APPENDIX D

Water Supply Assessment

WATER SUPPLY ASSESSMENT

STAGECOACH SOLAR PROJECT

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1. INTRODUCTION

This Water Supply Assessment (WSA) was prepared for the Stagecoach Solar Project (Project), proposed to be located in the Lucerne Valley of unincorporated San Bernardino County. If approved, the 200-megawatt (MW) photovoltaic (PV) facility will require about 258-acre feet (AF) of water for construction over an 18-month period and 0.6 AF per year (AFY) of water for operations, with an operational life of 40 years.

This Report provides technical support to California State Lands Commission (CSLC), the lead agency, in complying with the California Environmental Quality Act (CEQA) and developing an Environmental Impact Report (EIR) for the Project. The Report focuses on availability of sustainable water supply for the proposed Project. A Water Supply Assessment (WSA) as per Senate Bill 610 (SB610) is not required, consistent with the 2011 Senate Bill 267, which exempts photovoltaic energy generation facilities with annual water demand no more than 75 AFY. Nonetheless, SB610 provides a widely accepted process and format for systematically evaluating water demand and supply (including droughts) with specific requirements for groundwater assessment. Accordingly, this Report follows the SB610 guidelines.

The Project would be located in southwestern San Bernardino County about 15 miles south of the City of Barstow (**Figure 1**). Avangrid is the project proponent. The project area boundary is located east of Interstate 15, south of Interstate 40, and approximately 1.5 miles west of State Route 247. The Project area encompasses about 3,570 acres of undeveloped State-owned land in the Lucerne Valley, of which about 1,750 acres would include photovoltaic (PV) panels and associated infrastructure, a battery storage facility, onsite substation, and an operations and maintenance (O&M) building. Water supply for the O&M building would be provided by an on-site groundwater well or an on-site water tank using water transported from off-site.

The Project area is located within the adjudicated Mojave Basin Area (MBA) Watershed and is in the Mojave Water Agency (MWA) service area (**Figure 2**). It is located within the Este Subarea, one of the basic subdivisions of the Mojave Basin defined for groundwater management purposes.

1.1. BACKGROUND

The California Water Code Section 10910 (also termed Senate Bill 610 or SB610) requires that a Water Supply Assessment (WSA) be prepared for a project that is subject to the California Environmental Quality Act (CEQA) and is considered a project subject to SB610 as defined in Water Code Section 10912. SB610 was amended by the 2012 Senate Bill 267 (SB 267) to revise the definition of "project." Under SB 267, wind and solar photovoltaic projects that consume less than 75 AFY of water are not considered a "project" under SB 610, in which case a WSA would not be required. The Project's average 40-year water use of 0.6 AFY for operations would be below this threshold. It is therefore assumed that the Stagecoach Solar Project is exempted. However, because the 75 AFY threshold would be exceeded during the 18-month construction period, CSLC has requested preparation of this Water Supply Assessment.

1.2. Purpose and Organization

The purpose of this Report is to document the Este Subarea's demands and supplies and to compare them to the area's future water demand, including that of the proposed Project. This comparison, conducted for both normal and drought conditions in five-year increments to 2040, is the basis for an assessment of water supply sufficiency in accordance with California Water Code Section 10910 (SB610).

The Report incorporates current and future water supply and demand information from the MWA's 2020 Urban Water Management Plan (UWMP) Public Draft, other available MWA and regional documents regarding water supplies, current water use, and estimated water use of the Project. The analysis extends to 2040, addresses water demands in five-year increments, and provides information consistent with SB610 WSA requirements.

This Report is organized to be easily read and understood, as follows:

- Section 1 introduces the Project and provides background.
- Section 2 provides a regulatory background for the use of water resources for the Project.
- Sections 3 and 4 discuss water demand: Section 3 provides Project information and focuses on the current and proposed water demands. Section 4 provides the context of the area's current and projected water demands in normal and drought years.
- Section 5 documents the area's existing and future supplies and allocation of those supplies. The Project is in an adjudicated basin where groundwater use is controlled by a court judgment.
- Section 6 contains a comparison of water supply and demand (in normal and drought years) that fulfills the intent of SB610.
- Section 7 provides an assessment of the potential impacts.
- Section 8 summarizes the Report's conclusions.

2. GROUNDWATER RIGHTS AND MANAGEMENT

The following section summarizes water rights and management as applicable to the use of water resources for the Stagecoach Solar Project.

2.1. GROUNDWATER RIGHTS IN CALIFORNIA

In California, the State Water Resources Control Board (SWRCB) administers water rights law. A water right is legal permission to use a reasonable amount of water for beneficial purposes. Statutory and case law in California distinguish between groundwater and surface water. Groundwater is considered either percolating or a subterranean stream flowing through known and defined channels. The SWRCB issues permits for diversion of subterranean stream water, which generally moves through permeable streambed material following the course of a stream. However, most groundwater in California is considered to be percolating groundwater which is not regulated by the SWRCB unless it is being used for wasteful or unreasonable purposes or the use harms state resources. Although not regulated by the State, some groundwater use can be regulated by local entities such as a county or a groundwater management district (now a Groundwater Sustainability Agency – see information on Sustainable Groundwater Management Act below).

Overlying groundwater rights allow a landowner to use percolating groundwater on the overlying property. Overlying rights are usually not limited by history or frequency of use and are considered correlative rights where they are of equal priority to one another. If supply insufficiency exists, the water may be apportioned among the landowners by a court decree. If groundwater is used elsewhere, it becomes an appropriative groundwater right; for example, municipal use is considered an appropriative groundwater right. Appropriative rights are limited by historical use and priority is determined on a first-in-time, first-in-right basis between appropriators. Appropriative groundwater rights are junior to overlying groundwater rights. A third type of groundwater right is a prescriptive groundwater right and is acquired by someone who openly uses groundwater from someone who has an existing prior right. The use must be continuous and uninterrupted for a period of five years.

Groundwater rights can also be quantified through adjudication. State courts and occasionally the SWRCB can adjudicate a groundwater basin if competing demands become too great and lawsuits arise. In an adjudicated basin, water rights are allocated to the users based on complex legal and factual issues. There are 22 adjudicated groundwater basins in California. The Project is in the Este Subarea which is part of the adjudicated Mojave Basin Area.

2.2. MOJAVE BASIN AREA ADJUDICATION

The Mojave Basin Area adjudication was a legal process that allocated natural supply to producers in the area to address the water supply shortages through the Stipulated Judgment in City of Barstow, et al. vs. City of Adelanto, et al. and related cross-complaints (Case No. 208568). A Physical Solution was developed to allocate responsibility for correction of annual overdraft and to maintain historical average annual flows between subareas. For the Physical Solution, the Mojave River watershed was divided into five subareas and associated groundwater basins: Oeste, Alto, Baja, Centro, and Este as shown in **Figure 2**. These subareas are the basic units for defining groundwater supply and demand and the status of overdraft.

The Stipulated Judgment requires the Watermaster to file an annual report with the Court that addresses the state of each subarea and Physical Solution status. MWA was appointed the Watermaster by the Court to administer the Judgment and the Physical Solution. The Physical Solution is dependent upon sufficient water being available to meet the needs of the subareas from a combination of natural supply, imported water, water conservation, water reuse, and transfers among parties.

For the Physical Solution, determinations were made of the estimated average annual natural flow (excluding stormflow) between the subareas over a 60-year period (1930-31 through 1989-90). Subareas are required to provide this flow or provide makeup water. Base Annual Production (BAP) rights were assigned to each producer using 10 AFY or more based on 1986-1990 production. To address overdraft and maintain proper water balances within each subarea, a decreasing Free Production Allowance (FPA) was determined for each subarea for the first five water years (1993-94 to 1997-98) with the FPAs decreasing from 100 to 80 percent in the first five years as a means to "ramp down" groundwater production. Thereafter, the Court reviews the Production Safe Yield (PSY) and adjusts, if necessary, each FPA annually. The PSY was last updated in 2018 at the court's request. Producers must reduce their maximum BAP by the established FPA percentage. The FPA is now at 65 percent in the Este Subarea.

2.3. SUSTAINABLE GROUNDWATER MANAGEMENT ACT

The Sustainable Groundwater Management Act (SGMA), enacted as of January 1, 2015, provides a framework for sustainable management of groundwater resources by local agencies and lays out a process and timeline for local agencies to achieve sustainability. SGMA is directed at groundwater basins or subbasins that have been designated by California Department of Water Resources (DWR) as medium- or high-priority through the California Statewide Groundwater Elevation Monitoring (CASGEM) program. Of the 515 groundwater basins in California, 127 were assigned high and medium priority. The Project site overlies the Lucerne Valley Groundwater Basin (DWR Basin 7-19) which has been designated a low priority.

SGMA has different requirements for basins that have been, or are being, adjudicated. Among other requirements, watermasters or local agencies in adjudicated basins must submit to DWR an annual report containing the following information to the extent available for the portion of the basin subject to the adjudication:

- Groundwater elevation data unless otherwise submitted pursuant to Section 10932.

- Annual aggregated data identifying groundwater extraction for the preceding water year.
- Surface water supply used for or available for use for groundwater recharge or in-lieu use.
- Total water use.
- Change in groundwater storage.
- The annual report submitted to the court.

As Watermaster for the Mojave Basin Area, MWA has prepared annual reports for the Mojave River Area adjudication; these are available on the MWA and DWR SGMA websites.

2.4. MANAGEMENT PLANNING

The Project area is addressed in several water supply-related planning documents including the Annual Reports of the Mojave Basin Area Watermaster, Urban Water Management Plan (UWMP) (Tully and Young, 2021), Final Mojave Integrated Regional Water Management Plan (IRWMP) (Kennedy/Jenks, 2014), Final Mojave Salt and Nutrient Management Plan (SNMP) (Kennedy/Jenks and Todd, 2015), and the Desert Renewable Energy Conservation Plan (DRECP) (CEC, 2014).

The Mojave Basin Area Watermaster reports are prepared annually to comply with the adjudication judgment. The most recent report was prepared for water year 2019-20 (Mojave Basin Area Watermaster, 2021). The report states that Este Subarea water levels have remained stable over the past several years indicating a relative balance between recharge and discharge. The Este Subarea is recognized as including two distinct areas. Groundwater levels in the north Lucerne Valley area have trended slightly upward while groundwater levels in the south have trended slightly downward. Overall, the water balance shows little change in storage. Future annual reports will continue to review water use in the Este Subarea and if conditions change, the Este Subarea maybe subject to future pumping reductions.

The UWMP (Tully and Young, 2021) was prepared for the Mojave Water Agency wholesale area. UWMPs are intended to guide water management planning activities over a 20-year period. The MWA UWMP documents water sources, water demands, water reliability planning, and water demand management through 2040.

The IRWMP (Kennedy/Jenks, 2014) is a result of a collaborative, stakeholder-driven effort to manage all aspects of water resources in the region and set a vision for the future of water management. It integrates regional water management components, including water supply, water quality, wastewater, recycled water, water conservation, storm water/flood management, watershed planning, climate change, habitat protection and restoration, and stakeholder and public outreach. The IRWMP encompasses the entire MWA service area and four expansion areas. The IRWMP plan process included assessing water needs and identifying, evaluating, and prioritizing water management projects and programs.

The Mojave SNMP (Kennedy/Jenks and Todd, 2015) was developed to (1) promote reliance on local sustainable water sources such as recycled water and storm water, while maximizing the use of available high-quality imported State Water Project (SWP) supplies and (2) manage salts and nutrients from all sources on a sustainable basis to ensure attainment of water quality objectives and compliance with the Regional Water Quality Control Plans (Basin Plans). For the SNMP, the Este Subarea was divided into three analysis subregions to address variable groundwater quality and salt and nutrient loading conditions. The Project is located in the Lucerne Valley (north) subregion. Current average ambient total dissolved solids (TDS) concentrations in Lucerne Valley (north) are above 1,500 milligrams per liter (mg/L) due to natural mineralization and dry lake bed evaporation.

The DRECP (CEC, 2014) purpose is to protect and conserve desert ecosystems while allowing the development of renewable energy projects. It is focused on the desert regions and adjacent lands of seven California counties, including San Bernardino. The report identifies typical groundwater impacts such as depletion of groundwater levels and storage, water quality impacts, and interference with recharge. Potential mitigation measures to address these impacts include:

- groundwater level, quality, and subsidence monitoring, mitigation, and reporting plans
- water supply assessments
- metering devices to measure and report water use
- compensating impacted well owners
- monitoring potentially impacted vegetation, springs, and wildlife.

San Bernardino County regulates renewable energy generation facilities through an ordinance passed on December 2013 (Chapter 84.29 of the Development Code). The ordinance establishes additional findings for approval of commercial solar energy generation facilities to protect natural resources, safeguard existing and future rural residential areas, and protect and promote a vibrant tourist economy. The San Bernardino Partnership for Renewable Energy & Conservation (SPARC) is currently creating a Renewable Energy Element for the County General Plan.

3. PROJECT DESCRIPTION AND WATER DEMANDS

This section addresses water demands for the existing property and presents water demand estimates for the proposed solar facility. The next section, Section 4, *Este Subarea Water Demand*, presents the area's current and projected demands.

3.1. CURRENT SITE WATER USE

The Project site is currently vacant, and zero water use is assumed.

3.2. PROPOSED PROJECT WATER DEMAND

The proposed project water demand comprises two main uses: construction and operations and maintenance. **Table 1** summarizes the project water demands (all tables and maps are presented at the end of this report).

Construction water use is dependent upon many factors including soil characteristics, site location, weather conditions, type of panels, installation method, and site area, among other things. Construction water use at other solar sites in the Southern California region range from 1.17 MW/AF (Watearth, 2019) to 4.67 MW/AF (URS, 2016). The range is due to the size of facility, site specific soils, and local regulations on dust control.

A study, entitled *Water Use and Supply Concerns for Utility-Scale Solar Projects in the Southwestern United States* (Sandia, 2013), has compiled average peak construction water use estimates for PV projects over 100 MW in Imperial and Riverside counties. The peak averages were 2.251 AF/MW for dust control and 0.0099 AF/MW (2.26 AF/MW total) for potable supply during construction.

Avangrid has estimated the 200 MW project would use a total of 258 AF over 18 months for construction. This would result in an AF/WM ratio of 1.29, within the range of other solar projects. However, for the purposes of this WSA, the average construction water demand from the Sandia (2013) study (2.26 AF/MW or 452 AF over 18 months) was used to provide a conservative estimate.

The Sandia (2013) study also compiled **operation and maintenance** water use for PV facilities in Imperial and Riverside counties with an average of 0.0496 AF/year of water needed for module washing. Typical water use for panel cleaning of utility scale photovoltaic solar facilities can vary greatly, ranging from 0 - 33 gallons per MW-hour (MWh) of electricity generated (Frisvold and Marquez, 2013). Assuming a conversion of 1,700 MWh of electricity per MW capacity equates to about 0 - 0.17 AF/MW. For the DRECP Draft EIR/EIS (CEC, 2014), a general water demand of 0.05 AFY/MW was assumed for PV facilities, but the report stated that regular water cleaning may not be required.

Avangrid has estimated a total of 0.6 AFY for O&M water use for potable use at the facility and for panel washing. The Avangrid estimate of 0.6 AFY for potable use is reasonable and assumed for this analysis. Given the above, total O&M water use is estimated to be 0.6 AFY.

4. ESTE SUBAREA WATER DEMAND

This section summarizes the current and projected water demands for the Este Subarea of the Mojave River Groundwater Basin. The subsections below describe the factors affecting total water demand, including population and climate under normal climatic conditions and during droughts.

4.1. CLIMATE

Climate has a significant influence on water demand on a seasonal and annual basis. A regional network of weather stations spans the MWA area. Temperature, precipitation, and evaporation data are routinely evaluated to assess the contribution of runoff from precipitation in the San Bernardino Mountains and on valley floor and the evaporative potential. Mountain runoff contributes substantially more to the recharge of the Mojave River Groundwater Basin than precipitation falling directly on the valley floor (Tully and Young, 2021).

Average annual precipitation in the San Bernardino Mountains is approximately 41 inches but has ranged from a high of 98 inches to 6 inches, reflecting the recent drought (Tully and Young, 2021).

Precipitation on the valley floor is much lower but less variable and averages approximately 5 to 7 inches per year for the Mojave Basin Area. **Table 2** summarizes representative climate data for the Lucerne Valley area, including average monthly and annual rainfall, temperature, and evapotranspiration (ETo). Rainfall averages 5.80 inches per year.

Climate change affects global and local climate patterns. Potential climate changes that may affect the Mojave Basin Area include (Tully and Young, 2021):

- Higher temperatures and heat waves that increase water demand
- Decrease in precipitation
- More intense individual storm events
- Increased flooding
- Less precipitation falling as snowfall
- Change in runoff patterns that can affect water storage planning
- Increased evaporation will create a generally drier climate
- Increased burn area from wildfires
- Groundwater basins likely to receive less replenishment.

The annual Watermaster reports review the state of the Este Subarea on an annual basis and production reductions could be imposed if climate change impacts on supply are indicated in the Este Subarea.

4.2. POPULATION

Current and projected population estimates are shown in **Table 3a**. These estimates are from the MWA and reflect the entire MWA service area (Tully and Young, 2021), which is illustrated in **Figure 1** (Vicinity Map). Previous reports projected population for each subbasin. **Table 3b** shows the expected population for the Este subbasin from the IRWMP, as shown in **Figure 2** (Subarea Map) (Kennedy/Jenks, 2014).

4.3. CURRENT AND PROJECTED WATER DEMAND

Groundwater demands and groundwater production are considered equivalent in the Este Subarea because groundwater pumping is the source of supply to residential, commercial/industrial, and agriculture in the subarea. Current and projected water demands in the Este Subarea were obtained from Mojave Water Agency's Demand Forecast Model updated for the IRWMP (Kennedy/Jenks, 2014). Water demands in the Este Subarea were broken down into five main categories: municipal production, minimal producers, industrial, agricultural, and other. Annual demands are summarized in **Table 4** in 5-year increments to 2040. In the 2014 IRWMP, demand is estimated to increase from 6,892 AFY in 2015 to 7,805 AFY by 2040. This is a 13.2 percent increase over the 25-year period or about 0.53 percent per year.

The municipal production category is pumping by municipal water purveyors in the Este Subarea and was estimated to be around 823 AFY in 2015. The 2020 UWMP did not break down project water demand by subbasin. In the 2014 IRWMP, municipal water use was projected to increase to 1,179 AFY by 2040, a 43 percent increase from 2015 with an average annual increase of about 1.7 percent. Most of this municipal pumping is for single family residences.

The minimal producer category represents individuals pumping less than 10 AFY. These producers are not part of the Stipulated Judgment and not required to decrease or ramp down their water use to the FPA percentage. The 2014 IRWMP projected minimal producer production to increase from 1,012 AFY in 2015 to 1,569 AFY in 2040. This is a 55 percent increase over the 25-year period or about a 2.2 percent increase per year.

Industry production was assumed to remain steady at 857 AFY between 2015 and 2040. This water is mainly used for sand and cement mining/processing.

Agriculture usage was also assumed to remain steady at 4,100 AFY between 2015 and 2040. Agriculture in the Este Subarea consists mainly of alfalfa, grains, orchard, row crops, and pasture. The Other category consists of recreational water use such as park irrigation and was estimated at 100 AFY for the entire period.

5. ESTE SUBAREA WATER SUPPLY

The Stagecoach project is located in the Lucerne Valley (north) portion of the Este Subarea of the adjudicated Mojave Basin Area (MBA) Watershed (see **Figure 2**).

Due to long-term overdraft of groundwater, water production rights within the MBA Watershed were adjudicated in 1996. As defined in the Mojave Basin Area Adjudication (Judgment), the Mojave Basin Area and associated groundwater basins were divided into five management subareas: Este, Oeste, Alto, Centro, and Baja. Each subarea has a unique set of hydrologic and hydrogeologic conditions and land and water demand profiles. The subareas are hydraulically inter-related to varying degrees based on their respective location to the Mojave River and the distribution of water use in the basin.

5.1. GEOLOGY AND GROUNDWATER BASINS

The regional geology of the Mojave basin area has been described in previous studies (DWR, 1963; DWR, 1967; Hardt, 1971; Lewis, 1972; Stamos, et al., 2001; Stamos, et al., 2004). The local geology is characterized by numerous geologic faults and by sedimentary alluvial basins bordered by igneous and metamorphic rocks in the mountain ranges and uplands. These rocks, considered non-water bearing (DWR, 1967), also underlie the valley floor but are overlain by Quaternary deposits that generally comprise water-bearing formations (DWR, 1967). Unconsolidated alluvial fill deposits of late Pliocene to Holocene age compose the aquifer system in the Este Subarea (Stamos et al., 2001).

Lucerne Valley (north) is characterized by undifferentiated alluvial deposits that occur as a thin veneer over older deposits. These undifferentiated alluvial deposits primarily occur above the water table and thus are only partially saturated. A groundwater investigation of the Project site by Geo-Logic Associates (Geo-Logic 2021) indicates the occurrence of local groundwater primarily in fractured bedrock and the possible existence of nearby faults. Faults may affect local groundwater occurrence and flow.

5.1.1. Groundwater Levels and Flow

Groundwater in the Lucerne Valley (north) is derived from limited natural recharge and subsurface inflow from surrounding mountains. Groundwater flows generally from the basin margins towards the center of the basin to the south, where it discharges to a pumping depression east of Lucerne Dry Lake and to Lucerne Dry Lake, where water is lost to the atmosphere via evaporation.

Water levels have remained relatively stable within the Este Subarea over the past 20 years. Water level hydrographs for four wells located near the Project site (6N/1W-5J1, 6N/1W-27B1, 6N/1W-27R1 and 6N/1W-36J1) are shown on **Figure 3**. These wells are measured by the United States Geological Survey (USGS). As shown in **Figure 3**, hydrographs indicate groundwater levels are locally stable.

5.1.2. Groundwater Quality

Groundwater quality monitoring in the region is conducted by MWA and the USGS through their cooperative water resources program. MWA also collects water quality data from special/scientific studies conducted in the region.

The Mojave SNMP characterized groundwater quality across the Lucerne Valley with a focus on TDS and nitrate. Elevated TDS concentrations (exceeding 1,500 and 2,000 mg/L) are observed in the vicinity of the Lucerne Dry Lake and to the north. The high TDS levels reflect natural mineralization along groundwater flow paths and evapo-concentration effects near Lucerne Dry Lake. Nitrate concentrations in the Lucerne Valley (north) average 5.6 mg/L, significantly below the primary maximum contaminant level (MCL) of 45 mg/L for nitrate (Kennedy/Jenks and Todd, 2015).

5.2. CURRENT AND PROJECTED WATER SUPPLY

Water supplies in the Este Subarea are summarized in **Table 5**. The Este Subarea supply includes three main sources: natural supply (ungaged inflow minus subsurface outflow), return flows (which includes irrigation and septic returns) and wastewater imports (BBAWRA infiltration ponds). WSAs must examine the projected demand and supply of the groundwater basin as a whole. While the supplies for the Este subarea include wastewater imports, there are currently no plans to use wastewater imports as supply for the project.

Data for **Table 5** was derived from the updated Demand Forecast Model including return flows. Return flows are estimated to gradually increase over time (about 0.7 percent per year for the 2015 to 2040 time period), reflecting the gradual increase in local population and associated water usage (Kennedy/Jenks, 2014). Data for individual subareas were not available in the 2020 UWMP.

Average ungaged inflow is estimated to be 1,700 AFY. The subsurface outflow estimate was revised in 2015 from 825 AFY to 200 AFY based on land use conditions and the outflow remains at 200 AFY in the most recent annual report (Mojave Basin Area Watermaster, 2021).

Big Bear Area Wastewater Regional Agency (BBAWRA) discharges their undisinfected secondary treated effluent to a site in Lucerne Valley. The effluent outfall pipeline extends north along Camp Rock Road, about six miles east of the community of Lucerne Valley. Through an agreement with BBAWRA, a nearby farmer uses the water for spray irrigation to grow alfalfa to feed horses, sheep, and other livestock. According to the updated Demand Forecast Model, imported BBARWA water is anticipated to increase 1 percent per year over the 2015 to 2040 time period. However, because the change in future BBAWRA imports is unknown at this time, this Report will use the established IRWMP updated Demand Forecast Model numbers but be cognizant that the BBAWRA imports may not be as great as the future projections presented in **Table 6**. As noted above, BBWARA is a supply source for the Este Subarea but not currently being considered for project supply.

5.2.1. Adjudication Status

As described in Section 2.2, the Mojave Groundwater Basin is adjudicated and therefore governed by the Judgment. The Physical Solution, laid out by the Judgment, is in place to ensure the basin water resources are sufficient for all parties.

As part of the Physical Solution, Base Annual Production (BAP) rights were assigned to each producer using 10 AFY or more based on 1986-1990 production. To address overdraft and maintain proper water balances within each subarea, a decreasing Free Production Allowance (FPA) was determined for each subarea for the first five water years (1993-94 to 1997-98). The FPA in the Este Subarea has decreased from 100 to 80 percent.

Exhibit H of the Judgment provides that in the event that the FPA exceeds the estimated Production Safe Yield (PSY) by five percent or more (of the Subarea BAP), Watermaster shall recommend (if necessary) a reduction in FPA equal to a full five percent of the aggregate Subarea BAP.

Table 6 shows the BAP, 2020-21 FPA, PSY, verified 2019-2020 production, and total production (includes estimated minimal producers water use) for the Este Subarea. In the most recent Annual Report, the FPA was proposed to be 65 percent of the BAP. In other words, users are allowed to pump up to 65 percent of their base allocation (Mojave Basin Area Watermaster, 2021). Appendix B of the Watermaster Report lists 61 producers in the Este Subarea. The total 2020-21 unused FPA was 14,227 AF in the Este Subbasin. The unused FPA is equal to the total FPA minus the total verified production but is not greater than the sum of the base FPA and the 2019-20 FPA transfers for each producer. Unused FPAs range from 0 to 1,651 AF and only 10 of the 61 Este Subarea producers used all their FPA. This indicates that water would be available for purchase from one or more of the producers in the Este Subarea for the Stagecoach Project.

While the project is in the Este subbasin, a potential source of water supply may come from the Centro subarea. **Table 6** shows the BAP, 2020-21 FPA, PSY, verified 2019-2020 production, and total production for the Centro Subarea. In the most recent Annual Report, the Centro FPA was proposed to be 65 percent of the BAP (Mojave Basin Area Watermaster, 2021) from over 70 producers in the Centro Subarea. The total 2020-21 unused FPA was 34,592 AF in the Centro Subbasin. This indicates that water would be available for purchase from one or more of the producers in the Centro Subarea for the Stagecoach Project.

5.3. WATER SUPPLY IN NORMAL, SINGLE-DRY YEAR, AND MULTIPLE-DRY YEARS

The net average annual water supply estimate for the Este Subarea has been developed for the annual reports (Mojave Basin Area Watermaster 2021). Normal year natural supply is estimated to be 1,500 AFY which is the average subsurface inflow (1,700 AFY) minus the subsurface outflow (200 AFY).

For the estimation of the average annual Este Subarea water supply, single-dry year and multiple-dry year supply are the same as a normal year supply. This reflects the fact that the natural supply is net subsurface inflow. Subsurface inflow (unlike inflow from rainfall or surface water) is not responsive to the weather conditions of wet or dry years, but represents the slow subsurface migration of groundwater from across the basin and watershed, which is cumulated over many years. The long-term average includes single-year and multiple-year dry periods as well as wet years. Accordingly, the annual reports use a long-term average that accounts for hydrologic variation and incorporates all year types (wet, normal, and dry years).

6. PROJECT WATER SUPPLY OPTIONS

There are several water supply options, or combinations of options, available to the Project. They fall into two main source options: pump onsite well and/or purchase water from an existing water rights holder.

6.1. ONSITE WELL

A new onsite well could be used to supply water to the Project. Use of onsite well water falls into one of the following two categories: 1) Water rights are purchased for the well and well production falls under the Judgment (stipulated party) or 2) The onsite well produces less than 10 AFY (minimal producer), and therefore it is not subject to the Judgment as a de minimis user.

Geo-Logic Associates investigated the possibility of an onsite well for the project and documented their findings in a memorandum "Groundwater Resource Feasibility Study for Proposed Stagecoach Solar Facility" (Geo-Logic 2021). They conducted a well survey of the surrounding parcels to compile a list of wells and their production capacities. Production capacities ranged from 8 to 22 gallons per minute (gpm), which would produce 13 to 35 AFY, assuming fulltime pumping of the wells. Well operations would likely involve pumping for a lesser number of hours per day (for example to maintain water levels in a storage tank), but this provides an estimate of supply. Given the local geology, Geo-Logic Associates noted an onsite well would likely be drilled into underlying fractured bedrock and the actual capacity is uncertain. Geo-Logic Associates recommended test hole drilling with geophysical surveying to ensure that a new onsite well could provide adequate supply for operations and maintenance. Geo-Logic also noted that construction supply could be purchased from an existing water rights holder.

While unlikely given the geology of the site, an onsite well could be considered as a source of supply greater than the de minimis level of 10 AFY. However, additional water rights would need to be acquired. However, it is not clear if there are available rights to be purchased or their cost, which could vary based on availability. Annual reporting to the Watermaster would be required. The water rights (established by the MWA as its Free Production Allowance, or FPA) would also be subject to future ramp down requirements.

An onsite well could be used to provide the estimated annual maintenance water (0.60 AFY) during project operation. This estimated demand is well below the 10 AFY de minimis producer category so would not be subject to the Judgment. Minimal producer use is not subject to reporting or ramp down requirements. The only costs associated with this option would be well maintenance and electrical costs. Additional water would need to be purchased for construction uses.

6.2. PURCHASE/TRANSFER FROM EXISTING WATER RIGHTS HOLDER

Water could be purchased from an existing water rights holder in the Este Subarea. The cost would be less than the cost of purchasing water rights. There appears to be unused FPA that the Project applicant could purchase for a short-term (18-month) construction use and for ongoing cleaning of the panels during operation. There would be no limit on the amount of water used provided a supplier can be found. Agreements could be made with one or several water rights holders and the amounts could be adjusted to match the Project's needs.

Golden State Water Company (GSWC) has indicated that they would be able to supply water to the project during the construction phase. The service would be considered a Hydrant meter, a temporary and interruptible form of water service. GSWC is a producer in the Este Subbasin and has an allocation of 134 AFY (reduced from their 178 AFY BAP). This allocation would not be sufficient to serve the project and GSWC would be required to purchase replacement water from MWA. However, in Centro subbasin, GSWC has a FPA of 10,806 AFY (reduced from their 14,407 AFY BAP), respectively. In addition, in Centro Subbasin GSWC had an additional 11,256 AFY carry-over from last year.

In other similar water sales, MWA has required the water rights holder to replace water at a 2:1 ratio. In other words, payment is required for twice as much water as needed; this allows MWA to secure water supply for recharge and to ensure that the Judgment is made whole. Because water may be transferred from Centro to Este Subareas, additional replacement water and payments may be required.

As indicated in the Project Demand section 3, it is estimated (based on construction demands for similarly sized projects) that construction water demand could be 450 AFY. Replacement water purchased from MWA would be 900 AFY at a minimum. However, GSWC does have unused FPA in the Centro Subarea. GSWC, MWA, and the project proponent would have to work out a legal agreement to transfer water allowance from one subbasin to other and to purchase the required replacement water.

This proposed purchase is a sufficient supply, assuming successful negotiation and payment as described above. The environmental effects of bringing this supply to the project area, via water trucks, is considered in the EIR.

7. COMPARISON OF SUPPLY AND DEMAND

The WSA must compare supply and demand for the groundwater basin where the project is located. **Tables 7, 8 and 9** show water supply and demand projections for the Este Subarea in five-year increments to 2040 for normal, single-dry and multiple-dry years, respectively. Between 2015 and 2040 the supply is expected to slightly exceed demand (2 to 5 percent) based on **Table 4** growth and use assumptions and supply assumptions in **Table 5**. As discussed in Section 5.3, the annual reports use a long-term average for groundwater supply (subsurface inflow) that incorporates the hydrologic variation of all year types (wet, normal, and dry years). Single-dry year and multiple-dry year supply are assumed to be the same as a normal year supply because the long-term average includes single year and multiple year dry periods. Demands in dry years were also assumed to be the same as normal years.

The Lucerne Valley receives very little rainfall (5.8 inches annually) and consequently demands are typically not linked to rainfall. In addition, supply and demand alone does not govern the sufficiency of supply in the Este Subarea. Because the Subarea is part of the adjudicated Mojave Groundwater Basin it is governed by the Judgment. The Physical Solution, laid out by the Judgment, is in place to ensure the basin water resources are sufficient for all parties. As long as the selected water supply for the project is designed to comply with the Physical Solution, it is considered to be sufficient.

8. CONCLUSIONS

Findings of this WSA are summarized below.

- The Stagecoach Solar Project is in Lucerne Valley in southwestern San Bernardino County about 15 miles south of Barstow.
- The Project would be developed on 1,750 acres of an undeveloped site.
- The 200 MW PV facility will require about 450 AF of water for construction over an 18-month period and less than 0.60 AFY of water for operations.
- A WSA as per SB610 is not required because PV energy generation facilities with an annual water demand no more than 75 AFY are exempt.
- The Project area overlies an adjudicated basin (Mojave Basin Area) and is within the Mojave Water Agency service area.
- Water source options for the Project include local groundwater from Golden State Water Company from either the Este Subarea or Centro Subbasin of the Mojave River Groundwater Basin.
- In general, water levels have been stable in the Este Subarea.
- An onsite well could supply annual water needs but water rights would need to be purchased if the onsite well were used to supply construction water because more than 10 AFY is needed.
- Unused FPA (production rights) exist in the Este Subarea, which indicates that water would be available for purchase from one or more of the producers in the Este Subarea for the Stagecoach Solar Project.
- Sufficient water supplies are available to serve the Project's one time construction needs from existing water rights provided successful negotiation with GSWC to serve the project.
- Sufficient water supplies are available to serve the Project's annual operational water needs from existing water rights or as a minimal producer.

Contingent upon successful negotiations among the project proponent, Golden State Water Company, and Mojave Basin Area Watermaster, sufficient supplies are available to supply the Project.

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TABLES

Table 1
Project Water Demands
Stagecoach Solar Project

Construction	Dust Control Construction			Source
Solar Projects	**AF**	**MW**	**AF/MW**	
Stagecoach	**258**	**200**	**1.29**	**from Project Applicant**
Big Beau	150	128	1.17	Watearth, 2019
Desert Quarzite Solar Project Riverside	1400	300	4.67	URS, 2016
Average Southern California Utility-Scale Solar Projects			2.26	Sandia 2013

Operations & Maintenance	Washing	Potable Supply	Total	Source
Solar Projects	**AFY**			
Stagecoach	**-**	**0.6**	**0.6**	**from Project Applicant**
Big Beau	11.1	10.7	21.8	Watearth, 2019
Desert Quarzite Solar Project Riverside	18.0		18.0	
Average Southern California Utility-Scale Solar Projects	9.9	0.3	10.2	Sandia 2013

Table 2
Climate Data

	Average Rainfall (inches)	Average ETo (inches)	Average Temperature (°F)
January	1.00	2.24	46
February	1.08	2.94	48.70
March	0.77	4.87	53.60
April	0.30	6.42	58.8
May	0.13	7.97	66.20
June	0.04	9.09	74.5
July	0.19	9.57	80.7
August	0.19	8.88	80.1
September	0.17	6.6	74.1
October	0.35	4.41	63.4
November	0.44	2.78	52.6
December	1.14	2	45
Average Calendar Year Total	**5.80**	**67.77**	**62.0**
Monthly Average	**0.48**	**5.65**	**62.0**

Source: Mojave Water Agency UWMP 2020 Public Draft

Table 3a
Population Projections

	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065
Mojave Service Area	492,319	533,170	567,855	592,849	614,931	634,934	635,017	669,424	684,247	697,603

Population estimates are from the Mojave Water Agency Population Forecast from the 2020 UWMP (Tully and Young, 2021).

Table 3b
Population Projections

	2010	2015	2020	2025	2030	2035	2040
Este Subarea Population	7,370	8,149	9,361	10,169	10,977	11,785	12,633

Population estimates are from the IRWMP Demand Forecast Model (Kennedy/Jenks, 2014). The 2040 value was extrapolated assuming a 1.4% annual growth rate.

Table 4
Groundwater Production/Demand in Este Subarea (AFY)

Water Use Categories	2010	2015	2020	2025	2030	2035	2040
Total Municipal Production[1]	700	823	872	942	1,021	1,101	1,179
Minimal Producers[2]	922	1,012	1,163	1,263	1,364	1,464	1,569
Industrial[3]	563	857	857	857	857	857	857
Agriculture[4]	3,500	4,100	4,100	4,100	4,100	4,100	4,100
Other[5]	100	100	100	100	100	100	100
Total Production/Demand[6]	**5,785**	**6,892**	**7,092**	**7,262**	**7,442**	**7,622**	**7,805**

Data from the IRWMP updated Demand Forecast Model (Kennedy/Jenks, 2014).

1. Municipal production is pumping by water purveyors.
2. Minimal producers represent entities pumping less than 10 AFY.
3. Industrial water use is mainly used for sand and cement mining/processing.
4. Agriculture consists mainly of alfalfa, grains, orchard, row crops, and pasture.
5. Other category is for recreational uses such as park irrigation.
6. Production and demand are essentially equivalent in the Este Subarea

Table 5
Water Supplies in Este Subarea (AFY)

Water Supply Source	2010	2015	2020	2025	2030	2035	2040
Net Natural Supply[1]	875	1,500	1,500	1,500	1,500	1,500	1,500
Return Flow	2,296	2,654	2,753	2,839	2,928	3,018	3,110
Wastewater Import[2]	2,759	2,905	3,052	3,199	3,345	3,492	3,642
Total Supply	**5,930**	**7,059**	**7,305**	**7,538**	**7,773**	**8,010**	**8,252**

Data from the IRWMP updated Demand Forecast Model (Kennedy/Jenks, 2014) and Mojave Basin Area Watermaster (2021).

1. Net natural supply is average ungaged inflow (1,700 AFY) minus subsurface outflow (Mojave Basin Area Watermaster, 2021).

2. Wastewater import is BBAWRA import to infiltration ponds and represents projections used for the IRWMP updated Demand Forecast Model (Kennedy/Jenks, 2014). BBAWRA is reviewing options to upgrade the treatment plant and possibly use some of the treated wastewater in the Big Bear Valley rather than export it to the Lucerne Valley. Additionally, ongoing conservation efforts may reduce future wastewater generation amounts from previous projections. Nonetheless, this Report will use the established IRWMP updated Demand Forecast Model numbers.

Table 6
Adjudication Status

	Base Annual Production (AFY)	20-21 Free Production Allowance[1] (AFY)	Production Safe Yield[2] (AFY)	Percent Difference[3]	2019-20 Verified Production (AFY)
Este Subarea	20,205	14,453	4,728	48.1%	4,227
Centro Subarea	51,030	36,214	21,088	29.6%	16,756

Data from Mojave Basin Area Watermaster Report (Mojave Basin Area Watermaster, 2021).

1. Free Production Allowance (FPA) was at 70% but is proposed to reduce to 65% of the Base Annual Production (BAP).

2. The Production Safe Yield was last updated in 2018 and is from Table 5-2 of the Mojave Basin Area Watermaster Report (Mojave Basin Area Watermaster, 2021).

3. This value represents the percent of BAP that PSY departs from FPA.

Table 7
Supply and Demand Comparison - Normal Year (AFY)

	2015	2020	2025	2030	2035	2040
Supply Totals	7,059	7,305	7,538	7,773	8,010	8,252
Demand Totals	6,892	7,092	7,262	7,442	7,622	7,805
Difference (Supply-Demand)	167	213	276	331	388	447
Difference as % of Supply	2%	3%	4%	4%	5%	5%
Difference as % of Demand	2%	3%	4%	4%	5%	6%

Data from Tables 4 and 5 - IRWMP 2014

Table 8
Supply and Demand Comparison - Single Dry Year (AFY)

	2015	2020	2025	2030	2035	2040
Supply Totals	7,059	7,305	7,538	7,773	8,010	8,252
Demand Totals	6,892	7,092	7,262	7,442	7,622	7,805
Difference (Supply-Demand)	167	213	276	331	388	447
Difference as % of Supply	2%	3%	4%	4%	5%	5%
Difference as % of Demand	2%	3%	4%	4%	5%	6%

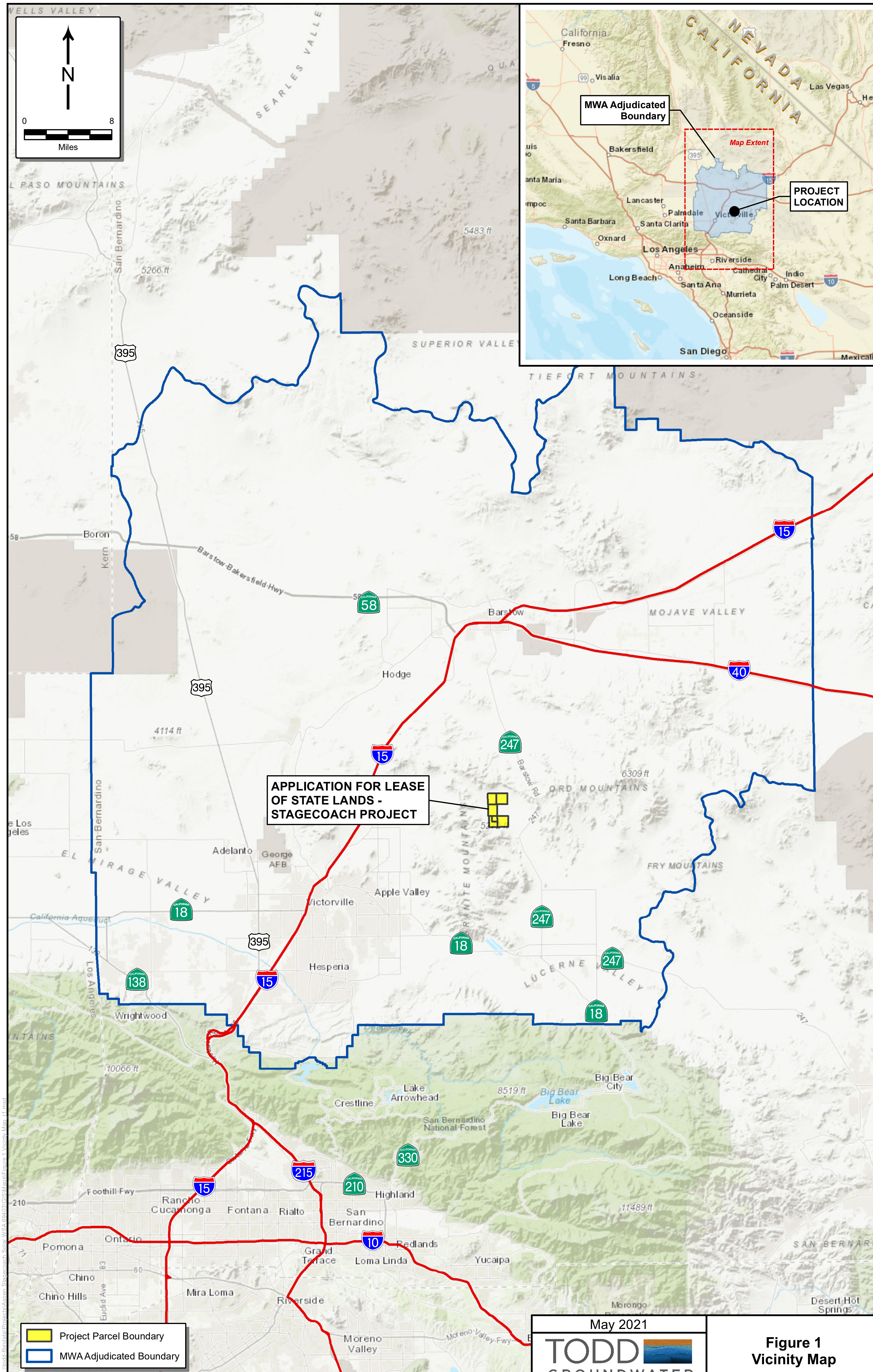
Data from Tables 4 and 5 - IRWMP 2014

Table 9
Supply and Demand Comparison - Multiple Dry Years (AFY)

	2015	2020	2025	2030	2035	2040
Supply Totals	7,059	7,305	7,538	7,773	8,010	8,252
Demand Totals	6,892	7,092	7,262	7,442	7,622	7,805
Difference (Supply-Demand)	167	213	276	331	388	447
Difference as % of Supply	2%	3%	4%	4%	5%	5%
Difference as % of Demand	2%	3%	4%	4%	5%	6%

Data from Tables 4 and 5 - IRWMP 2014

FIGURES



May 2021

TODD GROUNDWATER

Figure 1
Vicinity Map

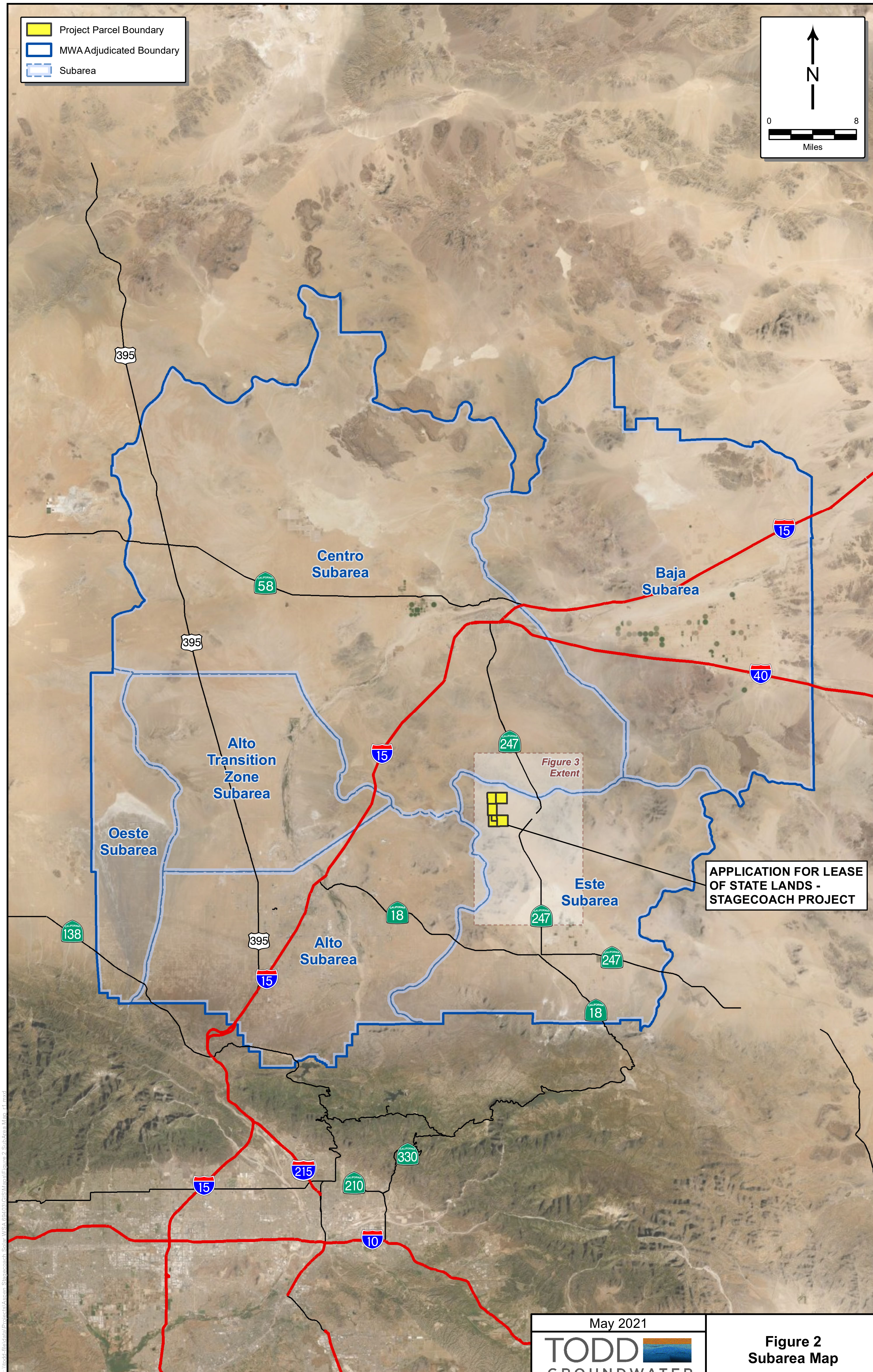


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Figure 2
Subarea Map

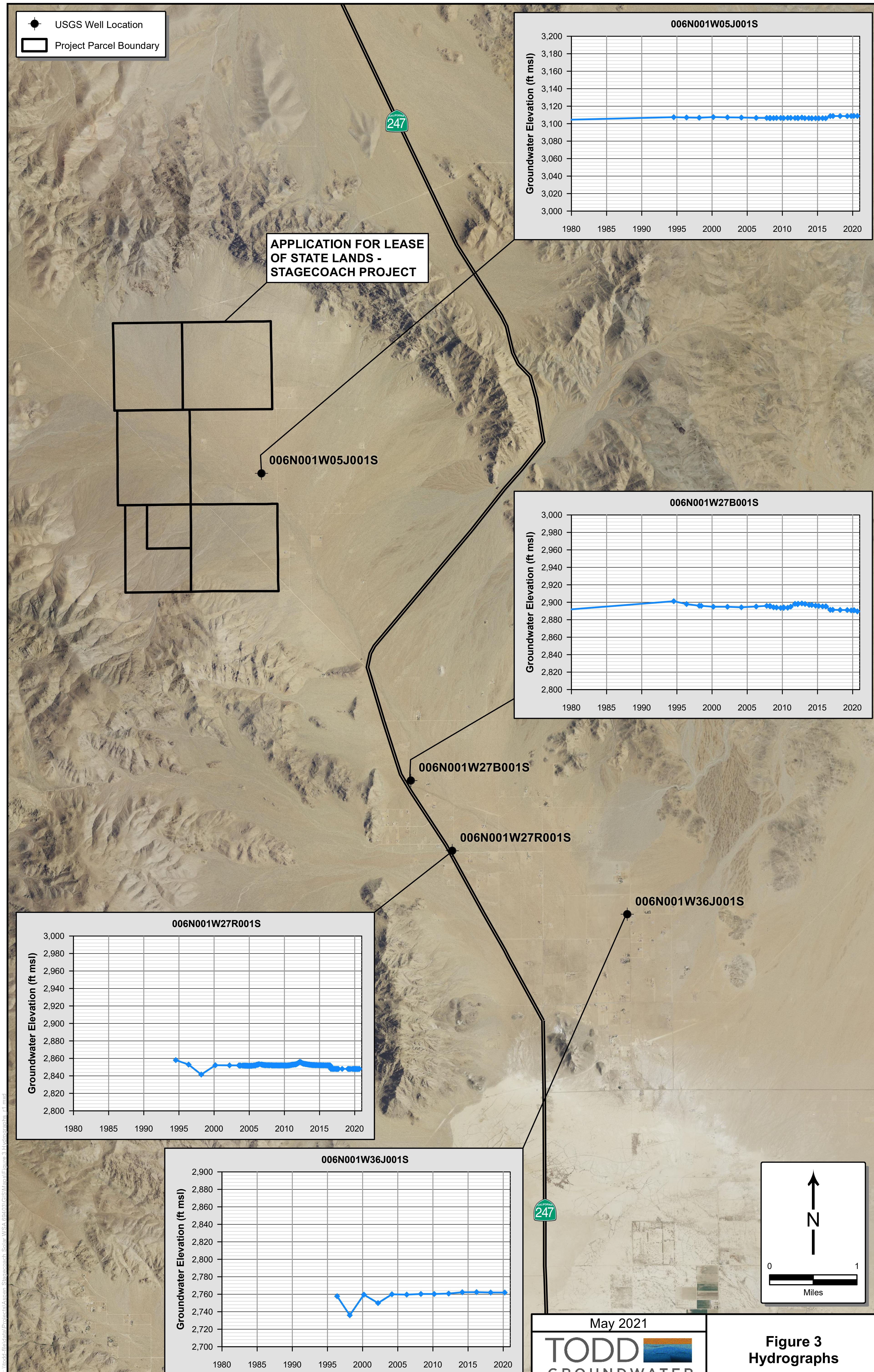

Figure 3
Hydrographs