one local well that would be used for development of the southern area of the project site and northern area of the project site, respectively. This value represents average annual use from 2021 to 2023. Data was provided by SMUD (SMUD 2024).

3 WATER RESOURCE ANALYSIS

This section provides a summary of the requirements for a water supply assessment; it describes the water resources in the project area including the surface water drainage basin and the regional groundwater basin; and it provides information from water resource management plans which characterize these water supplies.

3.1 WATER SUPPLY ASSESSMENTS

This water supply assessment has been prepared in accordance with California Water Code §10910 *et seq.* to address the following questions.

- **Public water systems, §10910(b)-(c).** Is the project site within (or near) the service area for a public water system[4] that may supply water to the project?
    - Was the projected water demand associated with a proposed project accounted for in the most recently adopted urban water management plan?
    - If project demands were not accounted for in the urban water management plan, does the city, county, or public water system's total projected water supplies available during normal, single dry, and multiple dry water years during a 20-year projection meet the projected water demand associated with the proposed project, in addition to existing and planned future uses, including agricultural and manufacturing uses?
- **Entitlements, §10910(d)-(e)**. Are there existing water supply entitlements, water rights, or water service contracts relevant to the identified water supply for the proposed project?
    - How much water was received in prior years from the city, county, or public water systems (and will new infrastructure be required to deliver the water supply)?
    - Are there other public water systems or water service contract holders (which receive a water supply, or have existing water supply entitlements, water rights, or water service contracts) to the same source of water?
- **Groundwater, §10910(f)**. Does the water supply for the proposed project include groundwater?
    - If so, information contained in the urban water management plan relevant to the identified water supply for the proposed project should be reviewed and groundwater basin or basins for the water supply should be described. The following information should be included: if the groundwater basin is adjudicated, overdrafted, or projected to be overdrafted, and if the groundwater sustainability agency has adopted a groundwater sustainability plan.
    - If groundwater is received from the city, county, or public water system, the amount and location of the groundwater pumping should be described, and the sufficiency of the groundwater to meet the projected water demand associated with the proposed project should be analyzed.

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[4] A "public water system" is for the provision of piped water to the public for human consumption.

Note that for the purposes of this analysis, hauled water is not considered as a source of water, consistent with California Water Code §10910(i).

3.2 WATER RESOURCES

Regional water supplies are sourced from groundwater and surface water, with only a limited amount of recycled water/treated wastewater use in some urban areas. Most agricultural areas rely exclusively on groundwater or have access to both surface water and groundwater supplies and conjunctively use these resources. As discussed below, water supplied to the project area is sourced solely from groundwater via onsite and local wells.

3.2.1 Surface Water

The project site is located within the southern portion of Sacramento River Basin in an area where eastside drainages discharge to the Sacramento River below its confluence with the American River and/or to the Sacramento-San Joaquin Delta. The Sacramento River Basin covers approximately 26,500 square miles and is bounded by the Sierra Nevada to the east, the Coast Ranges to the west, the Cascade Range and Trinity Mountains to the north, and the Sacramento-San Joaquin Delta to the south.

The project site crosses three local drainage areas: the Eder Creek, Laguna Creek, and Lower Deer Creek watersheds. Approximately 4 miles of the distribution lines area is located within the Elder Creek watershed, while the remaining portion of the distribution lines, all of the northern area, and a small section of the southern area is located within the Laguna Creek watershed. The remaining portion of southern area is located within the Lower Deer Creek watershed. The Eder Creek, Laguna Creek, and Lower Deer Creek watersheds are approximately 22 square miles, 48 square miles, and 45 square miles in size, respectively (U.S. Geological Survey [USGS] 2024).

The project site is generally flat, with an elevation of 55 to 120 feet above mean sea level. Irrigated pastures and croplands are the dominant landcover within the project site. Surrounding land uses immediately adjacent to the project site include agricultural fields and existing open space preserves with seasonal wetland, riparian, and annual grassland vegetation.

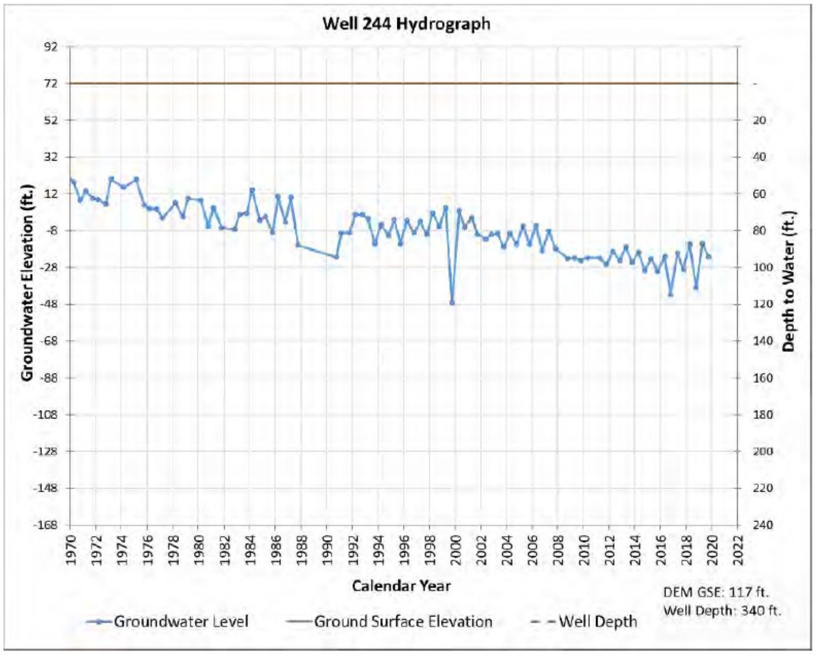
There are no streams within the northern or southern areas of the project site where the PV solar panels, BESS, substation, and associated infrastructure would be installed. However, the northern area is located north of Frye Creek and the southern area of the project site supports three agricultural ditches, an irrigation pond, and pipelines and other irrigation infrastructure. In addition, three named streams overlap the distribution line corridors of the project site – Gerber Creek, Frye Creek, and Laguna Creek. Gerber Creek is an ephemeral stream that drains to Elder Creek. Elder Creek discharges to Morrison Creek, which is tributary to the Sacramento River south of Freeport. Frye Creek, located just west of the northern area of the project site, drains to Laguna Creek, which discharges to Morrison Creek, which, as mentioned above, is tributary to the Sacramento River south of Freeport. Located south of the project site, Deer Creek drains to the Cosumnes River, which discharges to the Mokelumne River, a major eastside tributary to the Sacramento-San Joaquin Delta.

3.2.2 Groundwater

The project site is within the Sacramento Valley – South American Subbasin (South American Subbasin), Basin Code 5-021.65, which is one of sixteen subbasins that comprise the Sacramento Valley Groundwater Basin. This subbasin is located within Sacramento County and is bounded by the American River to the north, the Sacramento River to the west, the Cosumnes and Mokelumne Rivers to the south, and the Sierra foothills to the east. The South American Subbasin encompasses approximately 388 square miles (248,000 acres) of area.

Groundwater levels in the western portion of the South American Subbasin have been generally increasing since the 1980s despite a turn towards drier conditions and increasing population. This increase in groundwater levels has been largely attributed to a combination of conjunctive use projects (i.e., the combined use of groundwater and surface water sources), construction of the Freeport diversion facility and Vineyard surface water treatment plant (WTP), urban conservation plans, and changes in use of previous agricultural land.

Groundwater levels in some areas of the eastern portions of the South American Subbasin show decreases in groundwater levels despite the lack of significant changes in land or water use. Declining trends have been seen at several wells located near Laguna Creek from Douglas Road to just south of Jackson Highway (Larry Walker and Associates 2021). Figure 4 shows groundwater monitoring data for Well 2627908. This well is a Sustainable Groundwater Management Act (SGMA) representative monitoring location for the South American Subbasin (referred to as Well 244 in the South American Subbasin Groundwater Sustainability Plan). Well 2627908 had experienced a relatively steady decline in groundwater levels of about 40 feet during the 1970 to 2010 period, but trends are longer decreasing since this period. This well is located just east of the southern area of the project site (see Figure 3).



Source: Larry Walker and Associates 2021

Figure 4. Groundwater Levels at Well 2627908 from 1970 to 2020

Little to no land subsidence has been observed in the South American Subbasin (i.e., the lowering of the ground surface elevation). Elevation change generally ranges from 0 to -0.14 foot from 2005 to 2020 (Larry Walker and Associates 2021).

3.2.3 Water Supply

There are nine municipal and two agricultural water purveyors in the South American Subbasin. Municipal water purveyors include the California American Water Company, City of Folsom, City of Sacramento, Elk Grove Water District, Florin County Water District, Golden State Water Company, Rancho Murieta Community Services District, Sacramento County Water Agency (SCWA), and the Tokay Park Water Company. Agricultural purveyors include Sacramento Sewer District and North Delta Water Agency. The Sacramento Regional County Sanitation District is the only recycled water purveyor in the subbasin (Larry Walker and Associates 2021).

The project site is within the SCWA and SCWA – Laguna-Vineyard service boundaries for municipal supplies, but outside of the service boundaries for agricultural water purveyors. Agricultural irrigation water at the project site is sourced from onsite and local groundwater wells.

3.2.4 Recycled Water

Tertiary treated wastewater is produced for SCWA at Sacramento Sewer District's Water Reclamation Facility located at the Sacramento Regional Wastewater Treatment Plant. Recycled water is conveyed from the Water Reclamation Facility to a portion of SCWA's distribution system that serves urban areas. The project area is outside of the service area for recycled water.

3.3 WATER RESOURCES MANAGEMENT PLANS AND WATER SUPPLY ANALYSIS

This section includes a discussion of regional water resources management plans including the groundwater sustainability plan for the region and the urban water management plan which has a service area that extends to the project site. Groundwater conditions are further described, as is projected future water supplies for the region.

3.3.1 South American Subbasin Groundwater Sustainability Plan

SGMA was passed in 2014. It was created to facilitate sustainable management of groundwater supplies and empower local agencies to adopt groundwater sustainability plans. SGMA requires that each high and medium priority groundwater basin be operated to a sustainable yield, balancing natural and artificial groundwater recharge with groundwater use, to ensure undesirable results such as chronic lowering of groundwater levels, loss of storage, water quality impacts, land subsidence, and impacts to hydraulically connected streams. SGMA is considered part of the statewide, comprehensive California Water Action Plan which includes water conservation, water recycling, expanded water storage, safe drinking water, and wetlands and watershed restoration.

California's groundwater basins are classified into one of four categories – high-, medium-, low-, or very low-priority – based on components identified in California Water Code §10933(b). Basin priority determines which provisions of SGMA apply to the basin. The California Department of Water Resources (DWR) determined that the South American Subbasin (the groundwater subbasin that includes the project site) is a high priority basin.

SGMA also requires that local agencies form one or more groundwater sustainability agencies (GSAs) and that the agencies located within high- or medium-priority basins adopt groundwater sustainability plans. Six local entities formed GSAs within the South American Subbasin: the Sacramento Central Groundwater Authority, Omochumne-Hartnell Water District, Sloughhouse Resource Conservation District, North Delta GSAs, Reclamation District 551, and Sacramento County.

The *South American Subbasin Groundwater Sustainability Plan* (Larry Walker and Associates 2021) is the guidance document prepared by the GSAs that explains how the subbasin will be managed sustainably over a 20-year timeframe. This plan defines the sustainable yield of the basin, identifies what would constitute undesirable results, and identifies what projects and actions will be implemented to avoid undesirable results. (Sustained groundwater pumping can create undesirable results when it exceeds the basin sustainable yield.) The South American Subbasin Groundwater Sustainability Plan was submitted to DWR in January 2022 and approved by DWR in July 2023 (DWR 2023).

The *South American Subbasin Groundwater Sustainability Plan* provides estimates of current and projected conditions in the subbasin based on the Cosumnes-South American-North American model (CoSANA), a surface and groundwater numerical model that integrates the groundwater aquifer with the surface hydrologic system, land surface processes, and operations. Water budgets were developed for the stream and canal system, the land surface system, and for the groundwater system. The water budget for the groundwater system reports inflows (i.e., deep percolation, stream losses to groundwater, and subsurface inflow) and outflows (i.e., stream gain from groundwater, groundwater pumping/production, and subsurface outflow) and estimates change in groundwater storage under different land use and climate conditions.

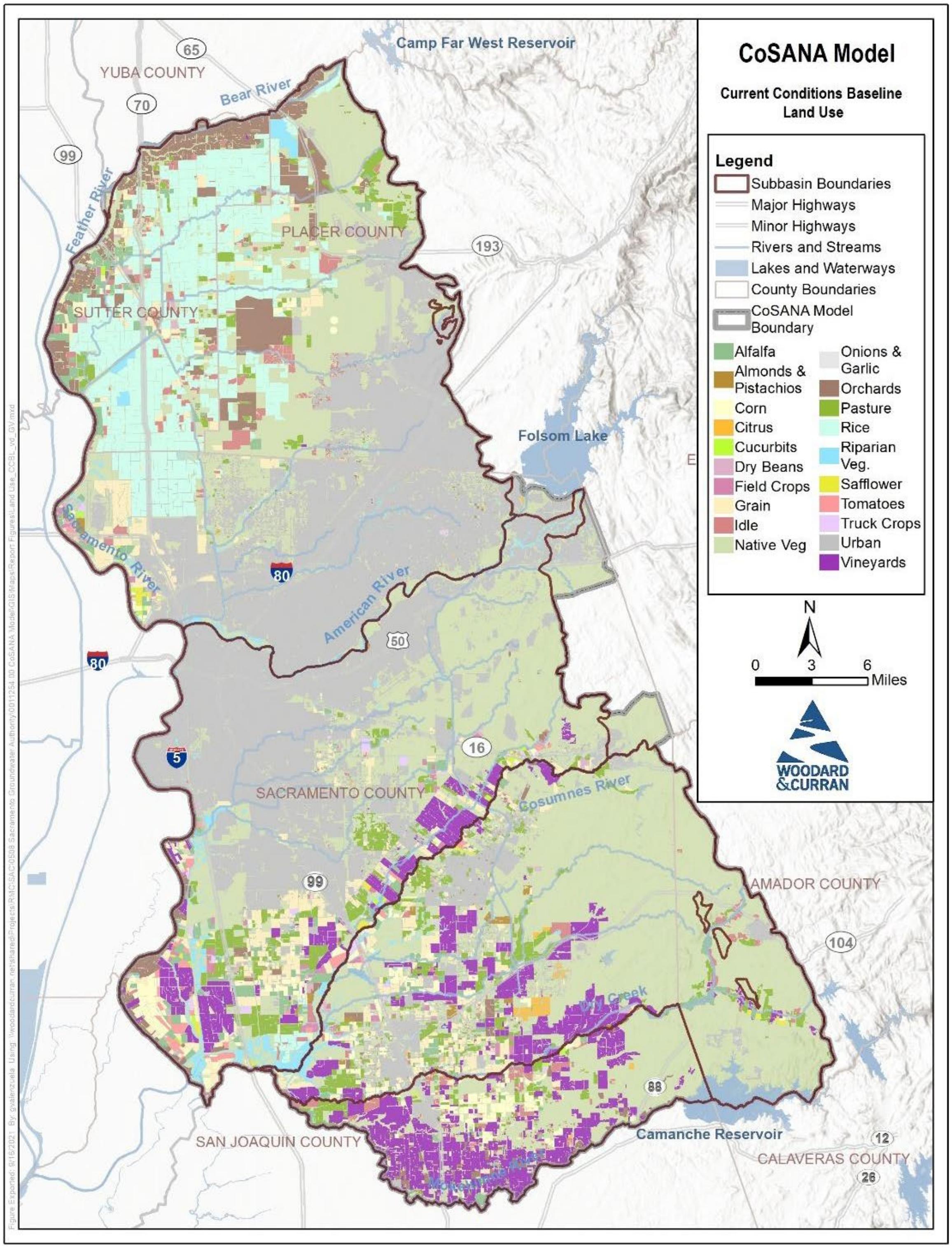
Water budgets were determined for the following baseline scenarios:

- **Historical water budget.** Historical data were used to evaluate the availability and reliability of past surface water supplies, the aquifer's response to water supply, and trends in demands relative to water year type. The hydrologic period of water years 1990 to 2018 was analyzed to provide a period of representative hydrology while capturing recent operations in the subbasin. For reporting purposes, the 10-year period from water year 2009 to 2018 was selected to provide the best representation of recent historical conditions.
- **Current water budget**. Current land and water use conditions were simulated to analyze the long-term effects of current land and water use practices on groundwater conditions and to estimate inflows and outflows for the groundwater system. The water budget quantifies inflows to and outflows from the basin using 50-years of hydrology (water years 1970 to 2019) in conjunction with 2015 water supply, demand, and land use information.
- **Projected water budget**. Projected land and water use conditions were simulated using hydrologic data from water years 1970 to 2019 (a 50-year period) to assess future subbasin

conditions. Projected conditions include future changes to land use, water supplies, agricultural demand, and urban demand based on the population growth trends reported in urban water management plans, general plans, and other planning documents, or current information provided by purveyors. Conditions with and without climate change were evaluated.

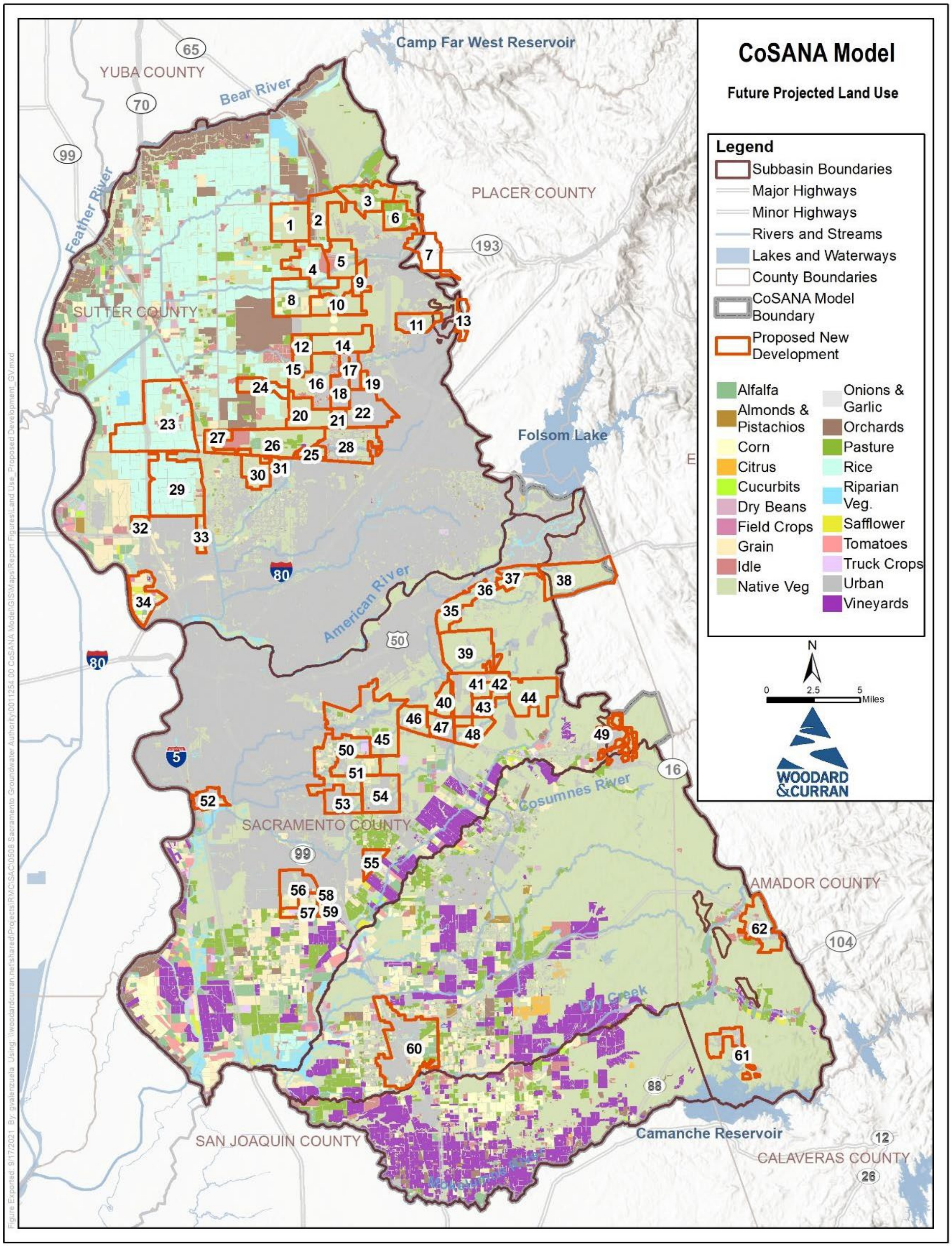
Figure 5 shows the land use assumptions used in CoSANA for the current baseline condition and Figure 6 shows the projected land use and proposed new developments used in CoSANA for the projected baseline condition. As indicated in the CoSANA modeling report, urban water demand and supply assumptions for projected conditions are based on the 2015 urban water management plans, general plans, other planning documents, or most current information provided by purveyors. Specifically for the project vicinity, projections for urban water demands in SCWA's Laguna Vineyard and Mather service areas reflect 2052 conditions based on the 2021 Zone 40 Water Supply Master Plan Amendment (SCWA 2021). Supply projections for SCWA's Laguna Vineyard and Mather service areas reflect 2052 conditions based on a mix of groundwater, surface water, recycled water, and remediated water as reported in the 2021 Zone 40 Master Plan Amendment (SCWA 2021). The modeling assumes that approximately 1,700 AFY of recycled water and 8,900 AFY of remediated water would be available in the Laguna Vineyard service area every year (Larry Walker and Associates 2021). The assumptions for agricultural demands were driven by land use changes that incorporated the proposed new developments shown in Figure 6.

The modeling of current and projected conditions considers the water budget from a long-term average annual basis to facilitate the assessment of long-term operational effects and water supply reliability. This is in contrast to the modeling of historical conditions, which is to validate the model and to evaluate trends relative to water year type. Annual inflows and the outflows vary to a large degree based on water year type. In wet years, precipitation met some of the water demand, and greater availability to surface water reduced the need for groundwater. However, in dry years, more groundwater was pumped to meet the agricultural demand not met by surface water or precipitation, which led to an increase in groundwater storage in wet years and a decrease in groundwater storage in dry years. While demand of applied water increased in dry years due to lack of precipitation, surface water supply remained consistent in most noncritical years (Larry Walker and Associates 2021).



Source: Larry Walker and Associates 2021, Figure 5-3 of Appendix 2-B.

Figure 5. Current Conditions Baseline Land Use



Source: Larry Walker and Associates 2021, Figure 5-17 of Appendix 2-B.

Figure 6. Projected Land Use and Proposed New Developments

Table 3 shows average historical water supply and demand by water year type for the 2009 to 2018 period and the average annual change in groundwater storage based on water year type for the same period. This modeling indicates that there would be a net increase in groundwater storage during wet and above normal years and a net deficit in groundwater storage in below normal, dry, and critically dry years. The magnitude of the change in groundwater storage also differs by water year type. Moderate losses in groundwater storage occurred during below normal, dry, and critically dry years and more substantial gains occurred during wet years.

Table 3. Historical Water Supply and Demand for the South American Subbasin

Supply and Demand	Wet	Above Normal	Below Normal	Dry	Critical	10-Year Average (WY 2009-2018
Water Demand (AFY)						
Agricultural demand	171,100	176,600	173,300	182,600	183,800	163,900
Urban demand	175,700	184,500	186,000	187,400	171,000	177,400
Total Demand	**346,800**	**361,100**	**359,300**	**370,000**	**354,800**	**341,300**
Water Supply (AFY)						
Surface water used by agriculture	44,400	45,600	45,100	45,300	46,100	45,100
Surface water used by urban	84,100	89,500	90,400	92,900	84,100	86,600
Groundwater used by agriculture	106,000	110,300	107,500	116,600	117,000	98,100
Groundwater used by agricultural residential	20,700	20,700	20,700	20,700	20,700	20,700
Groundwater used by urban	72,800	76,200	73,900	73,500	70,000	67,600
Groundwater for remediation	18,800	18,800	21,700	21,000	16,900	23,200
Total Supply	**346,800**	**361,100**	**359,300**	**370,000**	**354,800**	**341,300**
Average Annual Change in Groundwater Storage (AF)	**50,500**	**2,600**	**(10,900)**	**(20,800)**	**(15,300)**	**7,700**

Source: Larry Walker and Associates 2021, Table 2.4-8

AF = acre-feet; AFY = acre-feet per year; WY = water year

Note: Total supply equals total demand assuming supplies are available to meet those demands.

Table 4 shows long-term annual average inflows and outflows to the groundwater subbasin and the average annual change in groundwater storage. The results for future projections include planned growth and land use changes for forecasted conditions with and without climate change. This modeling indicates that the subbasin is currently within balance and projected conditions would result in only a slight imbalance. When future baseline conditions were modeled, the subbasin was found to be in a modest overdraft with or without climate change.

To achieve sustainability goals by 2042 and to avoid undesirable results over a 50-year implementation horizon, multiple planned projects and potential management actions were identified for the South American Subbasin and considered by the GSAs. Projects and management actions for the subbasin included topics such as recharge, flood/stormwater management, water quality, supply augmentation, demand management, community stewardship, and conjunctive use.

Table 4. Average Annual Water Budget for the South American Subbasin

Groundwater Inflow/Outflow Sources	Historical Condition Water Budget (WY 2009-2018)	Current Condition Water Budget (WY 1970-2019)	Projected Condition Water Budget (WY 1970-2019)	Projected Condition Water Budget with Climate (WY 1970-2019
Inflows (AFY)				
Deep percolation	119,500	120,900	121,300	114,800
Groundwater gains from streams	117,200	113,500	125,700	137,200
Groundwater injection	200	200	200	200
Other recharge	40	30	30	30
Subsurface inflow	38,500	40,200	44,900	46,700
Total Inflow	**275,400**	**274,800**	**292,100**	**298,900**
Outflows (AFY)				
Groundwater discharge to streams	18,000	22,200	20,000	19,100
Groundwater pumping	207,400	212,800	234,200	246,000
Subsurface outflow	42,300	37,600	39,000	40,000
Total Outflow	**267,700**	**272,600**	**293,200**	**305,100**
Average Annual Change in Groundwater Storage (AF)	**7,700**	**2,200**	**(1,100)**	**(6,200)**

Source: Larry Walker and Associates 2021, Table 2.4-7

AF = acre-feet; AFY = acre-feet per year; WY = water year

Note: The sustainable yield for the South American Subbasin was found to range between 210,000 AF and 270,00 AF of in any given year, as long as a long-term average of 235,000 AFY is maintained (Larry Walker and Associates 2021). The sustainable yield can be compared to the long-term mean groundwater pumping estimated for different hydrological conditions.

Several projects that focus on conjunctive use have already been implemented (e.g., the Freeport Intake on the Sacramento River and the Vineyard Surface Water Treatment Plant). Long-term benefits from those projects are expected to reduce urban demands and potentially reduce agricultural demands in the near term (Larry Walker and Associates 2021). In addition, the following projects are also expected to be implemented within the near term:

- The Harvest Water project, sponsored by the Sacramento Sewer District, will provide a safe and reliable supply of disinfected tertiary-treated recycled water, up to 50,000 AFY to irrigate more than 16,000 acres of agricultural and 400 acres of habitat lands.
- Omochumne-Hartnell Water District groundwater recharge project will divert up to 4,000 AFY of surface water from the Cosumnes River to an 1,168-acre spreading basin between the Cosumnes River and Deer Creek to help alleviate groundwater storage overdraft in both the South American Subbasin and the Cosumnes Subbasin.
- Regional Conjunctive Use Program elements will increase conjunctive use among both the South American Subbasin and the North American Subbasin municipal and industrial water purveyors. Planned projects will utilize existing infrastructure to leverage ongoing planning processes to use available additional surface water through water transfers, groundwater recharge projects, wholesale agreements, or wheeling agreements. It is expected that an average of 20,400 AF of surface water would be made available during wet years within the South American Subbasin, directly offsetting the use of groundwater and equating to an average annual benefit of about 7,200 AFY.

These projects are expected to result in lower average annual groundwater pumping and an improvement in groundwater storage in the South American Subbasin. The groundwater sustainability plan concludes that long-term groundwater basin sustainability will be achieved under a variety of project and management action scenarios modeled (when climate change is not considered), and with implementation of all the planned projects and accounting for an expected minor planned reduction in demand, long-term groundwater basin sustainability is projected to be achieved with climate change conditions (Larry Walker and Associates 2021).

Although the proposed project is not directly accounted for in the groundwater sustainability modeling, regional changes in land use and water demands are part of the future condition projections. These projections include reductions in agricultural lands and reduced agricultural water demands and increases in urban development and increased urban demands. The proposed project would continue to use the land for agricultural activities through continued irrigation of the pastures within the project site for grazing and possible crop production and the potential planting of pollinator friendly vegetation, but it would not be associated with increased urban demands. Because the modeling assumes continued agricultural use in the project area and vicinity over the near-term and during future conditions, the project site's agricultural use of 775 AFY is accounted for in the model's agricultural demands for both current and projected conditions.

The required 15 AF of water for construction is a new demand that would occur in the near term when the model is predicting that there is excess groundwater storage in the basin (Table 4). However, the 1 AFY needed for washing solar panels is a new demand that can occur in both the near term and under future conditions. In the near-term, there is excess groundwater storage in the basin. In the future, planned projects and potential management actions would be implemented to achieve long-term groundwater basin sustainability. The order of magnitude of the proposed change in long-term groundwater pumping at the project site (approximately 1 AFY) is significantly less than the change in current or projected groundwater storage estimated by the modeling (which is thousands of AFY; see Table 4). A small change of 1 AFY is likely within the noise of the model. Therefore, a long-term increase in groundwater use of 1 AFY is not expected to cause a noticeable difference beyond what is already predicted for future conditions.

3.3.2 Urban Water Management Plan

Urban water suppliers that provide over 3,000 acre-feet of water annually or serves more than 3,000 service connections are required to submit an urban water management plan. Urban water management plans are prepared by urban water suppliers every 5 years to ensure that adequate water supplies are available to meet existing and projected water needs. Urban water management plans describe water purveyors' existing and planned water systems, supplies and demands, and water conservation measures.

Although they do not serve the project area, the project site is within the SCWA's Zone 40 Central Service Area and within SCWA's Laguna-Vineyard service area (which is a combination of the Zone 40 Central Service Area and the South Service Area). Zone 40 retail customer water use includes single family residential, multi-family residential, commercial, institutional, industrial, and landscape irrigation.

SCWA's Zone 40 has potable surface water supplies, a non-potable surface water supply, and groundwater available to meet its customers' demands. Zone 40 potable water supplies consist of three water rights from the Sacramento River, two Central Valley Project contracts for water, a contract for water with Aerojet, a contract supply from North Delta Water Agency, and groundwater supplies. Zone 40 non-potable supplies consist of a contract for recycled water supplies from Sacramento Regional County Sanitation District to meet non-potable demands.

SCWA surface water supplies for Zone 40 are diverted from the Sacramento River at Freeport and obtained via the City of Sacramento's Sacramento River WTP and Fairbairn WTP. Surface water diverted from the Sacramento River at the Freeport diversion structure is conveyed through the Freeport Regional Water Authority pipeline, treated at the Vineyard WTP, and then delivered to customers in the Zone 40 Central Service Area, South Service Area, and North Service Area.

Groundwater is supplied to Zone 40 from wells that that are connected to groundwater treatment plants (GWTPs) and from wells that pump directly into the distribution system (direct feed). Most GWTP facilities consist of wells that supply raw water into a treatment plant, a ground level storage tank, and a pump station. Most GWTPs are supplied by more than one well. The direct feed wells pump directly into the distribution system and do not require treatment. Direct feed wells are located in some areas of the Zone 40 Central Service Area.

Based upon the estimated water use of the existing and new customers, SCWA anticipates an approximate doubling of potable and non-potable water use in Zone 40 between year 2020 and 2045 (from 37,620 AFY to 74,388 AFY for potable water supplies and from 962 AFY to 3,300 AFY for non-potable supplies). However, due to its various water supplies, water demands are expected to be met within its service areas in normal, single dry, and five consecutive dry years during this same period (Tully & Young 2021).

3.3.3 Agricultural Water Management Plans

Agricultural water suppliers serving more than 25,000 irrigated acres (excluding recycled water deliveries) are required to adopt and submit an Agricultural Water Management Plan. These plans contain reports on efficient water management practices, annual water budgets, system efficiency objectives, and water use efficiency estimates and they provide a drought plan.

The project area is outside of the service boundary for local agricultural water purveyors.

4 COMPARISON OF SUPPLY AND DEMAND

This section provides a comparison of past and future water demands for the project area and compares those demands to projected regional supplies available over the 20-year to 50-year planning horizon of the groundwater sustainability plan.

4.1 EXISTING WATER USE

4.1.1 Water Rights, Water Supply Entitlements, and/or Water Service Contracts

California law distinguishes between surface water and groundwater. Except for “subterranean streams flowing in known and definite channels,” if you use groundwater on land that is over the groundwater basin from which you took the water, you have an “overlying groundwater right.” Surface water rights are more complicated. Individuals can typically hold riparian rights or appropriative rights. A riparian water right is a right to use the natural flow of water on riparian land. Surface water use by individuals on non-riparian land is typically associated with appropriative rights (State Water Resources Control Board [SWRCB] 2025a).

The State Water Resources Control Board (SWRCB) issues water rights permits for appropriative rights. According to the SWRCB’s Electronic Water Rights Information Management System (eWRIMS) database, landowners within the vicinity of the project area have appropriative rights for diversions from Laguna Creek and unnamed tributaries for the purposes of irrigation and stock watering (SWRCB 2025b).

Existing water rights within the project area include the overlying groundwater rights associated with pumped groundwater used locally. Appropriative rights to surface water would not be used to serve the project during construction or during operation and maintenance. In addition, no new water supply entitlements or water service contracts would be obtained for the project.

4.1.2 Existing Groundwater Wells

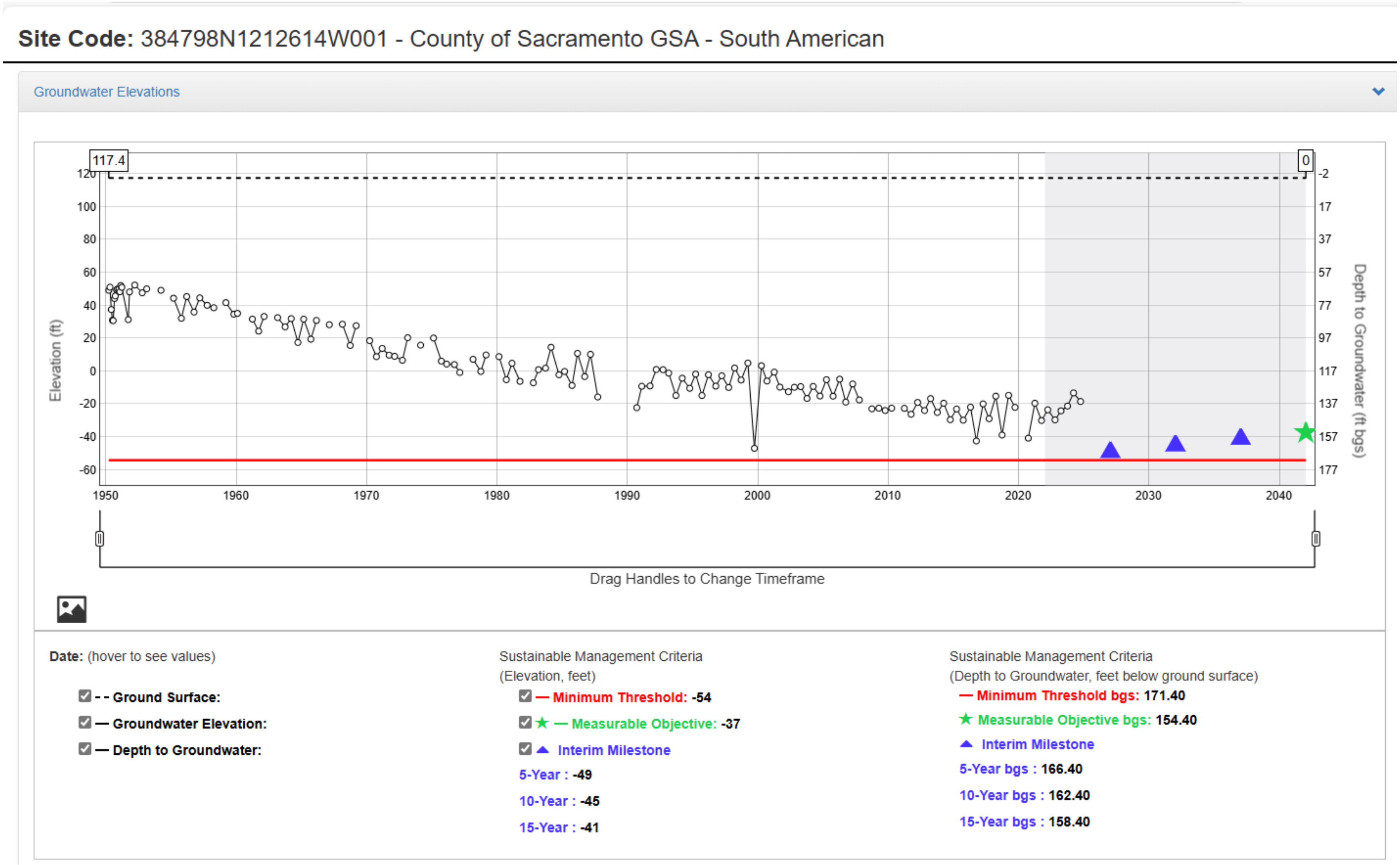
Groundwater is currently pumped from onsite and local wells to meet agricultural demands within the project area. Existing agricultural land uses within the project area include irrigated pastures for crops and forage ground for livestock. Crops include sudan grass for seed, corn for grain, summer and winter hay, and triticale grain. Approximately 385 acres of cropland (e.g., corn or sudan) and 103 acres of pasture are located within the northern area or southern area of the project site (see Table 1).

Existing agricultural wells currently in use within the project area and vicinity are identified on Table 2 and Figure 3. In addition to the wells, there are other wells within the project vicinity associated with residential use, irrigation, or groundwater observations which have reported data to DWR in the past (DWR 2025). Many of these wells have not reported use to DWR in several decades.

During construction, two onsite wells are expected to be used during development of the southern area of the project site (Well 2730064 and Well 2628266) and one local well is expected to be used during development of the northern area of the project site (Well 2627257). These wells would also be used during the operations and maintenance phase of the project. These wells would be used to support PV panel washing and/or compatible agricultural activities. For the purpose of this analysis, it is assumed that current agricultural practices would be unaffected by solar facility operations and that groundwater use would be unchanged.

Figure 7 shows groundwater levels at the representative SGMA monitoring site located approximate 0.35 miles east of the southern area (Well 2627908). As seen by the long-term record, groundwater levels decreased between 1950 and 1990, suggesting increased groundwater pumping in the local area at that time, but during the last 15 years, long-term groundwater levels in the local area have been relatively stable.

As discussed in Sections 3.2 and 3.3, groundwater levels can vary year-to-year in direct response to groundwater pumping for agricultural demands. As shown in Figure 7, water levels have decreased locally during periods of drought but have also recovered during wet and above normal years.



Site Code: 384798N1212614W001 - County of Sacramento GSA - South American

Date: (hover to see values)

☑ - - **Ground Surface:**
☑ — **Groundwater Elevation:**
☑ — **Depth to Groundwater:**

Sustainable Management Criteria
(Elevation, feet)

☑ — **Minimum Threshold:** **-54**
☑ ★ — **Measurable Objective:** **-37**
☑ ▲ **Interim Milestone**
5-Year : **-49**
10-Year : **-45**
15-Year : **-41**

Sustainable Management Criteria
(Depth to Groundwater, feet below ground surface)

— **Minimum Threshold bgs:** **171.40**
★ **Measurable Objective bgs:** **154.40**
▲ **Interim Milestone**
5-Year bgs : **166.40**
10-Year bgs : **162.40**
15-Year bgs : **158.40**

Source: DWR 2025

Figure 7. Groundwater Levels at Well 2627908 and the Sustainable Management Criteria for the SGMA Representative Monitoring Site

4.2 PROJECTED WATER DEMAND AND DRAWDOWN FROM ONSITE WELLS

The project site is currently served by two onsite wells and one local well and future demands from the project are expected to be met by these same wells. Estimated demands for the project are summarized in Table 5.

Table 5. Water Demand from Onsite and Local Wells

Project Phase	Water Demand	Primary Use
Construction	15 AF over 18 to 24 months	Soil compaction and dust control
O&M of Solar Facilities	1 AFY	Washing of solar panels
Continued Agricultral Use	775 AFY	Continued agricultural activities

AF = acre-feet; AFY = acre-feet per year; O&M = operation and maintenance

Groundwater pumped at a well causes a local drawdown effect. The extent of the drawdown depends on various factors, such as subsurface characteristics (e.g., hydraulic conductivity), pumping rates, volume, and duration. Additional pumping at an existing well could potentially affect other wells within the local area.

The radius of influence of a well is the distance at which the localized effects from groundwater pumping is negligible. Effects to groundwater intake at a nearby wells would be dependent on the well's screening interval and on change in groundwater levels. For this analysis, a negligible effect is assumed if drawdown is less than 0.5 foot.

The amount of groundwater drawdown can be calculated using Theis's method for unsteady flow for a well (Kruseman and de Ridder 1991). The Theis equation is summarized below in equations 1 through 3.

$$s = \frac{Q}{4\pi KD} W(u) \qquad \text{(Eqn 1)}$$

$$W(u) = -0.5772 - lnu + u - \frac{u^2}{2*2!} + \frac{u^3}{3*3!} - \frac{u^4}{4*4!} + \cdots \qquad \text{(Eqn 2)}$$

$$u = \frac{r^2 S}{4KDt} \qquad \text{(Eqn 3)}$$

Where:

s = drawdown at a distance r from the well (feet)

Q = well discharge (cubic feet per day),

K = hydraulic conductivity (feet per day),

D = depth of the aquifer (feet),

W(u) = Theis well function,

u = the argument of the Theis function,

r = distance from the well (feet),

S = storativity of the aquifer (foot per foot),

t = time since pumping started (days)

The following parameters were used in the Theis equation.

Hydraulic conductivity. The hydraulic conductivity is a measure of the ease with which water can move through pore spaces in soil. Hydraulic conductivity values for the groundwater subbasin typically range from approximately 2.7 to 35 feet per day (Larry Walker and Associates 2021). Values for hydraulic conductivity can also be estimated based on data reported by the U.S. Department of Agriculture National Resources Conservation Service web soil survey for site-specific soils. The saturated hydraulic conductivity is estimated to be 3.5446 micrometers per second or 1 foot per day based on site-specific soils (NRCS 2025).

Aquifer depth. Aquifer depth is based on regional or project specific groundwater information. The base of freshwater (or bottom of the aquifer) in the lower zone of the groundwater aquifer is at an average approximate depth of 1,400 feet below ground surface (Larry Walker and Associates 2021). Depth to groundwater at the project site is approximately 140 feet (see Figure 7). Therefore, the depth of the aquifer was assumed to be about 1,300 feet.

Storativity. The storativity is a measure of the ability of the aquifer to release water from storage. Approximations for the storativity are different for confined vs. unconfined conditions, with the latter having higher storativity coefficients. Because the groundwater subbasin has unconfined to semiconfined conditions, to be conservative unconfined conditions were assumed. Storativity in unconfined aquifers typically range from 0.01 to 0.3 and is approximately equal to the specific yield. The storativity was assumed to equal the specific yield for silt (0.18) (Johnson 1967) based on the soil composition/characteristics of the aquifer.

The radius of influence was calculated for pumping scenarios associated with construction and operations and maintenance activities. For the purpose of this analysis, a negligible effect was assumed if drawdown is less than 0.5 foot.

- During project construction, approximately 15 AF of water would be used over an 18-month to 24-month period. Assuming 15 AF is pumped during an 18-month period with 375 construction days, the average flow rate would be approximately 1,700 cubic feet per day. Assuming construction demands are met by pumping groundwater from a single well, drawdown at that well would be approximately 0.5 foot at a distance of 300 feet from the well after 375 days of pumping. At a distance of 1,900 feet from the well, drawdown would be less than 0.1 foot after 375 days of pumping.
- Approximately 1 AF of water would be needed for PV panel washing during project operations and maintenance. Assuming the annual PV panel washing would occur over 4 weeks (20 construction days), the average flow rate would be approximately 2,200 cubic feet per day. Under these conditions, drawdown would be less than 0.5 foot at a distance of 100 feet after 20 days of pumping (with drawdown effects attenuated at greater distances).

The project would utilize two onsite wells and one local well for construction and operations of the project. Two onsite wells would be used in the southern area of the project site (Well

2730064 and Well 2628266) and one local well would be used for the northern area of the project site (Well 2627257). Groundwater would be used to support agricultural activities such as grazing, possible crop production, and/or establishment of pollinator habitat. However, groundwater pumping for agricultural activities is conservatively assumed to be the same before and after project implementation. The active well that is closest in proximity is Well 2647312, which located east of the southern area (shown on Figure 3). Well 2730064 is approximately 1,900 feet from Well 2647312. Based on the calculations above, drawdown is expected to change by less than 0.1 foot at Well 2647312 during both construction and operations.

Local drawdown effects from pumped groundwater during project construction, operations, and maintenance is expected to be negligible.

4.3 SUFFICIENCY OF SUPPLIES TO MEET THE DEMAND

As discussed in Section 3.3, the groundwater subbasin is currently within balance and projected conditions with or without climate change results in only a slight imbalance. During below normal, dry, and critically dry water years, there is a net decrease in groundwater storage within the subbasin, but this storage is typically recovered during subsequent wet and above normal years. To achieve sustainability goals by 2042 and to avoid undesirable results over a 50-year implementation horizon, multiple planned projects and potential management actions were identified for the South American Subbasin. With implementation of the planned projects, long-term groundwater basin sustainability is projected to be achieved.

Implementation of the proposed project would require up to 15 AF of groundwater over an 18-month to 24- month period which could occur during normal, single dry, and even multiple dry water years. Approximately 775 AFY of water would be needed for agricultural purposes and approximately 1 AFY of water would also be needed for washing solar panels during a longer 35-year time period. The continuation of existing agricultural demands in the project area and vicinity is already anticipated in the groundwater sustainability planning. However, the additional use of 15 AF of groundwater over an 18-month to 24-month period and the 1 AFY groundwater use over a 35-year period are new demands that were not anticipated in the groundwater sustainability modeling. These supplies are currently available within the groundwater basin and can be accounted for under projected conditions with the planned projects and potential management actions under consideration. Implementation of the proposed project would not conflict with the sustainable groundwater management plan of the subbasin.

5 CONCLUSIONS

Groundwater and trucked water for portable bathrooms are the only sources of water supply proposed for the project. Effects to regional water supplies were considered in the context of existing modeling results for current and projected conditions for the groundwater subbasin as analyzed in existing water resource management plans. Modeling indicates that there are currently adequate supplies to support the project even in the context of normal, single dry, and multiple dry water years.

Projections of future conditions with or without climate change indicate that the groundwater subbasin is in slight imbalance. As per the groundwater sustainability plan, planned projects and management actions will be implemented to avoid undesirable results over the 20-year to 50-years planning horizon of the groundwater sustainability plan. As such, there would be sufficient supplies to serve the increased project demand (a minor increase of 1 AFY) over the next 35 years.

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APPENDIX A
DUST CONTROL WATER ESTIMATION

	Solar Fields (AF)	Substation and switchyard (AF)	Total (AF)
Native soil compaction	0.0	1.7	1.7
Aggregate base compaction	1.8	4.0	5.7
Dust control	5.7	1.6	7.4
	7.5	7.3	15

SUMMARY

Total Water Estimate (Compaction and Dust Control) for Project

Details for Water Estimate for compaction and dust control are found in Section A and B

	Total Water (gal)	**Total Water (CFT)**	**Total Water (Ac Ft)**
Water Est. for Compaction & Dust Control	2,400,000	320,856	**7**

Details for Water Estimates for Compaction and Dust Control

A. Water Estimate for Compaction- Methodology

1. Using soil type at site (reference Geologic Recon report) and reviewing published sources determine range of optimum moisture contents recommended for compaction for site soil types
2. Determine basis for water estimate, either using site description or assumptions
3. Calculate water Est. (total and use per day)

1. Determine Water estimate for compaction on a per cubic yard (of compacted soil) basis by Establishing Soil Type at site and estimating corresponding water estimates

Eberhart United Consultants (EUC); Phase 1 Geologic Recon. Report; Desert Sunlight Solar Energy, Desert Center, (06/21/07)

From Table on page 2 of the WKA report & adding ranges of maximum dry density/moisture contents (CE Reference 1989 Lindenburg)

Hand auger Location ID	**Soil Type**	Max Dry Density (lb/cft)	**Correspond Opt Moisture %**	In-Place Dry Density (lb/cft)	**In-Place Moisture %**
D2	CL	116.0	11.0%	105	19%
D9	SM	126.5	9.0%		
D11	SM	114.0	10.1%	115	16%
D25	SM	94.5	23.3%		
	Simple Average	**112.8**	**13.4%**	**110**	**17.6%**

Assume that site soils are compacted at optimum moisture contents

WKA 2022 reports inplace moisture content was measured at 17.6% lb/cft per ASTM D 2936

WKA 2022 reports inplace dry density was calculated to be 110 lb/cft per ASTM D 2937

Assume that Rice will be Harvested In October and Construction starts in January the Native Fill will have an existing moisture content that exceeds the Optimum Moisture per the WKA 2022 inplace moisture measurements, discing and drying or lime treatment of the native soil will be required for compaction thus no additional water will be needed for moisture conditioning

Assume that AB Fill has an existing moisture content of 1% and that moisture conditioning of fill will have a 3% (dry soil basis) loss during mixing (could be more due to evaporation). Therefore (unit rate) water estimate will be 2% more than optimum

	Averaged Max Dry Density (lb/cft)	**Corresponding Opt Moisture %**	**Est. Water Content % for Compaction**	**Est. Water (lb per cft) for Compaction**	**Est. Water (lb per CYD) for Compaction**	**Est. Water (Gal per CYD) for Compaction**
Native Fill Unit Water Est.	112.8	13.4%	13.4%	0.0	0	0
AB Fill Unit Water Est.	122	12.5%	14.5%	17.7	478	57

2. Basis for Water Est.

Site will move 100,000 cubic yards of Native Fill (TOTAL) (No estimate has been provided in preliminary design)

Site will move 10,000 cubic yards of Aggregate Base Fill (TOTAL) Assumes 10 acres of roads and inverter pads w/ 6-inches of AB Earthwork Analysis 03/07/23

Construction Schedule for grading is (Oveja Ranch Solar Schedule Dated September 18th)

Construction period is 2 months,(8 weeks) at 5 days a week or total 40 days

Note that this is an average use and actual daily Est. could be higher to handle peak conditions

3. Est. Water Use for Compaction

This Table does not include a safety factor to account for peak demands

	Total Water Est. (gal)	Total Water Est. (CFT)	Total Water Est. (Ac-Ft)	Water Est. (GPD)	Water Est. (Ac-Ft per Day)
Native Soil Compaction Water Est.	0	0	0.0	0	0.000
Aggregate Base Compaction Water Est.	573,317	76,647	1.8	14,333	0.044

B. Water Est. for Dust Control- Methodology

1. Using published sources determine a water use unit rates recommended for dust control
2. Determine basis for water Est., either using site description or assumptions
3. Calculate water Est. (total and use per day)

1. Determine Water Est. for dust control on a per square yard of road
Estimate Dust control water unit rate
Reference: Mojave Desert AQMD Emission Inventory Guidance for Mineral Handling and Process Industry
(based on USEPA AP-42 (9/98) on Unpaved Roads)

Item K, Dust Entainment from Unpaved Roads page 31 provides the following guidance
Water application rate (I) is 0.11 gallons per square yard
Conservative frequency for water application (T) is 3 hours
Conservative evaporation rate (A) 67 inches (average annual) from Class A Pan

Control efficiency (Cf) for any water application rate is derived from
Cf = 100-(0.0012*(A*D*T/I)) where D is Average Hourly traffic rate in vehicles/hour
Determine water application rate for site assuming equivalent control efficiency for 20 vehicles/hour
Cf = 56% Assumed equivalency
Pan evaporation rate for area is 67 inches (average annual) from Class A Pan
Source is Bulletin 73-39 (11/79) Evaporation from Water Surfaces in California, page 40
Calculate water application rate
I= 0.110 gallons per square yard (SYD)
This is the application rate is for every 3 hours , so to convert to a daily rate
Assume 12 hour construction days
Assume that roads are watered ~three times each day during construction period
I per day is 0.44 gallons per square yard (SYD) for each 12 hour day

2. Basis for Water Est. for Dust Control
Asume that construction starts at the North and proceeds South
Assume roads are 30 feet wide
Assume initial dustcontrol is for 8000 feet of road (80% of total road)
Assume final dust control is for 2500 feet of road (25% of total road)

Construction will start with 26667 SYD
Construction will end with 8333 SYD

3. Calculate Water Use for Dust Control

	Water Est. (GPD) for Dust Control	Water Est. for Dust Control (CFT/day)	Water Est. for Dust Control (Ac-Ft per Day)
Initial Water Est. for Dust Control	11,721	1,567	0.04
End of Construction Water Estimate for Dust Control	3,663	490	0.01

Construction Schedule for grading is (Oveja Ranch Solar Schedule Dated September 18th)

Construction period is 12 months at 5 days a week or total 243 days
Note that this is an average use and actual daily requirement could be higher to handle peak conditions

Water Estimates for Compaction and Dust Control
Desert Sunlight Solar Farm

	Total Water Est for Dust Control (gal)	Total Water Estimate for Dust Control (CFT)	Total Water Est for Dust Control (Ac-Ft)
Water Est. for Dust Control	1,868,022	249,736	5.7

SUMMARY

Total Water Estimate (Compaction and Dust Control) for Project

Details for Water Estimate for compaction and dust control are found in Section A and B

	Total Water (gal)	Total Water (CFT)	Total Water (Ac Ft)
Water Est. for Compaction & Dust Control	2,400,000	320,856	**7**

Details for Water Estimates for Compaction and Dust Control

A. Water Estimate for Compaction- Methodology

1. Using soil type at site (reference Geologic Recon report) and reviewing published sources
   determine range of optimum moisture contents recommended for compaction for site soil types
2. Determine basis for water estimate, either using site description or assumptions
3. Calculate water Est. (total and use per day)

1. Determine Water estimate for compaction on a per cubic yard (of compacted soil) basis by Establishing Soil Type at site and estimating corresponding water estimates

Eberhart United Consultants (EUC); Phase 1 Geologic Recon. Report; Desert Sunlight Solar Energy, Desert Center, (06/21/07)

From Table on page 2 of the WKA report & adding ranges of maximum dry density/moisture contents (CE Reference 1989 Lindenburg)

Hand auger Location ID	**Soil Type**	Max Dry Density (lb/cft)	**Correspond Opt Moisture %**	In-Place Dry Density (lb/cft)	**In-Place Moisture %**
D35	CL	111.5	17.0%		
D37	SM	122.0	11.1%	120	7%
	Simple Average	**116.8**	**14.1%**	**120**	**7.4%**

Assume that site soils are compacted at optimum moisture contents

WKA 2022 reports inplace moisture content was measured at	7.4%	lb/cft per ASTM D 2936
WKA 2022 reports inplace dry density was calculated to be	120	lb/cft per ASTM D 2937

Assume that Native Fill has an existing moisture conten 7.4% and that moisture conditioning of fill will have a 3% (dry soil basis) loss during mixing (could be more due to evaporation).

Assume that AB Fill has an existing moisture content of 1% and that moisture conditioning of fill will have a 3% (dry soil basis) loss during mixing (could be more due to evaporation). Therefore (unit rate) water estimate will be 2% more than optimum

	Averaged Max Dry Density (lb/cft)	**Corresponding Opt Moisture %**	**Est. Water Content % for Compaction**	**Est. Water (lb per cft) for Compaction**	**Est. Water (lb per CYD) for Compaction**	**Est. Water (Gal per CYD) for Compaction**
Native Fill Unit Water Est.	116.8	14.1%	9.7%	11.3	304	37
AB Fill Unit Water Est.	122	12.5%	14.5%	17.7	478	57

2. Basis for Water Est.

Site will move 15,000 cubic yards of Native Fill (TOTAL) Ref: No Estimate Provided, assumes 1' of fill placed over BESS and Substation Analysis 03/07/22
Site will move 22,600 cubic yards of Aggregate Base Fill (TOTAL) Ref:
Construction Schedule for grading is (Oveja Ranch Solar Site Schedule Dated September 18th)
The civil construction period is 2 months,(8 weeks) at 5 days a week or total 60 days
Note that this is an average use and actual daily Est. could be higher to handle peak conditions

3. Est. Water Use for Compaction

This Table does not include a safety factor to account for peak demands

	Total Water Est. (gal)	**Total Water Est. (CFT)**	**Total Water Est. (Ac-Ft)**	**Water Est. (GPD)**	**Water Est. (Ac-Ft per Day)**

Native Soil Compaction Water Est.	547,699	73,222	1.7	9,128	0.028
Aggregate Base Compaction Water Est.	1,295,695	173,221	4.0	21,595	0.066

B. Water Est. for Dust Control- Methodology

1. Using published sources determine a water use unit rates recommended for dust control
2. Determine basis for water Est., either using site description or assumptions
3. Calculate water Est. (total and use per day)

1. Determine Water Est. for dust control on a per square yard of road
Estimate Dust control water unit rate

Reference: Mojave Desert AQMD Emission Inventory Guidance for Mineral Handling and Process Industry
(based on USEPA AP-42 (9/98) on Unpaved Roads)

Item K, Dust Entainment from Unpaved Roads page 31 provides the following guidance
Water application rate (I) is 0.11 gallons per square yard
Conservative frequency for water application (T) is 3 hours
Conservative evaporation rate (A) 67 inches (average annual) from Class A Pan

Control efficiency (Cf) for any water application rate is derived from
Cf = 100-(0.0012*(A*D*T/I) where D is Average Hourly traffic rate in vehicles/hour
Determine water application rate for site assuming equivalent control efficiency for 20 vehicles/hour
Cf = 56% Assumed equivalency
Pan evaporation rate for area is 67 inches (average annual) from Class A Pan
Source is Bulletin 73-39 (11/79) Evaporation from Water Surfaces in California, page 40
Calculate water application rate
I= 0.110 gallons per square yard (SYD)
This is the application rate is for every 3 hours , so to convert to a daily rate
Assume 12 hour construction days
Assume that roads are watered ~three times each day during construction period
I per day is 0.44 gallons per square yard (SYD) for each 12 hour day

2. Basis for Water Est. for Dust Control

Asume Shared Access Route is off of Eagles Nest Road.
Assume roads are 30 feet wide
Assume initial dustcontrol is for 3000 feet of road (60% of total road)
Assume final dust control is for 3000 feet of road (25% of total road)

Construction will start with 10000 SYD
Construction will end with 10000 SYD

3. Calculate Water Use for Dust Control

	Water Est. (GPD) for Dust Control	Water Est. for Dust Control (CFT/day)	Water Est. for Dust Control (Ac Ft per Day)
Initial Water Est. for Dust Control	4,395	588	0.01
End of Construction Water Estimate for Dust Control	4,395	588	0.01

Construction Schedule for grading is (Oveja Ranch Solar Schedule Dated September 18th)

Construction period is 12 months,(52 weeks) at 5 days a week or total 120 days
Note that this is an average use and actual daily requirement could be higher to handle peak conditions

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Desert Sunlight Solar Farm

	Total Water Est for Dust Control (gal)	Total Water Estimate for Dust Control (CFT)	Total Water Est for Dust Control (Ac-Ft)
Water Est. for Dust Control	527,442	70,514	1.6