Mound Basin
Groundwater Sustainability Plan

MoundBasin
GROUNDWATER SUSTAINABILITY AGENCY

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Mound Basin Groundwater Sustainability Plan

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MoundBasin
GROUNDWATER SUSTAINABILITY AGENCY

Mound Basin Groundwater Sustainability Agency

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Executive Summary [§354.4(a)]

§354.4 General Information. *Each Plan shall include the following general information:*
(a) *An executive summary written in plain language that provides an overview of the Plan and description of groundwater conditions in the basin.*

Introduction

The State of California enacted the Sustainable Groundwater Management Act (SGMA), effective January 1, 2015, to mandate comprehensive sustainable groundwater resources management. SGMA provides a statewide framework for groundwater management by locally formed Groundwater Sustainability Agencies (GSAs). The Mound Basin Groundwater Sustainability Agency (MBGSA) was formed in 2017 to satisfy the requirement for a GSA to fully cover the Mound Basin (DWR Basin 4-004.03) (Basin).

MBGSA was formed pursuant to a joint exercise of powers agreement (JPA) between three local public agencies overlying the Basin: the City of San Buenaventura (more commonly known as the City of Ventura), the County of Ventura, and the United Water Conservation District (United) (Figure 2.1-01). The City of San Buenaventura is a local municipality that exercises water supply, water management, and land use authority within the city's boundaries. The County of Ventura exercises water management and land use authority on a portion of the land overlying the Mound Basin. See Figure 2.1-03 for land use information. United was formed in 1950 under the State of California's Water Conservation District Law of 1931 and is organized as a governmental special district. United does not produce water from the Basin but is authorized to engage in groundwater replenishment of the Basin.

MBGSA is governed by a five-member board comprising one director appointed by each member public agency (City of San Buenaventura, the County of Ventura, and United) and two stakeholder directors representing agricultural and environmental interests. Except for the two industrial well owners, all groundwater users in the Basin have direct representation in the SGMA process by virtue of a director on the MBGSA Board of Directors. MBGSA was designated as the exclusive GSA for the Basin by the State on September 30, 2017. Following submittal of an initial notification on September 17, 2018, MBGSA developed this Groundwater Sustainability Plan (GSP) to comply with SGMA's statutory and regulatory requirements and initiated planning by engaging with stakeholders and holding public meetings pursuant to an adopted Stakeholder Engagement Plan.

The goal of this GSP is to sustainably manage the groundwater resources of the Mound Basin for the benefit of current and anticipated future beneficial users of groundwater and the welfare of the general public who rely directly or indirectly on groundwater. This GSP describes the approach to achieve and maintain a sustainable groundwater resource free of undesirable results pursuant to the SGMA, while establishing long-term reliability no later than 20 years from GSP adoption through implementation.

The content of this GSP includes administrative information, description of the Basin setting, development of quantitative sustainable management criteria (SMC) that consider the interests of all beneficial uses and users of groundwater, identification of projects and management actions and monitoring networks that will ensure the Basin is demonstrably managed in a sustainable manner no later than the 20-year sustainability timeframe (2042) and for the duration of the entire 50-year planning and implementation horizon (2072).

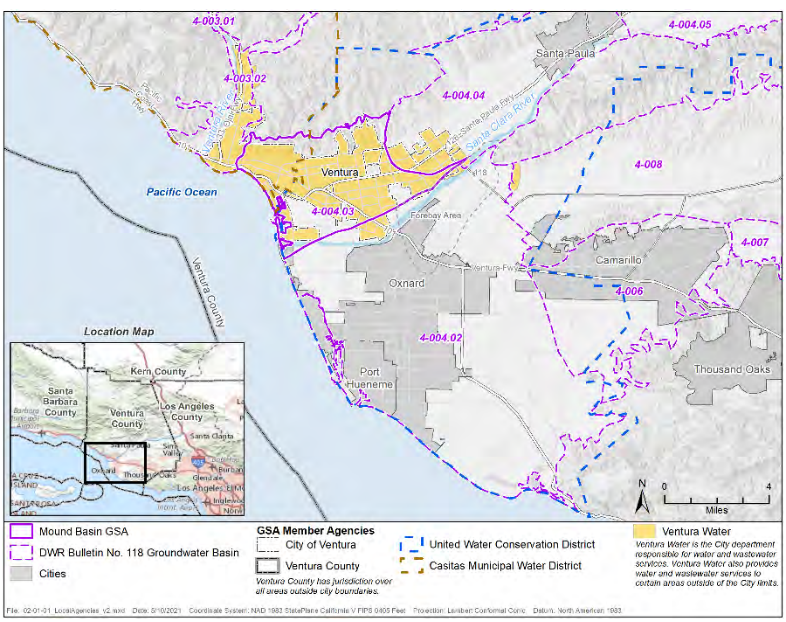
This GSP is generally organized following California Department of Water Resources (DWR) guidance documents (DWR, 2016a):

- Section 1 - Introduction to Plan Contents
- Section 2 - Administrative Information
- Section 3 - Basin Setting
- Section 4 - Sustainable Management Criteria
- Section 5 - Monitoring Networks
- Section 6 - Projects and Management Actions
- Section 7 - GSP Implementation
- Section 8 - References and Technical Studies

ES-1. Plan Area, Land Use, and Water Sources.

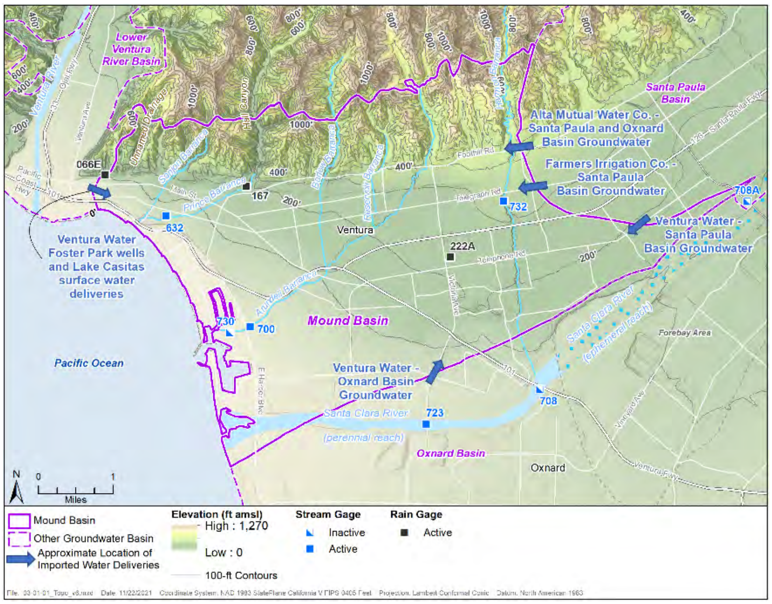
The Mound Basin is in western Ventura County along the Pacific coastline, including the City of Ventura (officially San Buenaventura). The Basin is within the Santa Clara River Valley watershed and includes the Santa Clara River estuary and floodplain at the southwestern corner, where the river discharges into the Pacific Ocean.

The geographic area covered by this GSP and managed by MBGSA includes the entire Mound Basin (DWR Basin No. 4-004.03), as defined by DWR Bulletin No. 118, "California's Groundwater," Update 2020 (DWR, 2021a). Adjacent basins are Oxnard Subbasin (No. 4-004.02) to the south, Santa Paula Subbasin (No. 4-004.04) to the east, and Lower Ventura River Subbasin (4-003.02) to the west.



Land use in the Basin is dominated by developed areas of the City of Ventura, including low-density residential, commercial, public/institutional, and industrial land use designations. Agricultural land use occupies three separate areas of farmland in the eastern and southwestern portions of the Basin, and open space covers the remaining upland areas in the northern portion of the Basin. The principal land use planning agencies in the Basin include the City of Ventura (within the City limits) and County of Ventura (unincorporated areas outside of the City limits).

The beneficial uses of groundwater extracted from the principal aquifers of Mound Basin include municipal, industrial, and agricultural water supply corresponding to the land use categories above. There are no active or recently active domestic wells in the Basin. Beneficial uses for the shallow, non-principal groundwater include the groundwater-dependent ecosystem (GDE) associated with groundwater in the Shallow Alluvial Deposits and instream flow uses in interconnected reaches of the Santa Clara River and estuary (interconnected with groundwater in the Shallow Alluvial Deposits). However, these beneficial uses are not impacted by groundwater extraction because there is no groundwater extraction from the Shallow Alluvial Deposits and groundwater extraction from principal aquifers (Mugu and Hueneme aquifers) does not materially influence shallow groundwater levels or surface water flows (see Appendix G for explanation).



The beneficial users for the principal aquifers of Mound Basin include the City of Ventura, industrial users (two as of 2021), and agricultural users (22 active wells as of 2021). There are currently no active domestic well users within the Basin or private water companies; drinking water supply within the Basin is provided exclusively by the City of Ventura.

Other sources of water supply for the Basin include groundwater extracted from City of Ventura wells located in the adjacent Santa Paula and Oxnard Basins and from the Upper Ventura River Basin (not an immediately adjacent basin), and surface water imported from the Ventura River Watershed, which is purchased from Casitas Municipal Water District (MWD). Although Mound Basin groundwater is an important source of water supply for the communities located within the Basin, the communities are not considered to be exclusively dependent on Mound Basin groundwater because it is only one component of the City's water supply portfolio. In contrast, agricultural beneficial users are heavily dependent on groundwater extracted from the Mound Basin as they currently do not have an alternative water supply.

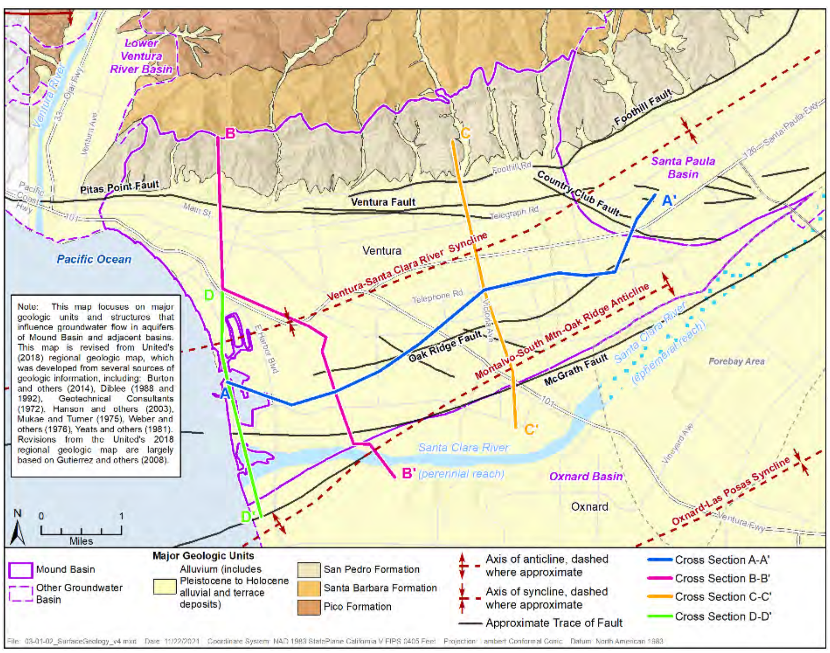
ES-2. Basin Setting and Groundwater Conditions

The topography of Mound Basin consists largely of gently south-sloping coastal plain, coastal and alluvial terraces, and alluvial fans. Hills rising to approximately 1,000 feet above mean sea level (ft msl) are present along the northern margin of the Basin in which one of the principal aquifers of the Basin outcrops and is recharged. Several small perennial stream channels originate in the canyons above the Basin and trend south and southwest within the Basin, either discharging into the Santa Clara River to the south or the Pacific Ocean to the west.

The Mound Basin is within the tectonically active Transverse Ranges geomorphic province of California, characterized by mountain ranges and valleys with an east-west orientation. Structurally, Mound Basin occurs within an elongate, complex syncline referred to as the Ventura structural basin, which trends east to west (Yeats et al., 1981). Near the coast, sediments were deposited on a wide delta complex that formed at the terminus of the Santa Clara River, with a total stratigraphic thickness reportedly exceeding 55,000 ft (Sylvester and Brown, 1988).

The geologic units (strata) in the Basin which contain groundwater include (from youngest/shallowest to oldest/deepest):

- Recent (active) stream-channel deposits along the present course of the Santa Clara River and its tributaries;
- Holocene-age alluvial fan deposits, which cover most of the Mound Basin surface;
- Stream terrace deposits adjacent to the Santa Clara River;
- Undifferentiated older alluvium of Pleistocene age; and
- Semi-consolidated sand, gravel, and clay deposits of the San Pedro Formation of late Pleistocene age.



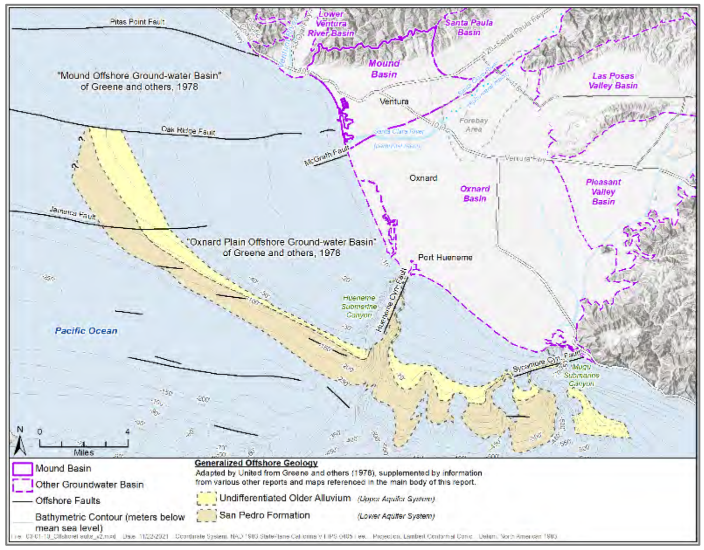
Structurally, the Mound Basin is generally bounded on the east by the Country Club Fault system, which offsets the aquifers and impedes groundwater flow from the Santa Paula Basin into the Mound Basin. To the northwest, the Basin boundary is the hydraulic divide between Mound Basin and Lower Ventura River Subbasin.

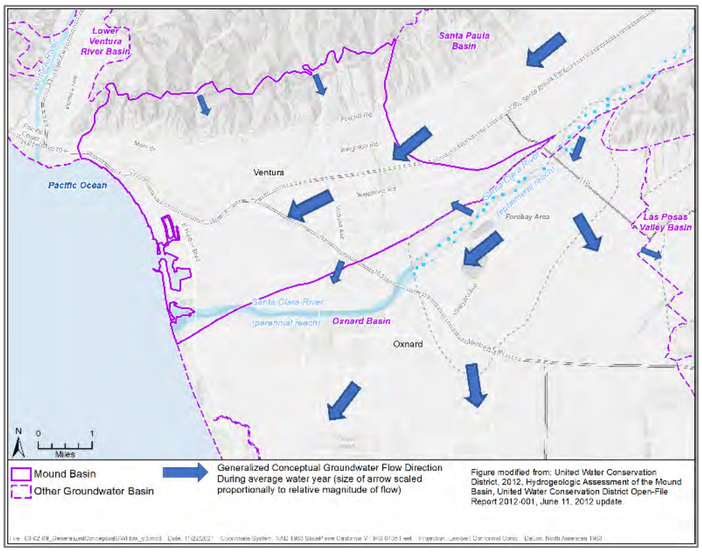
The western boundary is the Pacific Ocean shoreline; however, the primary aquifers crop out on the continental shelf approximately 10 miles offshore. The northern boundary is defined by the contact of the San Pedro Formation (the deepest freshwater-bearing formation in the Basin) with the underlying Santa Barbara Formation. The southern boundary is approximately aligned with the axis of the Montalvo-South Mountain-Oak Ridge Anticline and the McGrath Fault. The bottom of the Basin is defined by the base of fresh water, corresponding with the base of the San Pedro Formation.

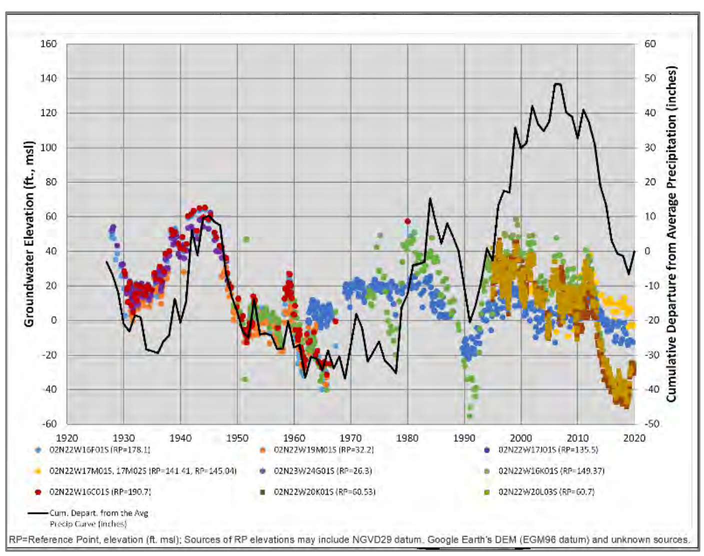
The aquifers in Mound Basin consist of layers and lenses of relatively coarse-grained, permeable sediments (primarily sand and gravel) deposited within unconsolidated alluvium and the underlying, semi-consolidated San Pedro Formation (Figure 3.1-04). Aquitards present between the aquifers in Mound Basin consist of layers of poorly permeable fine-grained sediments (primarily silt and clay, Figure 3.1-04). Distinct hydrostratigraphic units (HSUs) were identified using geophysical methods by United (2018), and consist of the Shallow Alluvial Deposits, fine-grained Pleistocene deposits, Mugu, Hueneme, and Fox Canyon aquifers (and the aquitards between these aquifers). The Mugu and Hueneme aquifers are considered principal aquifers and are managed by this GSP. The Shallow Alluvial Deposits and fine-grained Pleistocene deposits do not meet the SGMA definition of a principal aquifer to "store, transmit, and yield significant or economic quantities of groundwater…", and the Fox Canyon Aquifer does not have material groundwater extractions; therefore, they are not considered principal aquifers in the GSP and will not be managed at this time.

Importantly, the principal aquifers extend approximately 10 miles offshore to the edge of the continental shelf, where they crop out and are exposed to seawater. The principal aquifers are believed to be protected from seawater between the shoreline and the continental shelf outcrops by the fine-grained stratigraphic units that overlie them. Modeling performed for this GSP indicates that seawater will not migrate from the aquifer outcrops to the shoreline within the 50-year SGMA period. However, there is a risk that seawater could enter the aquifers though nearshore short circuit pathways along faults or stratigraphic windows in the fine-grained stratigraphic units. This risk is considered in the GSP.

Groundwater flow directions within Mound Basin are generally from the east to west and are generally parallel with the Santa Clara River within the eastern portion of the Basin, and toward the Oxnard Basin in the southwestern portion of the Basin. A small groundwater flow component from the uplands to the north flows to the south and is driven by recharge in the hills.







Measured groundwater levels in the Mound Basin have historically risen and fallen consistent with the rainfall patterns and have not exhibited evidence of chronic lowering. Groundwater storage has fluctuated similarly, with no long-term reduction and no reports of land subsidence effects or seawater intrusion historically.

The natural groundwater quality in the principal aquifers is not ideal but is beneficially used by municipal and agricultural users across the Basin. Regional Water Quality Control Board (RWQCB) Water Quality Objectives (WQOs) exist for sulfate, boron, chloride, and total dissolved solids (TDS) and are generally met, although some exceptions exist. The natural groundwater quality is generally better in the Mugu Aquifer as compared to the Hueneme Aquifer, which has more frequent exceedances of RWQCB WQOs. These constituents appear to be relatively stable at most Mound Basin wells having long-term groundwater quality records. The dissolved constituents are derived from natural sources, and groundwater extraction does not appear to be correlated with common ion chemistry concentrations; however, there is a risk that lower groundwater levels could locally induce migration of poor-quality groundwater from shallow water-bearing units into the Mugu Aquifer. Nitrate concentrations in groundwater are generally low. It is noted that several wells exhibit anomalously high nitrate concentrations that are believed to be the result of well construction or well deterioration issues that have created conduits for poor-quality water to enter the well from shallow water-bearing units. Lastly, migration of contaminant plumes is not an issue because there are none identified in the Basin at present.

Surface bodies in the Mound Basin include the Santa Clara River and its estuary and several smaller, ephemeral streams (barrancas). The Santa Clara River has perennial baseflow within its reach that spans the Mound Basin. The perennial baseflow is fed by shallow groundwater and tile drain discharges from the Mound and Oxnard basins. The barrancas are ephemeral and flow in response to storm events and, hence, may only be transiently interconnected with shallow groundwater. Despite the interconnection with shallow groundwater occurring within the Shallow Alluvial Deposits, there is no depletion of interconnected surface water in the Basin because there are no groundwater extractions from the Shallow Alluvial Deposits, and groundwater in the principal aquifers is physically separated from the surface water bodies by several hundred feet of fine-grained materials. In addition, numerical modeling simulations that varied extraction rates in the principal aquifers did not show any significant impact to shallow groundwater levels or Santa Clara River flows (Appendix G). No GDEs have been identified in the Basin that rely on groundwater from a principal aquifer.

ES-3. Water Budget

The groundwater flow model was used to quantify and evaluate the water budgets for the historical, current, and projected conditions, including the evaluation of uncertainty due to climate change (United, 2021a).

Surface water enters and leaves Mound Basin via the Santa Clara River and several smaller barrancas where they cross the Basin's boundaries primarily as storm flows. Surface water is also imported into the Basin via pipeline from Casitas MWD (Ventura Water, 2020b).

The primary sources of recharge to the Mound Basin groundwater system are underflow from the Santa Paula Basin, areal recharge (the sum of infiltration of precipitation, Municipal and Industrial (M&I) return flows, and agricultural irrigation return flows), and mountain-front recharge. Stream channel recharge is a minor component. Depending on groundwater level conditions, groundwater can flow into the Mound

Basin from the Oxnard Basin; however, there has historically been a net outflow from the Mound Basin to the Oxnard Basin. The primary groundwater outflow is groundwater extraction for beneficial use, although underflow to the Oxnard Basin can be a significant outflow at times. Discharge from the Shallow Alluvial Deposits (not a principal aquifer) along the lower, gaining reach of the Santa Clara River; via tile drains installed under farmland adjacent to the river; and via evapotranspiration are minor components. The change in storage for the Basin is a function of imbalances between inflows and outflows. In years when inflow (recharge) exceeds outflow (discharge) the volume of groundwater in storage increases, and vice versa. The average reduction in groundwater storage during the historical period (water years 1985-2015), current period (water years 2016-2019), and the baseline future projection for the implementation period (2022-2041), are 469 acre-feet per year (AF/yr), 147 AF/yr, and 13 AF/yr, respectively. A summary of average water budget components for each period is shown on Table ES-1. Climate change and potential land use and population changes were evaluated and are not expected to materially impact the future water budget.

Modeling results for the future projection periods indicate that the projected inflow and outflows will be approximately balanced during the 20-year GSP implementation period and that the minimum thresholds for the sustainability indicators will not be exceeded. Therefore, an estimate of the sustainable yield is approximately equal to the projected extraction rates (approximately averaging 7,900 to 8,200 AF/yr), depending on climate change assumptions. It is recognized that increasing extraction rates above these amounts could increase underflow from adjacent basins, thereby increasing the sustainable yield of the Mound Basin. However, this could impact sustainable management of the adjacent Santa Paula and/or Oxnard basins and is, therefore, not included in the sustainable yield estimate at this time.

Table ES-1. Summary of Average Water Budget Components (acre-feet/year).

	Mugu	Hueneme	Entire Basin
Historical (1986-2015)			
Total in	3,287	7,612	20,291
Total out	-3,462	-7,758	-20,768
Change in Storage[1]	175	138	469
Current (2016-2019)			
Total in	4,050	7,029	19,303
Total out	-4,057	-7,252	-19,450
Change in Storage[1]	7	224	147
Projected (Implementation Period 2022-2041)			
Total in	4,579	5,847	19,342
Total out	-4,592	-5,727	-19,355
Change in Storage[1]	13	-120	13

1 – Storage term is average volume of groundwater released from storage per water-year (Oct. 1 – Sept.30). Positive values represent inflows to the basin/aquifer. Change in storage term may not match difference between total in and total out due to rounding.

ES-4. Sustainable Management Criteria

The SMC were developed using the best available science and information for the Basin. MBGSA characterized undesirable results and established minimum thresholds, measurable objectives, and interim milestones for each applicable sustainability indicator:

1. Chronic lowering of groundwater levels (Section 4.4)
2. Reduction in groundwater storage (Section 4.5)
3. Seawater intrusion (Section 4.6)
4. Degraded water quality (Section 4.7)
5. Land subsidence (Section 4.8)

The sixth sustainable management criterion, depletion of interconnected surface water, is not applicable in the Basin because surface water is not interconnected with groundwater in the principal aquifers.

The process for developing SMC for this GSP began with a deliberate process that was reviewed by the MBGSA Board of Directors in June 2020, followed by adoption of a sustainability goal in September 2020. These actions were performed intentionally up front to guide SMC development. SMC development then consisted of the MBGSA Board of Directors and stakeholders reviewing SMC proposals prepared by staff. Written proposals were provided in the form of staff reports and presentations at numerous Board of Directors meetings, which included information on SGMA requirements, relevant information from the Basin Setting section, and results of additional analyses completed to support SMC development. Meeting summaries (minutes) were posted on the MBGSA website and two GSP workshops were held to address the SMC. Outreach was performed throughout the SMC development process to encourage input on the proposed SMC, including GSP newsletters, e-mails to the interested parties list, social media posts, telephone communications with stakeholders, updates at the Santa Clara River Watershed Committee, public notices, and a bilingual bill stuffer in the City of Ventura's consumer water bills.

A key part of the SMC development process is defining undesirable results (GSP Emergency Regulations §354.26(a)). The process for defining undesirable results consisted of multiple steps:

1. First, potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other effects were evaluated and described qualitatively.
2. The qualitative statement on potential effects was then translated and quantified into minimum thresholds at specific monitoring network sites (existing and proposed).
3. Lastly, a combination of minimum threshold exceedances representing undesirable results (when significant and unreasonable effects occur on any of the sustainability indicators) in the Basin was established.

For this GSP and pursuant to GSP Emergency Regulations §354.28(d), groundwater elevations are used as a proxy for the depletion of groundwater storage and land subsidence sustainability indicators.

Chronic Lowering of Groundwater Levels: Historically, measured and modeled future groundwater levels indicate no chronic lowering of groundwater levels has or will occur in the Basin. The qualitative description of undesirable results is chronic lowering of groundwater levels that causes a significant number of wells in the Basin to no longer be capable of being operated as designed for the confined aquifers of the Mound Basin. The results of analyzing groundwater levels, well data, and the groundwater model results indicate that groundwater levels could decline by a considerable amount below historical low levels in many areas of the Basin before a significant and unreasonable depletion of supply would occur. The analysis results for the groundwater supply depletion water level thresholds are supported by the lack of reported pumping problems during historical periods of lowered groundwater levels. However, the groundwater supply depletion water level thresholds can be hundreds of feet lower in elevation than historical low groundwater levels (especially for the Hueneme Aquifer), while for others they can be similar in elevation. Groundwater levels cannot decline significantly below historical low levels without creating risk for subsidence undesirable results. For these reasons, the minimum threshold for the chronic lowering of groundwater levels is set at the historical low levels. The combination of minimum threshold exceedances that is deemed to cause significant and unreasonable effects in the Basin for chronic lowering of groundwater levels is minimum threshold exceedances in 50% of the groundwater level monitoring sites in either principal aquifer. This combination is intended to indicate significant and unreasonable effects are widespread in either principal aquifer. The measurable objective was set based on the reasonable margin of operational flexibility and was determined to be groundwater levels following wet phases that are sufficiently high to prevent groundwater levels from dropping below the minimum thresholds during a subsequent drought phase.

Reduction in Groundwater Storage**:** The reduction in groundwater storage sustainability indicator is measured as the "total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results" (GSP Emergency Regulations §354.28 (c)(2)). The minimum threshold is set for the extraction rate not to exceed the sustainable yield (i.e., 8,200 AF/yr) for the Basin, which is the rate that is anticipated to cause water levels to go below the historical low. The reduction of groundwater storage measurable objective is 90% of the sustainable yield (i.e., 7,400 AF/yr), based on professional judgement and to account for uncertainty in the sustainable yield estimate.

Seawater Intrusion**:** Available data indicate that seawater has not been present in the onshore portions of the principal aquifers to date. In addition, the Mound Basin principal aquifers may only be exposed to seawater where they crop out on the continental shelf edge, approximately 10 miles offshore, greatly reducing the likelihood that seawater can find a near-shore path for intrusion into the principal aquifers. Groundwater model particle tracking results suggest that the most seawater has moved is in the Hueneme Aquifer, an average of approximately 0.5 miles from the offshore subcrop (approximately 10 miles from the shoreline) toward the shoreline during the past 100 years. The criteria used to define when and where the effects of the groundwater conditions cause undesirable results is based on the qualitative description of undesirable result, which is seawater intrusion extending east of Harbor Boulevard into areas with current or anticipated future beneficial uses. This means that the chloride concentrations should be maintained below a concentration indicative of seawater intrusion impacts at monitoring sites along Harbor Boulevard. Therefore, the minimum threshold of 150 milligrams per liter (mg/L) is used at monitoring sites along Harbor Boulevard, which is consistent with the degraded water quality sustainability indicator minimum threshold for chloride. The measurable objectives are also set consistent with the degraded water quality sustainability indicator measurable objectives for chloride.

Degraded Water Quality**:** Groundwater quality in the Mound Basin is marginal due to natural geochemical processes, and groundwater extraction does not appear to have exacerbated these natural processes historically. Occurrences of elevated sulfate, TDS, and nitrate concentrations appear to be related to well construction/condition issues that facilitate intrusion of very poor-quality water from the shallow groundwater system into these wells, as opposed to being an indicator of regional water quality degradation in the principal aquifers. Potential future increases in Mugu Aquifer extraction rates could locally induce downward migration of very poor-quality water from the shallow groundwater system into the Mugu Aquifer, which could lead to undesirable results. The effects of groundwater conditions deemed to cause undesirable results is considered to occur when all representative monitoring wells in a principal aquifer exceed the minimum threshold concentration for a constituent for two consecutive years. The minimum thresholds and measurable objectives for degraded water quality were developed by considering existing water quality standards (drinking water regulations and RWQCB Basin Plan WQOs, and historically measured concentrations). The minimum thresholds are based on RWQCB WQOs except in cases where concentrations have historically exceeded the WQO. The measurable objectives are based on preserving existing water quality consistent with upper consumer acceptance levels for drinking water (which trigger treatment requirements) or toxicity levels for crops, in cases where concentrations have historically exceeded these levels.

Land Subsidence**:** No land subsidence due to groundwater extraction has been documented historically in the Mound Basin, which is considered to have a low estimated potential for inelastic land subsidence. Numerical modeling for the water budget suggests that future groundwater levels will remain above historical low levels, which would prevent inelastic subsidence due to groundwater extraction; however, groundwater levels could decline below historical levels and trigger inelastic land subsidence if actual future conditions differ significantly from those assumed in the projected water budget analysis. Undesirable results are any inelastic land subsidence caused by groundwater extraction in the Coastal Area of the Basin (i.e., areas located west of Harbor Boulevard). The minimum threshold is important in the Coastal Area because land subsidence here would exacerbate coastal hazards associated with sea level rise and/or impacts to the City of Ventura's sewer mains along Harbor Boulevard. Undesirable results could also occur outside of the Coastal Area if enough subsidence occurred to substantially interfere with surface land uses. Due to data coverage gaps and other factors, interferometric synthetic aperture radar (InSAR[1]) monitoring was not considered a reliable method for measuring land subsidence in the western half of the Mound Basin; therefore, groundwater levels were chosen as a proxy minimum threshold, and were set at the historical low groundwater levels to prevent measurable inelastic land subsidence due to groundwater extraction. Any combination of minimum threshold exceedances that include >50% of wells in the western half of the Basin would be considered as potentially leading to undesirable results. This combination is intended to indicate significant and unreasonable effects are widespread in the western half of the Basin. For the eastern half of the Basin, InSAR data are considered adequate to monitor for land subsidence when coupled with continuous global positioning system (GPS) data to filter out tectonic downwarping. Therefore, any exceedances of minimum thresholds in the eastern area will prompt the review of InSAR data to evaluate indications of subsidence rates (due to groundwater extraction) of ≥0.1 ft/yr that leads to cumulative subsidence of 0.6 ft or more. The less conservative minimum threshold for the eastern area was selected based on literature review of subsidence case studies. The measurable objectives for the western half of the Basin are identical to the chronic lowering of groundwater levels measurable objective, and for the eastern half they are equal to the minimum threshold.

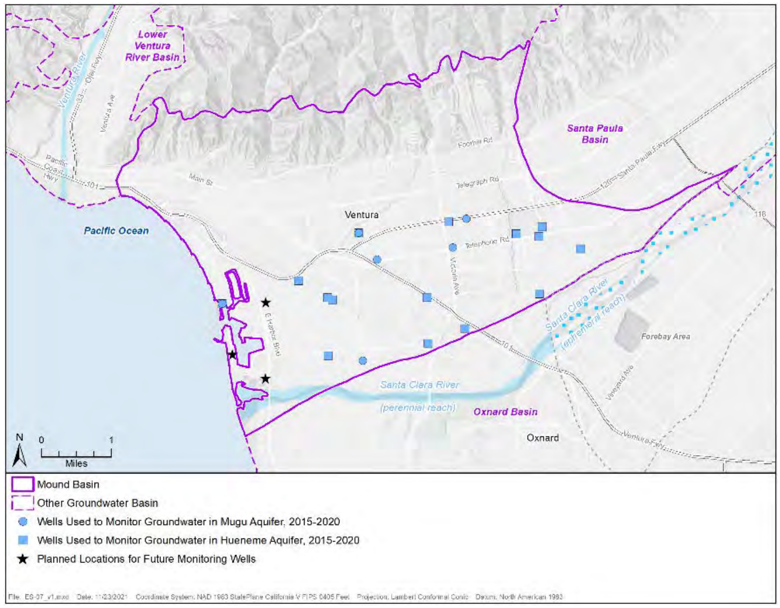
[1] Interferometric Synthetic Aperture Radar (InSAR) measures the spatial extent and magnitude of changes in the land surface associated with fluid extraction and natural hazards (e.g., earthquakes).

ES-5. Monitoring Networks

The GSP Emergency Regulations require monitoring networks be developed to collect data of sufficient quality, frequency, and spatial distribution to characterize groundwater and related surface water conditions (if applicable) in the Basin; evaluate changing conditions that occur during implementation of the GSP; and for implementation of the SMC for the Basin. Monitoring networks should accomplish the following (§354.34(b)):

- **Demonstrate Progress toward Achieving Measurable Objectives Described in the GSP**: The five sustainability indicators discussed above are applicable but have already met the corresponding measurable objectives historically and are expected to meet them going forward. Therefore, the focus of this objective for the Mound Basin is to demonstrate continued compliance with the measurable objectives as opposed to progress toward meeting the measurable objectives.
- **Monitor Impacts to the Beneficial Uses and Users of Groundwater**: The uses and users described in the introduction could be impacted by degradation of water quality, seawater intrusion, and declining groundwater levels and storage (which are an important causative factor in land subsidence). Monitoring groundwater levels and quality can indicate trends that could precede land subsidence or seawater intrusion, as well as trends that could affect operation and associated costs of production wells. Under this guidance, appropriate monitoring sites in Mound Basin are in the southern portion where all the Basin's active water supply wells are located and groundwater levels are known to fluctuate. Monitoring in the northern part of the Basin is low priority due to the lack of beneficial uses.
- **Monitor Changes in Groundwater Conditions Relative to Measurable Objectives and Minimum Thresholds**: This will be accomplished using groundwater level and groundwater quality monitoring. Quarterly groundwater level monitoring and annual groundwater quality sampling frequencies are considered adequate for the Basin, due to the relatively slow rate of groundwater movement.
- **Quantify Annual Changes in Water Budget Components**: The available monitoring data for the Basin will be input to United's flow model for calculating future annual changes in subsurface water budget components and change in storage. Surface flows in the Santa Clara River are measured daily by the Ventura County Watershed Protection District (VCWPD) at flow-gaging station "723 - Santa Clara River at Victoria Ave" located outside of the Basin. Data from this station are available online and can be downloaded annually to update this surface water component of the Mound Basin water budget (VCWPD, 2021). MBGSA intends to continue using data from these existing sources as input to United's model, which will in turn be used periodically to quantify changes in water budget components. At present, this GSP does not contemplate development of a new monitoring network or modification of existing monitoring networks to obtain data regarding groundwater extraction, imported water, or recharge quantities because it is MBGSA's opinion that these water budget components are currently adequate for sustainable management of the Basin.

Groundwater levels and water quality are monitored in approximately 20 wells across the Basin by United; Ventura Water (i.e. the City of Ventura's water and wastewater department) monitors two active water supply wells in the Basin, and VCWPD monitors three wells (currently or formerly used for agricultural and



industrial water supply) in the Basin. VCWPD is the California Statewide Groundwater Elevation Monitoring (CASGEM) monitoring entity for the Basin.

Consistent with GSP Emergency Regulations §354.34(e), the groundwater level and quality monitoring networks that will be utilized are based primarily on existing monitoring sites that are monitored by United and VCWPD. The existing monitoring networks in the Basin have been used for several decades to collect information to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface water conditions. The monitoring networks include features for the collection of data to monitor the groundwater sustainability indicators applicable to the Basin. Additional monitoring sites will be added to implement the SMC for seawater intrusion (two new monitoring wells located near Harbor Boulevard). The additional monitoring sites will also help refine the hydrogeologic conceptual model (HCM) and improve the numerical model. A third monitoring site is proposed along the shoreline to provide a second site for early detection of seawater intrusion. A final decision whether to construct this third well will be made during GSP implementation, based on available funding and monitoring results from new Harbor Boulevard monitoring wells. Lastly, MBGSA will seek opportunities to enhance the monitoring networks by instrumenting and sampling additional existing wells in the Basin if and when opportunities to do so arise.

InSAR is the best available method for measuring the rate and extent of land subsidence over large areas, such as a groundwater basin. As described above, InSAR is unreliable for the western half of the Basin, so groundwater elevations will be used as a proxy to detect and monitor the potential onset of inelastic land subsidence that may result from future groundwater extractions in the Basin (i.e., if groundwater elevations decline below historical low levels). To ensure the best available data is used for monitoring land subsidence, InSAR data will be utilized when groundwater levels are below historical lows in the eastern half of the Basin. If InSAR coverage and other data issues are resolved in the future, MBGSA will update the GSP to utilize InSAR measurements for the western half of the Basin.

Pursuant to section §352.6, monitoring data will be stored in MBGSA's Data Management System (DMS). Data will be transmitted to DWR with the GSP, annual reports, and GSP updates electronically on the forms provided by DWR.

ES-6. Projects and Management Actions

The 50-year future modeling projections developed for the projected water budget suggest that the measurable objectives for the applicable sustainability indicators will be met without the need for projects or management actions. However, several management actions are included to help prevent problems from developing and to respond to potential changing conditions in the Basin. The management actions include:

- Coordinate with the County of Ventura to identify and address improperly constructed or abandoned wells that create conduits for migration of poor-quality water from shallow water-bearing units into the principal aquifers. Grant funding will be pursued to address any improperly constructed or abandoned wells that are identified.
- Coordinate with County of Ventura to review the County well permit ordinance and modify, if necessary, to ensure the future wells are properly sealed to prevent migration of poor-quality water from shallow water-bearing units into the principal aquifers.
- Develop a contingency plan to address unexpected land subsidence.
- Develop a contingency plan to address unexpected seawater intrusion.
- Partner with the City of Ventura and United to collect interim shallow groundwater data to further assess the hydraulic connection between the Santa Clara River flows and groundwater in Shallow Alluvial Deposits with groundwater extraction from the deeper principal aquifers.

ES-7. Plan Implementation

The estimated costs for the GSP implementation include annual costs for ongoing activities and estimated costs for one-time activities that are scheduled to occur within the first 5-year GSP assessment period. The estimated total cost of the GSP Implementation over the 20-year planning horizon is [$7,002,188]. The total estimated cost through the first 5-year assessment is [$1,937,618]. The cost is based on the best available information at the time of Plan preparation and submittal. It represents the MBGSA's current understanding of Basin conditions and the current roles and responsibilities of the MBGSA under SGMA.

Funding for GSP implementation will be obtained from groundwater extraction fees charged to groundwater users in the Basin, and grants. This funding approach has been used since the MBGSA's formation and will be reevaluated over time as the GSP implementation progresses. The Site A monitoring well planned is being funded by DWR's Technical Support Services (TSS) grant program. MBGSA will continue to pursue funding from state and federal sources to support GSP planning and implementation.

Implementation of the GSP requires robust administrative and financial structures, with adequate human resources to ensure compliance with SGMA. The activities associated with the GSP implementation are:

1. Agency administration,
2. Preparing annual reports,
3. Monitoring groundwater levels and quality and land subsidence,
4. Maintaining the Basin DMS,
5. Updating the groundwater model,
6. Constructing new monitoring wells,
7. Developing contingency plans,
8. Performing ongoing stakeholder outreach and engagement, and

9. Assessing/updating the GSP every 5 years.

MBGSA will likely continue to address its human resources needs through contracts with consultants and United.

GSP reporting will occur on an annual basis, with reports for the preceding water year due to DWR by April 1. Periodic evaluations (every 5 years) and GSP amendments (if needed) will be submitted to DWR by at least every 5 years (2027, 2032, 2037, and 2042). The proposed monitoring wells are scheduled for construction in 2021, 2026, and 2032, but it is noted that site identification, access agreements, and permitting will take place in the years immediately preceding construction.

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GROUNDWATER SUSTAINABILITY AGENCY

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Definitions of Key SGMA Terms

California Water Code

Sec. 10721

Unless the context otherwise requires, the following definitions govern the construction of this part:

(a) Adjudication action means an action filed in the superior or federal district court to determine the rights to extract groundwater from a basin or store water within a basin, including, but not limited to, actions to quiet title respecting rights to extract or store groundwater or an action brought to impose a physical solution on a basin.

(b) Basin means a groundwater basin or subbasin identified and defined in Bulletin 118 or as modified pursuant to Chapter 3 (commencing with Section 10722).

(c) Bulletin 118 means the department's report entitled California's Groundwater: Bulletin 118 updated in 2003, as it may be subsequently updated or revised in accordance with Section 12924.

(d) Coordination agreement means a legal agreement adopted between two or more groundwater sustainability agencies that provides the basis for coordinating multiple agencies or groundwater sustainability plans within a basin pursuant to this part.

(e) De minimis extractor means a person who extracts, for domestic purposes, two acrefeet or less per year.

(f) Governing body means the legislative body of a groundwater sustainability agency.

(g) Groundwater means water beneath the surface of the earth within the zone below the water table in which the soil is completely saturated with water, but does not include water that flows in known and definite channels.

(h) Groundwater extraction facility means a device or method for extracting groundwater from within a basin.

(i) Groundwater recharge or recharge means the augmentation of groundwater, by natural or artificial means.

(j) Groundwater sustainability agency means one or more local agencies that implement the provisions of this part. For purposes of imposing fees pursuant to Chapter 8 (commencing with Section 10730) or taking action to enforce a groundwater sustainability plan, groundwater sustainability agency also means each local agency comprising the groundwater sustainability agency if the plan authorizes separate agency action.

(k) Groundwater sustainability plan or plan means a plan of a groundwater sustainability agency proposed or adopted pursuant to this part.

(l) Groundwater sustainability program means a coordinated and ongoing activity undertaken to benefit a basin, pursuant to a groundwater sustainability plan.

(m) In-lieu use means the use of surface water by persons that could otherwise extract groundwater in order to leave groundwater in the basin.

(n) Local agency means a local public agency that has water supply, water management, or land use responsibilities within a groundwater basin.

(o) Operator means a person operating a groundwater extraction facility. The owner of a groundwater extraction facility shall be conclusively presumed to be the operator unless a satisfactory showing is made to the governing body of the groundwater sustainability agency that the groundwater extraction facility actually is operated by some other person.

(p) Owner means a person owning a groundwater extraction facility or an interest in a groundwater extraction facility other than a lien to secure the payment of a debt or other obligation.

(q) Personal information has the same meaning as defined in Section 1798.3 of the Civil Code.

(r) Planning and implementation horizon means a 50-year time period over which a groundwater sustainability agency determines that plans and measures will be implemented in a basin to ensure that the basin is operated within its sustainable yield.

(s) Public water system has the same meaning as defined in Section 116275 of the Health and Safety Code.

(t) Recharge area means the area that supplies water to an aquifer in a groundwater basin.

(u) Sustainability goal means the existence and implementation of one or more groundwater sustainability plans that achieve sustainable groundwater management by identifying and causing the implementation of measures targeted to ensure that the applicable basin is operated within its sustainable yield.

(v) Sustainable groundwater management means the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results.

(w) Sustainable yield means the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any temporary surplus that can be withdrawn annually from a groundwater supply without causing an undesirable result.

(x) Undesirable result means one or more of the following effects caused by groundwater conditions occurring throughout the basin:

> (1) Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.
>
> (2) Significant and unreasonable reduction of groundwater storage.
>
> (3) Significant and unreasonable seawater intrusion.
>
> (4) Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.
>
> (5) Significant and unreasonable land subsidence that substantially interferes with surface land uses.

(6) Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

(y) Water budget means an accounting of the total groundwater and surface water entering and leaving a basin including the changes in the amount of water stored.

(z) Watermaster means a watermaster appointed by a court or pursuant to other law.

(aa) Water year means the period from October 1 through the following September 30,

inclusive.

(ab) Wellhead protection area means the surface and subsurface area surrounding a water well or well field that supplies a public water system through which contaminants are reasonably likely to migrate toward the water well or well field.

Official California Code of Regulations

Title 23. Waters

Division 2. Department of Water Resources

Chapter 1.5. Groundwater Management

Subchapter 2. Groundwater Sustainability Plans

Article 2. Definitions

23 CCR § 351

§ 351. Definitions.

The definitions in the Sustainable Groundwater Management Act, Bulletin 118, and Subchapter 1 of this Chapter, shall apply to these regulations. In the event of conflicting definitions, the definitions in the Act govern the meanings in this Subchapter. In addition, the following terms used in this Subchapter have the following meanings:

(a) "Agency" refers to a groundwater sustainability agency as defined in the Act.

(b) "Agricultural water management plan" refers to a plan adopted pursuant to the Agricultural Water Management Planning Act as described in Part 2.8 of Division 6 of the Water Code, commencing with Section 10800 et seq.

(c) "Alternative" refers to an alternative to a Plan described in Water Code Section 10733.6.

(d) "Annual report" refers to the report required by Water Code Section 10728.

(e) "Baseline" or "baseline conditions" refer to historical information used to project future conditions for hydrology, water demand, and availability of surface water and to evaluate potential sustainable management practices of a basin.

(f) "Basin" means a groundwater basin or subbasin identified and defined in Bulletin 118 or as modified pursuant to Water Code 10722 et seq.

(g) “Basin setting” refers to the information about the physical setting, characteristics, and current conditions of the basin as described by the Agency in the hydrogeologic conceptual model, the groundwater conditions, and the water budget, pursuant to Subarticle 2 of Article 5.

(h) “Best available science” refers to the use of sufficient and credible information and data, specific to the decision being made and the time frame available for making that decision, that is consistent with scientific and engineering professional standards of practice.

(i) “Best management practice” refers to a practice, or combination of practices, that are designed to achieve sustainable groundwater management and have been determined to be technologically and economically effective, practicable, and based on best available science.

(j) “Board” refers to the State Water Resources Control Board.

(k) “CASGEM” refers to the California Statewide Groundwater Elevation Monitoring Program developed by the Department pursuant to Water Code Section 10920 et seq., or as amended.

(l) “Data gap” refers to a lack of information that significantly affects the understanding of the basin setting or evaluation of the efficacy of Plan implementation, and could limit the ability to assess whether a basin is being sustainably managed.

(m) “Groundwater dependent ecosystem” refers to ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface.

(n) “Groundwater flow” refers to the volume and direction of groundwater movement into, out of, or throughout a basin.

(o) “Interconnected surface water” refers to surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted.

(p) “Interested parties” refers to persons and entities on the list of interested persons established by the Agency pursuant to Water Code Section 10723.4.

(q) “Interim milestone” refers to a target value representing measurable groundwater conditions, in increments of five years, set by an Agency as part of a Plan.

(r) “Management area” refers to an area within a basin for which the Plan may identify different minimum thresholds, measurable objectives, monitoring, or projects and management actions based on differences in water use sector, water source type, geology, aquifer characteristics, or other factors.

(s) “Measurable objectives” refer to specific, quantifiable goals for the maintenance or improvement of specified groundwater conditions that have been included in an adopted Plan to achieve the sustainability goal for the basin.

(t) “Minimum threshold” refers to a numeric value for each sustainability indicator used to define undesirable results.

(u) “NAD83” refers to the North American Datum of 1983 computed by the National Geodetic Survey, or as modified.

(v) “NAVD88” refers to the North American Vertical Datum of 1988 computed by the National Geodetic Survey, or as modified.

(w) "Plain language" means language that the intended audience can readily understand and use because that language is concise, well-organized, uses simple vocabulary, avoids excessive acronyms and technical language, and follows other best practices of plain language writing.

(x) "Plan" refers to a groundwater sustainability plan as defined in the Act.

(y) "Plan implementation" refers to an Agency's exercise of the powers and authorities described in the Act, which commences after an Agency adopts and submits a Plan or Alternative to the Department and begins exercising such powers and authorities.

(z) "Plan manager" is an employee or authorized representative of an Agency, or Agencies, appointed through a coordination agreement or other agreement, who has been delegated management authority for submitting the Plan and serving as the point of contact between the Agency and the Department.

(aa) "Principal aquifers" refer to aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems.

(ab) "Reference point" refers to a permanent, stationary and readily identifiable mark or point on a well, such as the top of casing, from which groundwater level measurements are taken, or other monitoring site.

(ac) "Representative monitoring" refers to a monitoring site within a broader network of sites that typifies one or more conditions within the basin or an area of the basin.

(ad) "Seasonal high" refers to the highest annual static groundwater elevation that is typically measured in the Spring and associated with stable aquifer conditions following a period of lowest annual groundwater demand.

(ae) "Seasonal low" refers to the lowest annual static groundwater elevation that is typically measured in the Summer or Fall, and associated with a period of stable aquifer conditions following a period of highest annual groundwater demand.

(af) "Seawater intrusion" refers to the advancement of seawater into a groundwater supply that results in degradation of water quality in the basin, and includes seawater from any source.

(ag) "Statutory deadline" refers to the date by which an Agency must be managing a basin pursuant to an adopted Plan, as described in Water Code Sections 10720.7 or 10722.4.

(ah) "Sustainability indicator" refers to any of the effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, cause undesirable results, as described in Water Code Section 10721(x).

(ai) "Uncertainty" refers to a lack of understanding of the basin setting that significantly affects an Agency's ability to develop sustainable management criteria and appropriate projects and management actions in a Plan, or to evaluate the efficacy of Plan implementation, and therefore may limit the ability to assess whether a basin is being sustainably managed.

(aj) "Urban water management plan" refers to a plan adopted pursuant to the Urban Water Management Planning Act as described in Part 2.6 of Division 6 of the Water Code, commencing with Section 10610 et seq.

(ak) "Water source type" represents the source from which water is derived to meet the applied beneficial uses, including groundwater, recycled water, reused water, and surface water sources identified as Central Valley Project, the State Water Project, the Colorado River Project, local supplies, and local imported supplies.

(al) “Water use sector” refers to categories of water demand based on the general land uses to which the water is applied, including urban, industrial, agricultural, managed wetlands, managed recharge, and native vegetation.

(am) “Water year” refers to the period from October 1 through the following September 30, inclusive, as defined in the Act.

(an) “Water year type” refers to the classification provided by the Department to assess the amount of annual precipitation in a basin.

Acronyms and Abbreviations

AF	acre-foot/acre-feet
AF/yr	acre-feet per year
Alta MWC	Alta Mutual Water Company
Association	Santa Clara River Protection Association
Basin	Mound Basin
bgs	below ground surface
BMP	best management practices
CALVEG	Classification and Assessment with Landsat of Visible Ecological Groupings
CASGEM	California Statewide Groundwater Elevation Monitoring
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
cfs	cubic feet per second
County	County of Ventura
DAC	Disadvantaged Community
DDW	Department of Drinking Water, State of California
DMS	Data Management System
DTSC	Department of Toxic Substances Control
DWR	Department of Water Resources, State of California
ENSO	El Nino/Southern Oscillation
ET	evapotranspiration
FCGMA	Fox Canyon Groundwater Management Agency
FICO	Farmers Irrigation Company
ft	foot/feet
ft/d	feet per day
ft/yr	feet per year
GDE	groundwater-dependent ecosystem
GIS	geographic information system
GPS	Ground Positioning System
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HCM	hydrogeologic conceptual model
Hopkins	Hopkins Groundwater Consultants
HSU	hydrostratigraphic unit
HVPAA	Hillside Voter Participation Area Act, City of Ventura

iGDE	indicators of groundwater-dependent ecosystem
InSAR	interferometric synthetic aperture radar
IRWMP	Integrated Regional Water Management Plan
JPA	joint exercise of powers agreement
LAS	Lower Aquifer System
LUST	Leaking Underground Storage Tank
M&I	Municipal and Industrial
MBAWG	Mound Basin Agricultural Water Group
MBGSA	Mound Basin Groundwater Sustainability Agency
MCL	maximum contaminant level
MCLR	maximum contaminant level range
mg/L	milligrams per liter
mi^2	square miles
mm	millimeter/millimeters
msl	above mean sea level
MWD	Municipal Water District
NAVD88	North American Vertical Datum of 1988
NC	Natural Communities
NCCAG	Natural Communities Commonly Associated with Groundwater
NRCS	Natural Resources Conservation Service
PDO	Pacific Decadal Oscillation
RMSE	root mean square error
RWQCB	Regional Water Quality Control Board
RWQCB-LA	Regional Water Quality Control Board, Los Angeles region
SCAG	Southern California Association of Governments
SDAC	Severely Disadvantaged Communities
SEP	Stakeholder Engagement Plan
SGMA	Sustainable Groundwater Management Act
SMC	Sustainable Management Criteria
SOAR	Save Open Space and Agricultural Resources
SSP&A	S.S. Papadopulos & Associates, Inc.
SWP	State Water Project
SWRCB	State Water Resources Control Board
TDEM	time domain electromagnetic
TDS	total dissolved solids
TNC	The Nature Conservancy
TSS	Technical Support Services

UAS	Upper Aquifer System
United	United Water Conservation District
USDA	United States Department of Agriculture
USGS	United States Geological Survey
VCWPD	Ventura County Watershed Protection District
Ventura Water	The City of Ventura’s water and wastewater department
VWRF	Ventura Water Reclamation Facility
WQO	Water Quality Objective
WRF	Water Reclamation Facility
WWTP	Wastewater Treatment Plant

1.0 Introduction to Plan Contents [Article 5 §354]

§354 Introduction to Plan Contents. *This Article describes the required contents of Plans submitted to the Department for evaluation, including administrative information, a description of the basin setting, sustainable management criteria, description of the monitoring network, and projects and management actions.*

In 2014, the State of California enacted the Sustainable Groundwater Management Act (SGMA). This law requires groundwater basins in California that are designated as medium or high priority be managed sustainably. Satisfying the requirements of SGMA generally requires five basic activities:

1. Form one or multiple Groundwater Sustainability Agency(s) (GSAs) to fully cover the basin;
2. Develop one or more Groundwater Sustainability Plan(s) (GSPs) that fully cover the basin;
3. Implement the GSP to achieve sustainable groundwater management;
4. Annual reporting to the California Department of Water Resources (DWR); and
5. Prepare and submit a written assessment of the GSP at least every 5 years to DWR and amend the GSP as necessary.

Mound Basin Groundwater Sustainability Agency (MBGSA) was formed in 2017 to satisfy the requirement for a GSA to fully cover the Mound Basin (DWR Basin 4-004.03) (Basin). MBGSA was designated as the exclusive GSA for the Basin by the State on September 30, 2017. MBGSA developed this document to fulfill the GSP requirements for the Basin. This GSP provides administrative information, describes the Basin setting, develops quantitative sustainable management criteria (SMC) that consider the interests of all beneficial uses and users of groundwater, and identifies projects and management actions and monitoring networks that will ensure the Basin is demonstrably managed in a sustainable manner within the 20-year sustainability timeframe (2042) and for the duration of the entire 50-year planning and implementation horizon (2072).

Following submittal of an initial notification on September 17, 2018 (Appendix A), MBGSA developed this GSP to comply with SGMA's statutory and regulatory requirements. As such, the GSP uses the terminology set forth in these requirements (see e.g. Water Code §10721 and 23 CCR §351) which is oftentimes different from the terminology utilized in other contexts (e.g. past reports or studies, past analyses, judicial rules or findings). The definitions from the relevant statutes and regulations are provided in the section titled "Definitions of Key SGMA Terms."

The GSP includes all of the required elements of the GSP Emergency Regulation organized into eight sections plus appendices as follows:

- **Section 1 - Introduction to Plan Contents** provides an overview of SGMA and the plan contents.
- **Section 2 - Administrative Information** provides information about the GSA, a description of the Plan area, and a summary of information relating to notification and communication by the Agency with other agencies and interested parties.
- **Section 3 - Basin Setting** describes the hydrogeologic conceptual model (HCM) of the Basin, current and historical groundwater conditions, the Basin water budget, and designated management areas within the Basin.

- **Section 4 - Sustainable Management Criteria** describes the Basin sustainability goal and the SMC developed for each of the applicable SGMA sustainability indicators. The applicable sustainability indicators for the Basin are Chronic Lowering of Groundwater Levels, Reduction of Groundwater Storage, Seawater Intrusion, Degraded Water Quality, and Land Subsidence. The Depletions of Interconnected Surface Water sustainability indicator is not applicable to the Basin.
- **Section 5 - Monitoring Networks** describes the monitoring networks that will be utilized to characterize groundwater and surface water conditions in the Basin, evaluate changing conditions that occur through implementation of the Plan, and demonstrate sustainable management.
- **Section 6 - Projects and Management Actions** describes projects and management actions included in the GSP to meet the sustainability goal for the Basin in a manner that can be maintained over the planning and implementation horizon.
- **Section 7 - GSP Implementation** describes steps to implementation, plan implementation costs, and plan funding.
- **Section 8 - References and Technical Studies**: provides a list of references and technical studies relied upon by the GSA in developing the Plan.

Appendices provide supporting information referred to in the GSP:

- MBGSA's Initial Notification to DWR for the GSP is provided in Appendix A.
- This GSP meets regulatory requirements established by the DWR as shown in Appendix B, the Elements of the Plan table.
- The formation of MBGSA Pursuant to Water Code §10723.8 is provided in Appendix C.
- The plan for MBGSA's engagement with stakeholders is provided in Appendix D.
- A list of public meetings held with MBGSA pursuant to §354.10 is provided in Appendix E.
- Comments and responses regarding the GSP pursuant to §354.10 are provided in Appendix F.
- Appendix G provides supplemental information regarding the Shallow Alluvial Deposits and the Santa Clara River in relation to the principal aquifers of the Basin.
- Areas Containing Indicators of Potential Groundwater-Dependent Ecosystems (iGDEs) are mapped in Appendix H.
- Minimum Thresholds and Measurable Objectives associated with time-series plots of modeled versus observed groundwater level are provided in Appendix I.
- Minimum Thresholds and Measurable Objectives associated with time-series plots of water quality data are provided in Appendix J.
- The approach to estimating annual change in storage for the Basin in provided in Appendix K.
- The Data Management System (DMS) documentation is provided in Appendix L.

2.0 Administrative Information [Article 5, SubArticle 1]

§354.2 Introduction to Administrative Information. *This Subarticle describes information in the Plan relating to administrative and other general information about the Agency that has adopted the Plan and the area covered by the Plan.*

Section 2 describes information relating to administration and other general information about MBGSA and the area covered by the GSP.

2.1 Agency Information [§354.6]

This section describes the MBGSA and its authority in relation to the SGMA. MBGSA is the exclusive GSA for Mound Basin (Department of Water Resources Basin 4-004.03), located in western Ventura County (Figures 2.1-01 and 2.1-02)

MBGSA was formed in 2017, pursuant to a joint exercise of powers agreement (JPA) between three local public agencies overlying the Basin: the City of San Buenaventura, the County of Ventura, and the United Water Conservation District (United) (Figure 2.1-01). The City of San Buenaventura is a local municipality that exercises water supply, water management, and land use authority within the city's boundaries. The County of Ventura exercises water management and land use authority on a portion of the land overlying the Mound Basin. See Figure 2.1-03 for land use information. United was formed in 1950 under the State of California's Water Conservation District Law of 1931 and is organized as a governmental special district. United does not produce water from the Basin, but is authorized to engage in groundwater replenishment of the Basin.

Per §10723.8(a) of the California Water Code, MBGSA gave notice to DWR of its decision to form a GSA for the Basin on June 28, 2017. Copies of the information required pursuant to Water Code §10723.8 for GSA Formation, updated as appropriate, is provided in Appendix C. MBGSA was designated as the exclusive GSA for the Basin by the State on September 30, 2017.

2.1.1 Name and Mailing Address [§354.6(a)]

§354.6 Agency Information. *When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:*

(a) *The name and mailing address of the Agency.*

- GSA Name: Mound Basin Groundwater Sustainability Agency
- GSA Mailing Address: P.O. Box 3544, Ventura, CA 93006-3544

2.1.2 Organization and Management Structure [§354.6(b)]

§354.6 Agency Information. *When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:*

(b) *The organization and management structure of the Agency, identifying persons with management authority for implementation of the Plan.*

MBGSA is governed by a five-member board comprised of one director appointed by each member public agency (City of San Buenaventura, the County of Ventura, and United) and two stakeholder directors representing agricultural and environmental interests. MBGSA contracts with Bondy Groundwater Consulting, Inc. (Bryan Bondy), who serves as the Agency's Executive Director and GSP Plan Manager. MBGSA contracts with member agency United for financial and administrative support. The Executive Director manages day-to-day operations of the Agency, while Board Members vote on actions of the MBGSA. The Board of Directors is MBGSA's decision-making body. Further information about MBGSA's organization and management structure can be found in the MBGSA JPA and MBGSA Bylaws, which are included in Appendix C.

2.1.3 Plan Manager and Contact Information [§354.6(c)]

§354.6 Agency Information. *When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:*

(c) *The name and contact information, including the phone number, mailing address and electronic mail address, of the plan manager.*

- Mound Basin GSA Executive Director: Bryan Bondy, PG, CHG
- Phone Number: (805) 212-0484
- Email: bryan@moundbasingsa.org
- Mailing Address: P.O. Box 3544, Ventura, CA 93006-3544
- Website: www.moundbasingsa.org

2.1.4 Legal Authority [§354.6(d)]

§354.6 Agency Information. *When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:*

(d) *The legal authority of the Agency, with specific reference to citations setting forth the duties, powers, and responsibilities of the Agency, demonstrating that the Agency has the legal authority to implement the Plan.*

MBGSA has legal authority to perform duties, exercise powers, and accept responsibility for managing groundwater sustainably within the Mound Basin. MBGSA's legal authority comes from the SGMA, the JPA signed by MBGSA member agencies, and the MBGSA Bylaws. The JPA and bylaws are included in Appendix C. These laws and agreements, taken together, provide the necessary legal authority for the MBGSA Board to carry out the preparation and implementation of the Basin's GSP. Figures 2.1-01 and 2.1-02 show the extent of the GSP plan area, along with the jurisdictional boundary of each of the Member

Agencies of MBGSA's JPA. Figure 2.1-01 demonstrates that the entire Basin is covered by MBGSA. Therefore, MBGSA has the legal authority to implement this GSP throughout the entire plan area.

Additionally, the City is currently in the planning and design phases for the proposed VenturaWaterPure Program, which includes diversion of tertiary treated effluent to a new Advanced Water Purification Facility for potable reuse. Construction of these Projects is expected to begin in 2023.

City of San Buenaventura

The City of San Buenaventura (usually referred to as Ventura), located on the shore of the Pacific Ocean in western Ventura County, was founded as a Spanish mission in 1782 and incorporated as a town in 1866 and is the county seat of Ventura County. The City administers land use within its municipal boundaries and is the largest land use jurisdiction within the Basin. Ventura Water (the City of Ventura's water and wastewater department) provides retail potable water service within the City limits and portions of unincorporated Ventura County that meet the City's policy for water connections outside City limits (Municipal Code Section 22.110.055). The City's potable water supply is derived from a variety of sources, including Mound Basin groundwater. Sources located outside of the Mound Basin include groundwater pumped from the adjacent Santa Paula and Oxnard Basins, subsurface water from the Ventura River (Upper Ventura River Valley Basin), and Lake Casitas (Casitas Municipal Water District [Casitas MWD]). The City also provides recycled water from the Ventura Water Reclamation Facility (VWRF). The City operates its water supply system by utilizing a conjunctive use operating procedure. The City relies more heavily on surface water sources (such as the Ventura River and Lake Casitas) during wet years while letting groundwater sources rest. During dry years, when the surface water sources are reduced, the City relies more heavily on groundwater sources to meet demands. Conjunctive use of groundwater sources is limited by the requirement to maintain long-term production from the groundwater basins within their safe or operational yield. Conjunctive use also requires treatment and blending ratios to meet water quality goals. The City also has an entitlement from the California State Water Project (SWP) of 10,000 acre-feet per year (AF/yr). To date the City has not received any of this water because there are no existing facilities to get the water directly into the City's distribution system. However, the City is currently working on the design of the State Water Interconnection Project that will enable the City to receive its State Water allocation through a connection to Calleguas Municipal Water District. Additionally, the City is currently in the planning and design phases for the proposed VenturaWaterPure Program, which includes diversion of tertiary treated effluent to a new Advanced Water Purification Facility for potable reuse. Construction of these Projects is expected to begin in 2023.

United Water Conservation District

In 1925, the founding organization of today's United Water Conservation District, the Santa Clara River Protection Association (Association), was formed to protect the runoff of the Santa Clara River from being exported outside the watershed. This effort was successful, and in 1927, the Association was reorganized into the Santa Clara Water Conservation District by vote of the county residents. In 1950, the voters approved the formation of the District under the State Water Conservation Act of 1931, as the United Water Conservation District, to recognize the projected population growth within the District and the need for a reliable water source. The Santa Clara Water Conservation District was then dissolved and the assets transferred to the District. This allowed the District to issue bonds in order to raise funding for construction of the Santa Felicia Dam, creating Lake Piru and other conservation facilities. The District is divided into seven divisions and is governed by an elected seven-member Board of Directors, serving four-year staggered terms.

The District covers approximately 214,000 acres in central Ventura County, California. The District's mission is to manage, protect, conserve, and enhance the water resources of the District and produce a reliable and sustainable supply of groundwater for the reasonable and beneficial use of all users. The District accomplished its mission by constructing, maintaining, and operating facilities along the Santa Clara River and its tributaries to replenishment to groundwater basins within its service area, including the Mound Basin.

Ventura County

The County of Ventura (County) was founded in 1873 and has a total area of 2,208 square miles. The County does not provide water service but does permit and regulate groundwater wells and staffs the Ventura County Watershed Protection District (VCWPD), which participates in countywide planning and management efforts on a variety of water resource programs, including water quality, storm water management, and flood control.

2.2 Description of Plan Area [§354.8]

This section provides a description of the Plan area, including a summary of jurisdictional areas and existing water-resources monitoring and management programs in Mound Basin.

2.2.1 Summary of Jurisdictional Areas and Other Features [§354.8(a)(1),(a)(2),(a)(3),(a)(4),(a)(5), and (b)]

§354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*

(a) *One or more maps of the basin that depict the following, as applicable:*

- ***(1)*** *The area covered by the Plan, delineating areas managed by the Agency as an exclusive Agency and any areas for which the Agency is not an exclusive Agency, and the name and location of any adjacent basins.*
- ***(2)*** *Adjudicated areas, other Agencies within the basin, and areas covered by an Alternative.*
- ***(3)*** *Jurisdictional boundaries of federal or state land (including the identity of the agency with jurisdiction over that land), tribal land, cities, counties, agencies with water management responsibilities, and areas covered by relevant general plans.*
- ***(4)*** *Existing land use designations and the identification of water use sector and water source type.*
- ***(5)*** *The density of wells per square mile, by dasymetric or similar mapping techniques, showing the general distribution of agricultural, industrial, and domestic water supply wells in the basin, including de minimis extractors, and the location and extent of communities dependent upon groundwater, utilizing data provided by the Department, as specified in Section 353.2, or the best available information.*

(b) *A written description of the Plan area, including a summary of the jurisdictional areas and other features depicted on the map.*

The geographic area covered by this GSP and managed by MBGSA includes the entire Mound Basin (DWR Basin No. 4-004.03), as defined by DWR Bulletin No. 118, "California's Groundwater," Update 2020 (DWR, 2021a). The extent of Mound Basin is shown on Figures 2.1-01 and 2.1-02. The Mound Basin is bordered by the Oxnard Subbasin (DWR Basin No. 4-004.02) to the south and the Santa Paula Subbasin (DWR Basin No. 4-004.04) to the east. The Oxnard Subbasin is managed by the Fox Canyon Groundwater Management Agency (FCGMA) pursuant to pre-SGMA legislation and SGMA. The Santa Paula Subbasin is adjudicated.

Figure 2.1-01 also delineates the jurisdictional boundaries of Ventura County, the City of San Buenaventura (Ventura), and other agencies with water management responsibilities in Mound Basin (specifically, United and Casitas MWD). Three of the four overlying agencies (Ventura County, City of Ventura, and United) are Member Agencies of the MBGSA JPA, as detailed in Section 2.1. More information about the water resource management roles of these agencies is provided in Section 2.2.2. There are no adjudicated areas located within the Mound Basin. State and Federal Land within the Mound Basin includes two State Beaches (San Buenaventura State Beach and McGrath State Beach [California Department of Parks and Recreation]) and The Channel Islands National Park Visitors Center (Department of Interior) (Figure2.1-03). The Mound Basin lies within the traditional tribal territory of the Chumash; however, there are no tribal trust lands located within the Basin.

Land use planning agencies in the Basin include the City of Ventura (within the City limits) and County of Ventura (unincorporated areas outside of the City limits) (Figure 2.1-03). The City of Oxnard overlies a very small area in the southwestern corner of the Basin and has land use planning jurisdiction there, although most of this area overlaps with McGrath State Beach (Figure 2.1-03). The Basin is covered by the general plans of the above-listed entities. Further details concerning land use are provided in Section 2.2.3.

The City of Ventura occupies much of the land area in Mound Basin and the single largest existing land use in the Basin (in terms of area) is low-density residential, as shown on Figure 2.1-03. Inspection of Figure 2.1-03 indicates that commercial, public/institutional, industrial, and related municipal land use designations also occupy much of Mound Basin. The water use sector for these land use designations is collectively referred to in this GSP as "municipal and industrial" (M&I). Sources of water for the M&I sector in Mound Basin include local groundwater pumped from City of Ventura wells in the Basin, groundwater pumped by the City of Ventura from the adjacent Santa Paula and Oxnard Basins, subsurface water pumped by the City from the Ventura River / the Upper Ventura River Basin (not an immediately adjacent basin), and surface water purchased from Casitas MWD. Details regarding sources and volumes of water used by the M&I and other sectors in Mound Basin is provided in Section 3.1.4.4.

Another water use sector and land use designation in Mound Basin is agricultural, which occupies three separate areas of farmland in the eastern and southwestern portions of Mound Basin (Figure 2.1-03). Sources of water for the agricultural sector in Mound Basin include local groundwater extracted from wells in the Basin and groundwater extracted from the adjacent Santa Paula and Oxnard basins.

The third major land use designation in Mound Basin is open space, consisting largely of undeveloped land in the Hillside Protection Area (Figure 2.1-03) in the foothills of the northern part of the Basin. Very little water is applied to land designated as open space in Mound Basin, although small quantities of water from the M&I sector may be applied to orchards, residential landscaping, and parks along the margins and within the open space-designated area.

Figure 2.2-04 shows the density of wells per square mile and locations of known agricultural and M&I water supply wells in the Basin. There are no known de minimis extractors in the Mound Basin. The communities within the Basin are partially dependent upon groundwater from the Mound Basin. The City of Ventura supplies water to the communities within the Basin and has a diverse water supply portfolio that includes groundwater and surface water supplies from outside of the Basin. Although Mound Basin groundwater is an important source of water supply for the communities located within the Basin, the communities are not considered to be exclusively dependent on Mound Basin groundwater because it is only one component of the City's water supply portfolio.

2.2.2 Water Resources Monitoring and Management Programs [§354.8(c) and (d)]

2.2.2.1 Existing Water Resource Monitoring Programs [§354.8(c) and (d)]

§354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*

(c) *Identification of existing water resource **monitoring** and management programs, and description of any such programs the Agency plans to incorporate in its monitoring network or in development of its Plan. The Agency may coordinate with existing water resource monitoring and management programs to incorporate and adopt that program as part of the Plan.*

(d) *A description of how existing water resource **monitoring** or management programs may limit operational flexibility in the basin, and how the Plan has been developed to adapt to those limits.*

Existing water resources monitoring programs are listed in Table 2.2-01.

The water resources monitoring programs that have significant relevance to this GSP are the United, Ventura Water, and VCWPD groundwater resource monitoring programs. Details regarding groundwater monitoring locations (i.e., wells) and parameters monitored by these agencies/programs are provided in Section 5. In summary, United monitors groundwater quality and/or elevations in 20 wells across Mound Basin, while Ventura Water monitors their two active M&I water supply wells in the Basin, and VCWPD variably monitors two to four wells (currently or formerly used for agricultural and industrial water supply) in the Basin. VCWPD is the California Statewide Groundwater Elevation Monitoring (CASGEM) monitoring entity for the Basin. VCWPD compiles the groundwater level data gathered by Ventura County staff with that gathered by other agencies and uploads the data to the CASGEM website in accordance with CASGEM program requirements. VCWPD will continue in this role and provide data consistent with the CASGEM program. The MBGSA plans to continue coordinating with these other programs/agencies to obtain groundwater elevation and quality data to support GSP development, monitoring, and annual reporting, as detailed in Section 5.

As described in more detail in Sections 3.1 and 3.3, surface water is not diverted for beneficial uses from surface water bodies located within the Mound Basin. VCWPD monitors rainfall and surface water flow in selected streams (barrancas) in Mound Basin, as described in more detail in Sections 3.1, 3.2, and 3.3. VCWPD also monitors surface water flow in the Santa Clara River in the Oxnard Basin approximately 1.5 miles upstream from Mound Basin, as described in Sections 3.2 and 3.3. The City of Ventura monitors surface water quality in the Santa Clara River Estuary, pursuant to the discharge permit for the VWRF.

The existing water resource monitoring programs do not limit operational flexibility in the Basin.

2.2.2.2 Existing Water Resource Management Programs [§354.8(c) and (d)]

§354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*

(c) *Identification of existing water resource monitoring and* ***management programs****, and description of any such programs the Agency plans to incorporate in its monitoring network or in development of its Plan. The Agency may coordinate with existing water resource monitoring and management programs to incorporate and adopt that program as part of the Plan.*

(d) *A description of how existing water resource monitoring or* ***management programs*** *may limit operational flexibility in the basin, and how the Plan has been developed to adapt to those limits.*

Existing water resources management programs within the Basin are listed in Table 2.2-02. The key existing water resource management programs are described below.

City of Ventura Urban Water Management Plan and Related Planning Programs

The City's Urban Water Management Plan (Kennedy/Jenks Consultants, 2021a) describes their existing and planned sources of water supply and demand, as well as their water management programs. The City's 2020 Comprehensive Water Resources Report (Ventura Water, 2020b) provides updated information and projections on impacts of the City's water resources management program. Another related planning document is the City's Water Shortage Event Contingency Plan (Kennedy/Jenks Consultants, 2021b), which identifies actions to be taken during the various stages of a water shortage. The City's Urban Water Management Plan and related documents contain certain elements that reduce the likelihood of exceedances of the City's Mound Basin groundwater extraction projections used in the development of this GSP:

- **Demand Management Measures**: Existing and planned water conservation measures within the City of Ventura have resulted in reductions in M&I water use in Mound Basin, as described in Section 3.3. This reduced demand has been incorporated into the projections for future water use in Mound Basin in this GSP.
- **Recycled Water Reuse**: The City currently distributes approximately 564 AF/yr of treated recycled water for landscape and golf course irrigation (Kennedy/Jenks Consultants, 2021a). The City is currently in the planning phases for the proposed VenturaWaterPure Project, which includes additional diversion of tertiary treated effluent to a new Advanced Water Purification Facility for potable reuse. The future water supply that will be provided by the VenturaWaterPure Project is projected to be 2,800 AF/yr after 2025 and 4,000 AF/yr after 2030 (Ventura Water, 2020b; Kennedy/Jenks Consultants 2021a).
- **State Water Interconnection Project**: The City has a 10,000 AF/yr allocation from the California SWP. To date, the City has not constructed the improvements necessary to receive direct delivery of its allocation. Ventura Water is pursuing the State Water Interconnection Project with Calleguas MWD, Casitas MWD, and United. The projected available water supply for SWP water delivered by the State Water Interconnection Project is estimated to be 2,075-10,000 AF in 2025 and 0-10,000 AF in 2030 (Ventura Water, 2020b).
- **Water Shortage Event Contingency Plan (Kennedy/Jenks Consultants, 2021b)**: This plan provides criteria for when and how voluntary and mandatory water use restrictions are implemented during droughts or other emergency occurred that limited availability of water

supply within the City's service area. The project will reduce the potential for increased City demand for Mound Basin groundwater.

The City of Ventura's Urban Water Management Plan (Kennedy/Jenks, 2021b) and related planning programs do not limit operational flexibility in the Basin.

Casitas MWD Urban Water Management and Agricultural Water Management Plan

Casitas MWD's 2020 update to its Urban Water Management and Agricultural Water Management Plan (Casitas MWD, 2021) describes their existing and planned sources of water supply and demand, as well as their water management programs. Casitas MWD provides surface water to the City of Ventura, some of which is imported to Mound Basin. Similar to the City of Ventura's Urban Water Management Plan, the Casitas MWD plan includes descriptions of their water-resource management programs, including:

- Water shortage contingency planning.
- Demand management measures.
- Planned expansion of their portfolio of water supplies (including imports from the California SWP).

Elements of Casitas MWD's Urban Water Management and Agricultural Water Management Plan were used to inform development of the City of Ventura's 2020 Comprehensive Water Resources Report (Ventura Water, 2020b), which in turn was used to project future water use in Mound Basin in this GSP.

Watersheds Coalition of Ventura County Integrated Regional Water Management Plan

The Integrated Regional Water Management Plan (IRWMP) prepared by the Watersheds Coalition of Ventura County (2019) includes several "resource management strategies" that have the potential to directly or indirectly affect water resources management in Ventura County, including the Santa Clara River Watershed and Mound Basin. Some of the management strategies listed in the IRWMP that could potentially affect water-resources management by the MBGSA include the following:

- **Reduce Water Demand**: Includes a list of agricultural water efficiency best-management practices (BMPs) for agriculture and notes that urban water use efficiency practices and standards are implemented by urban water suppliers in Urban Water Management Plans.
- **Improve Operational Efficiency and Transfers**: Summarizes the effects of conveyance projects (for importing water from other areas or within Mound Basin), system reoperation, and water transfers.
- **Increase Water Supply**: Describes the benefits of conjunctive-use projects, desalination of seawater or brackish water, precipitation enhancement, municipal recycled water use, surface storage.
- **Increase Water Supply**: Describes several actions or policies that can improve water quality, including drinking water treatment and distribution, groundwater and aquifer remediation, matching water quality to use, pollution prevention, salt and salinity management, and urban storm water runoff management.

- **Practice Resources Stewardship**: Provides definitions for, and summarizes benefits of, the following activities: agricultural lands stewardship, ecosystem restoration, forest management, land use planning and management, sediment management, and watershed management.
- **People and Water**: Describes approaches for engaging the public in water-resources management, including economic incentives, outreach and engagement, "water and culture," and water-dependent recreation.
- **Other Strategies**: Summarizes potential future sources of supply or strategies for improving water-resources management, including crop idling for water transfers, "dewvaporation" for atmospheric pressure desalination, fog collection, irrigated land retirement, "rainfed agriculture," snow fences (at higher elevations in the Santa Clara River watershed), and "waterbag" transport/storage technology (towing water by ship from other coastal regions in inflatable bladders).

These IRWMP management strategies are not anticipated to limit operational flexibility.

2.2.2.3 Conjunctive-Use Programs [§354.8(e)]

> **§354.8 Description of Plan Area.** *Each Plan shall include a description of the geographic areas covered, including the following information:*
> ***(e)*** *A description of conjunctive use programs in the basin.*

The City of Ventura's surface water imports to Mound Basin from Casitas MWD comprise a conjunctive-use program, as described in the Ventura Water (2020b) Comprehensive Water Resources Report:

> *"The City (of Ventura) operates its water supply system by utilizing a conjunctive use operating procedure. The City relies more heavily on surface water sources (such as the Ventura River and Lake Casitas) during wet years while letting groundwater sources rest. During dry years, when the surface water sources are reduced, the City relies more heavily on groundwater sources to meet demands. Conjunctive use of groundwater sources is limited by the requirement to maintain long-term production from the groundwater basins within their safe or operational yield. Conjunctive use also requires treatment and blending ratios to meet water quality goals."*

More detail regarding quantities and sources of Ventura Water's surface water use in Mound Basin is provided in Section 3.1 and 3.3. According to the Ventura Water (2020b) Comprehensive Water Resources Report, the City intends to continue their conjunctive use of surface water and groundwater into the foreseeable future. This conjunctive-use program has been incorporated into the projections for future water supply and demand in Mound Basin in this GSP.

United operates a conjunctive-use program in the Forebay area of the Oxnard Basin, adjacent to Mound Basin (Figure 2.1-02) consisting of artificial recharge of 60,000 to 70,000 AF/yr of surface water diverted from the Santa Clara River, followed by groundwater extraction by United and other groundwater users (United, 2018). As described in Section 3.3, artificial recharge by United during high-rainfall years raises groundwater levels in Oxnard Basin sufficiently to induce substantial volumes of groundwater underflow from Oxnard Basin to Mound Basin. This conjunctive-use program has been incorporated into the projected water budget for Mound Basin in this GSP (Section 3.3).

2.2.3 Land Use/General Plans

The Basin is dominated by residential, commercial, and industrial land uses located within incorporated areas of the City of Ventura and collectively accounts for approximately 58% of Basin land acreage (Figure 2.1-03). Residential uses vary between large rural parcels with few impervious surfaces to suburban and urban residential parcels associated with higher development densities and surrounded by more impervious surfaces, wider roads, and more sidewalks. Open space accounts for approximately 13% of Basin land acreage. The key area open space that is relevant to this GSP is the hillsides along the northern part of the Basin where the principal aquifers receive recharge (Figure 3.1-11). Agricultural land accounts for approximately 1,972 acres of the Basin (approximately 14% of the Basin land area) (Figure 2.1-03). Agricultural land is not located in any key Basin recharge areas.

2.2.3.1 Land Use and General Plans Summary [§354.8(f)(1),(f)(2),(f)(3), and (f)(5)]

§354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*

(f) *A plain language description of the land use elements or topic categories of applicable general plans that includes the following:*

- ***(1)*** *A summary of general plans and other land use plans governing the basin.*
- ***(2)*** *A general description of how implementation of existing land use plans may change water demands within the basin or affect the ability of the Agency to achieve sustainable groundwater management over the planning and implementation horizon, and how the Plan addresses those potential effects.*
- ***(3)*** *A general description of how implementation of the Plan may affect the water supply assumptions of relevant land use plans over the planning and implementation horizon.*
- ***(5)*** *To the extent known, the Agency may include information regarding the implementation of land use plans outside the basin that could affect the ability of the Agency to achieve sustainable groundwater management.*

California state law requires that cities and counties prepare and adopt a "comprehensive long-term general plan for the physical development of the county or city" and that "elements and parts [of the plan] comprise an integrated, internally consistent and compatible statement of policies for the adopting agency" (California Government Code, §65300 and §65300.5). Among the required elements of the plan is the conservation, development, and utilization of water developed in coordination with groundwater agencies such as MBGSA (California Government Code, §65302[d][1]).

All existing general plans and future updates undergo an analysis of environmental impacts under the California Environmental Quality Act (CEQA). In addition, all discretionary projects proposed within the Mound Basin under municipal, County, and/or state jurisdiction are required to comply with CEQA. In 2019, the Governor's Office of Planning and Research released an update to the CEQA Guidelines that included a new requirement to analyze projects for their compliance with adopted GSPs. Specifically, the applicable significance criteria include the following:

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

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

The following sections contain a description of the land use plans that are applicable to sustainable groundwater management planning within the Mound Basin, a discussion of the consideration given to the land use plans, and an assessment of how the GSP may affect those plans. The plans included were selected as the plans with the most salient information relating to sustainable management. General plans are considered applicable to the GSP to the extent that they may change water demands within the Mound Basin or affect the ability of the GSA to achieve sustainable groundwater management over the planning and implementation horizon.

General Plans applicable to the Mound Basin are the City of Ventura General Plan (City of Ventura, 2005) and the Ventura County General Plan (County of Ventura, 2020). Most of the Basin falls within incorporated areas of the City of Ventura (Figure 2.1-01). The unincorporated areas within the Basin include mostly agricultural land use and open space that fall under the County of Ventura's General Plan, although the agricultural areas also fall within the planning area addressed in the City of Ventura's General Plan. A small area (0.5 square miles) of the Basin falls within the City of Oxnard's planning area, but implementation of this general plan (City of Oxnard, 2014) is expected to have a negligible effect on GSP implementation in the Mound Basin.

In addition to the General Plans, it is important to understand that the agricultural land and open space in the Basin lies is subject to the City of Ventura and County of Ventura Save Open Space and Agricultural Resources (SOAR) voter initiatives currently approved through 2050 (SOAR, 2015). The SOAR initiatives require a majority vote of the people to rezone unincorporated open space, agricultural, or rural land for development. In addition to the SOAR initiatives, the City of Ventura Hillside Voter Participation Area Act (HVPAA), also approved through 2050, requires voter approvals for development or the extension of City urban services into the hillsides. The existence of the SOAR and HVPPA make it very unlikely that a material change in land use will occur during the foreseeable future. Because agricultural land and open space is not expected to convert to other uses, it is assumed that there is little potential for new development that could impact basin recharge or water demands. These assumptions will be revisited during each 5-year GSP assessment.

2005 Ventura General Plan

The current version of the City of Ventura's General Plan was adopted in 2005 (City of Ventura, 2005), which has a planning horizon of 2025. The City of Ventura launched the first phase to update its General Plan in November 2020.

Most of the Basin falls within the incorporated limits of the City of Ventura, which consists of predominantly residential, commercial, and industrial land uses (Figure 2.1-03). Present City policy does not include specific growth targets and instead promotes a “Smart Growth” approach that emphasizes creating a “well-planned and designed community” and preserving open space and farmland. The plan calls for measured and appropriate growth in Ventura by prioritizing areas appropriate for additional development based on community values and infrastructure potential. Importantly, the plan emphasizes an “Infill First” strategy to help avoid sacrificing farmland and sensitive areas in hillsides, which lie predominantly at the edges of the City. Most growth is anticipated to occur within the existing City limits in the “Infill” areas. The development potential within the remainder of the City is very limited. Growth in open space and agricultural areas is unlikely to occur given the City’s General Plan policies and the involvement of groups such as SOAR and HVPPA.

As of December 2019, there are 47 infill development projects that are either approved or under construction. The estimated water demand for these projects is 921 AF/yr, and these demands are included into City’s forecasts cited elsewhere in this GSP. Going forward, development is not expected to impact water demand for groundwater in the Mound Basin because the City’s Water Rights Dedication and Water Resource Net Zero Fee Ordinance and Resolution (“Net Zero Policy”) adopted June 6, 2016, requires all new and intensified development to offset the demand associated with its impact on the City’s potable water system.

Offsets can take the form of water rights dedication (i.e. transfer existing rights to extract groundwater from the Mound Basin or the adjacent Oxnard or Santa Paula basins) or payment of a fee that funds development of new City water supplies. Future water supplies include VenturaWaterPure (potable reuse of advanced treated tertiary treated effluent from the VWRF and an interconnection with Calleguas MWD that will allow the City to access its 10,000 AF/yr Table A entitlement from the California SWP. Infill development is expected to have a very small impact on groundwater because the total area with infill potential is small, infill areas are not located in the principal recharge area of the Basin, and because the General Plan includes a policy to helps maintain groundwater recharge:

- <u>Action 5.16</u>: Require new developments to incorporate storm water treatment practices that allow percolation to the underlying aquifer and minimize offsite surface runoff utilizing methods such as pervious paving material for parking and other paved areas to facilitate rainwater percolation and retention/detention basins that limit runoff to pre-development levels.

Approximately 556 acres of agricultural lands within the Basin is located within the City’s sphere of influence in the eastern part of the Basin (approximately 4% of the Basin land area) (Figure 2.1-01). Another 1,267 acres of agricultural land within the Basin is located outside of the City’s sphere of influence in the western part of the Basin (approximately 9% of the Basin land area) (Figure 2.1-01).

The City of Ventura’s General Plan (City of Ventura, 2005) includes numerous elements that discourage development of agricultural land:

- **Policy 3C**: Maximize use of land in the city before considering expansion
- **Action 3.14**: Utilize infill, to the extent possible
- **Policy 3D**: Continue to preserve agricultural and other open space lands within the City’s Planning Area

- **Action 3.20**: Pursuant to SOAR, adopt development code provisions to "preserve agricultural and open space lands as a desirable means of shaping the City's internal and external form and size, and of serving the needs of the residents.

The key area open space that is relevant to this GSP is the hillsides along the northern part of the Basin where the principal aquifers receive recharge (Figure 3.1-11). The hillsides open space lies predominantly outside of the incorporated limits of the City and the City's sphere of influence (Figure 2.1-01). Nonetheless, the City's General Plan includes numerous elements that discourage development in this area:

- **Policy 1B**: Increase the area of open space protected from development impacts.
- **Action 1.12**: Update the provisions of the Hillside Management Program as necessary to ensure protection of open space lands.
- **Action 1.13**: Recommend that the City's Sphere of Influence boundary be coterminous with the existing City limits in the hillsides in order to preserve the hillsides as open space.
- **Action 1.14**: Work with established land conservation organizations toward establishing a Ventura hillsides preserve.
- **Action 1.15**: Actively seek local, State, and federal funding sources to achieve preservation of the hillsides.

As mentioned earlier, the existence of the SOAR and HVPPA make it very unlikely that a material amount of open space or agricultural land will be developed during the foreseeable future. Because agricultural land and open space is not expected to convert to other uses, it is assumed that there is little potential for new development in these areas that could impact basin recharge or water demands. These assumptions will be revisited during each 5-year GSP assessment.

County of Ventura 2040 General Plan

The Ventura County 2040 General Plan (County of Ventura, 2020) applies to the County as a whole and includes area-specific plans for distinct unincorporated areas.

The key recharge area that is relevant to this GSP is the open space on the hillsides along the northern part of the Basin where the principal aquifers receive recharge (Figure 3.1-11). The hillsides open space lies predominantly outside of the incorporated limits of the City and the City's sphere of influence and is included in the Ventura County 2040 General Plan (Figure 2.1-01).

The Ventura County 2040 General Plan also applies to the approximate 1,267 acres of agricultural land located outside of the City and its sphere of influence in the western part of the Basin (Figure 2.1-01). Although these open space and agricultural areas are located outside of the City's sphere of includes, any future development would very likely involve annexation to the City. The County's General Plan includes numerous elements that discourage development in the open space and agricultural areas and/or continued viability of agricultural activities on agricultural land.

Guiding Principle - Land Use and Community Character: Direct urban growth away from agricultural, rural, and open space lands, in favor of locating it in cities and unincorporated communities where public facilities, services, and infrastructure are available or can be provided.

Guiding Principle - Conservation and Open Space: Conserve and manage the County's open spaces and natural resources, including soils, water, air quality, minerals, biological resources, scenic resources, as well as historic and cultural resources.

Guiding Principle - Agriculture: Promote the economic vitality and environmental sustainability of Ventura County's agricultural economy by conserving soils/land while supporting a diverse and globally competitive agricultural industry that depends on the availability of water, land, and farmworker housing.

WR-6: To sustain the agricultural sector by ensuring an adequate water supply through water efficiency and conservation.

WR-6.1 - Water for Agricultural Uses: The County should support the appropriate agencies in their efforts to effectively manage and enhance water quantity and quality to ensure long-term, adequate availability of high quality and economically viable water for agricultural uses, consistent with water use efficiency programs.

WR-6.2 Agricultural Water Efficiency: The County should support programs designed to increase agricultural water use efficiency and secure long-term water supplies for agriculture.

WR-6.3 Reclaimed Water Use: The County should encourage the use of reclaimed irrigation water and treated urban wastewater for agricultural irrigation in accordance with federal and state requirements in order to conserve untreated groundwater and potable water supplies.

from the Ventura County 2040 General Plan

The Ventura County 2040 General Plan includes a Saticoy Area Plan for the unincorporated community of Saticoy located at the southeastern "tip" of the Basin (Figure 2.1-03). Saticoy is already largely developed (residential and industrial); thus, the Saticoy Area Plan focuses on redevelopment aspects. Saticoy's water service is provided by the City of Ventura. Thus, City of Ventura water supply policies apply in Saticoy, meaning that any new or intensified development would be required to be water neutral. The Saticoy Area overlaps with a very small area of the Basin and is not located in a key recharge area. Based on the foregoing, land use planning in the Saticoy Area will not have a significant impact in this GSP.

The Ventura County 2040 General Plan (County of Ventura, 2020) includes numerous elements designed to facilitate coordinated planning with MBGSA, maintain groundwater recharge, protect groundwater quality, and conserve groundwater resources.

WR-1: To effectively manage water supply by adequately planning for the development, conservation, and protection of water resources for present and future generations.

WR-1.1 - Sustainable Water Supply: The County should encourage water suppliers, groundwater management agencies, and groundwater sustainability agencies to inventory and monitor the quantity and quality of the county's water resources, and to identify and implement measures to ensure a sustainable water supply to serve all existing and future residents, businesses, agriculture, government, and the environment.

WR-1.2 - Watershed Planning: The County shall consider the location of a discretionary project within a watershed to determine whether or not it could negatively impact a water source. As part of discretionary project review, the County shall also consider local watershed management plans when considering land use development.

WR-1.3 - Portfolio of Water Sources: The County shall support the use of, conveyance of, and seek to secure water from varied sources that contribute to a diverse water supply portfolio. The water supply portfolio may include, but is not limited to, imported water, surface water, groundwater, treated brackish groundwater, desalinated seawater, recycled water, and storm water where economically feasible and protective of the environmental and public health.

WR-1.4 - State Water Sources: The County shall continue to support the conveyance of, and seek to secure water from, state sources.

WR-1.5 - Agency Collaboration: The County shall participate in regional committees to coordinate planning efforts for water and land use that is consistent with the Urban Water Management Planning Act, Sustainable Groundwater Management Act, the local Integrated Regional Water Management Plan, and the Countywide National Pollutant Discharge Elimination System Permit (storm water and runoff management and reuse).

WR-1.6 - Water Supplier Cooperation: The County shall encourage the continued cooperation among water suppliers in the county, through entities such as the Association of Water Agencies of Ventura County and the Watersheds Coalition of Ventura County, to ensure immediate and long-term water needs are met efficiently.

WR-1.7 - Water Supply Inter-Ties: The County shall encourage the continued cooperation among water suppliers in the county, through entities such as Association of Water Agencies of Ventura County and the Watersheds Coalition of Ventura County, to establish and maintain emergency inter-tie projects among water suppliers.

WR-1.9 - Groundwater Basin Use for Water Storage: Where technically feasible, the County shall support the use of groundwater basins for water storage.

WR-1.10 - Integrated Regional Water Management Plan: The County shall continue to support and participate with the Watersheds Coalition of Ventura County in implementing and regularly updating the Integrated Regional Water Management Plan.

WR-1.11 - Adequate Water for Discretionary Development: The County shall require all discretionary development to demonstrate an adequate long-term supply of water.

WR-1.12 - Water Quality Protection for Discretionary Development: The County shall evaluate the potential for discretionary development to cause deposition and discharge of sediment, debris, waste and other pollutants into surface runoff, drainage systems, surface water bodies, and groundwater. The County shall require discretionary development to minimize potential deposition and discharge through point source controls, storm water treatment, runoff reduction measures, best management practices, and low impact development.

WR-1.14 - Discretionary Development and Conditions of Approval: Golf Course Irrigation: The County shall require that discretionary development for new golf courses shall be subject to conditions of approval that prohibit landscape irrigation with water from groundwater basins or inland surface waters identified as Municipal and Domestic Supply or Agricultural Supply in the California Regional Water Quality Control Board's Water Quality Control Plan unless:

1. The existing and planned water supplies for a Hydrologic Area, including interrelated Hydrologic Areas and Subareas, are shown to be adequate to meet the projected demands for existing uses as well as reasonably foreseeable probable future uses within the area; and
2. It is demonstrated that the total groundwater extraction/recharge for the golf course will be equal to or less than the historic groundwater extraction/recharge for the site as defined in the County Initial Study Assessment Guidelines.

Further, where feasible, reclaimed water shall be utilized for new golf courses.

WR-2: To implement practices and designs that improve and protect water resources.

WR-2.1 - Identify and Eliminate of Sources of Water Pollution: The County shall cooperate with Federal, State and local agencies in identifying and eliminating or minimizing all sources of existing and potential point and non-point sources of pollution to ground and surface waters, including leaking fuel tanks, discharges from storm drains, dump sites, sanitary waste systems, parking lots, roadways, and mining operations.

WR-2.2 - Water Quality Protection for Discretionary Development: The County shall evaluate the potential for discretionary development to cause deposition and discharge of sediment, debris, waste, and other contaminants into surface runoff, drainage systems, surface water bodies, and groundwater. In addition, the County shall evaluate the potential for discretionary development to limit or otherwise impair later reuse or reclamation of wastewater or storm water. The County shall require discretionary development to minimize potential deposition and discharge through point source controls, storm water treatment, runoff reduction measures, best management practices, and low impact development.

WR-2.3 - Discretionary Development Subject to CEQA Statement of Overriding Considerations – Water Quality and Quantity: The County shall require that discretionary development not significantly impact the quality or quantity of water resources within watersheds, groundwater recharge areas or groundwater basins.

WR-3: To promote efficient use of water resources through water conservation, protection, and restoration.

WR-3.1 - Non-Potable Water Use: The County shall encourage the use of non-potable water, such as tertiary treated wastewater and household graywater, for industrial, agricultural, environmental, and landscaping needs consistent with appropriate regulations.

WR-3.2 - Water Use Efficiency for Discretionary Development: The County shall require the use of water conservation techniques for discretionary development, as appropriate. Such techniques include low-flow plumbing fixtures in new construction that meet or exceed the California Plumbing Code, use of graywater or reclaimed water for landscaping, retention of storm water runoff for direct use and/or groundwater recharge, and landscape water efficiency standards that meet or exceed the standards in the California Model Water Efficiency Landscape Ordinance.

WR-3.3 - Low-Impact Development: The County shall require discretionary development to incorporate low impact development design features and best management practices, including integration of storm water capture facilities, consistent with County's Storm water Permit.

WR-3.4 - Reduce Potable Water Use: The County shall strive for efficient use of potable water in County buildings and facilities through conservation measures, and technological advancements.

WR-4: To maintain and restore the chemical, physical, and biological integrity and quantity of groundwater resources.

WR-4.1 - Groundwater Management: The County shall work with water suppliers, water users, groundwater management agencies, and groundwater sustainability agencies to implement the Sustainable Groundwater Management Act (SGMA) and manage groundwater resources within the sustainable yield of each basin to ensure that county residents, businesses, agriculture, government, and the environment have reliable, high-quality groundwater to serve existing and planned land uses during prolonged drought years.

WR-4.2 - Important Groundwater Recharge Area Protection: In areas identified as important recharge areas by the County or the applicable Groundwater Sustainability Agency, the County shall condition discretionary development to limit impervious surfaces where feasible and shall require mitigation in cases where there is the potential for discharge of harmful pollutants within important groundwater recharge areas.

WR-4.3 - Groundwater Recharge Projects: The County shall support groundwater recharge and multi-benefit projects consistent with the Sustainable Groundwater Management Act and the Integrated Regional Water Management Plan to ensure the long-term sustainability of groundwater.

WR-4.4 - In-Stream and Recycled Water Use for Groundwater Recharge: The County shall encourage the use of in-stream water flow and recycled water for groundwater recharge while balancing the needs of urban and agricultural uses, and healthy ecosystems, including in-stream waterflows needed for endangered species protection.

WR-4.5 - Discretionary Development Subject to CEQA Statement of Overriding Considerations – Water Quantity and Quality: The County shall require that discretionary development shall not significantly impact the quantity or quality of water resources within watersheds, groundwater recharge areas or groundwater basins.

WR-4.7 - Discretionary Development and Conditions of Approval – Oil, Gas, and Water Wells: The County shall require that discretionary development be subject to conditions of approval requiring proper drilling and construction of new oil, gas, and water wells and removal and plugging of all abandoned wells on-site.

WR-4.8 - New Water Wells: The County shall require all new water wells located within Groundwater Sustainability Agency (GSA) boundaries to be compliant with GSAs and adopted Groundwater Sustainability Plans (GSPs).

WR-5: To protect and, where feasible, enhance watersheds and aquifer recharge areas through integration of multiple facets of watershed-based approaches.

WR-5.1 - Integrated Watershed Management: The County shall work with water suppliers, Groundwater Sustainability Agencies (GSAs), wastewater utilities, and storm water management entities to manage and enhance the shift toward integrated management of surface and groundwater, storm water treatment and use, recycled water and conservation, and desalination.

WR-5.2 - Watershed Management Funding: The County shall continue to seek funding and support coordination of watershed planning and watershed-level project implementation to protect and enhance local watersheds.

WR-7.1 - Water for the Environment: The County shall encourage the appropriate agencies to effectively manage water quantity and quality to address long-term adequate availability of water for environmental purposes, including maintenance of existing groundwater-dependent habitats and in-stream flows needed for riparian habitats and species protection.

from the Ventura County 2040 General Plan

City of Oxnard 2030 General Plan

A small area (0.5 square miles) in the southwestern corner the Basin lies within the City of Oxnard's planning boundary (Figure 2.1-01) (City of Oxnard, 2014). This area consists of the last approximately 1 mile of the Santa Clara River, including its estuary. This area is designated "Resource Protection" and "Recreation" (a small area lies within the McGrath State Beach). Due to the very small area and the land use designations, it is very unlikely that the land use in this area will change or that groundwater wells would be drilled. Based on the foregoing, it appears this area will not have a material impact on this GSP; and, for this reason, the City of Oxnard's General Plan is not discussed further in this GSP.

2.2.3.1.1 How Land Use Plans May Impact Water Demands and Sustainable Groundwater Management [§354.8(f)(2)]

§354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*

(f) *A plain language description of the land use elements or topic categories of applicable general plans that includes the following:*

(2) *A general description of how implementation of existing land use plans may change water demands within the basin or affect the ability of the Agency to achieve sustainable groundwater management over the planning and implementation horizon, and how the Plan addresses those potential effects.*

This GSP is not anticipated to be impacted by the City of Ventura or County of Ventura land use plans. The general plans already include policies that protect the key recharge area in the Basin (open space in the hillsides along the northern part of the Basin). Open space in the key recharge area is further protected from development by SOAR and HVPPA. Development allowed pursuant to the general plans will not create new demands for Mound Basin groundwater because growth will likely occur within the City of Ventura (within incorporated area or through annexation), making it subject to the City's Net Zero Policy. The Net Zero Policy requires that new water demands for development projects be met by a dedication of an existing water right (i.e. transfer existing rights to extract groundwater from the Mound Basin or the adjacent Oxnard or Santa Clara basins) or payment of a fee that funds development of new City water supplies. Future City of Ventura water supplies under development include VenturaWaterPure (potable reuse of advanced treated tertiary treated effluent from the VWRF) and an interconnection with Calleguas MWD that will allow the City to access its 10,000 AF/yr Table A entitlement from the California SWP.

2.2.3.1.2 How Sustainable Groundwater Management May Affect Water Supply Assumptions of Land Use Plans [§354.8(f)(3)]

§354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*
(f) *A plain language description of the land use elements or topic categories of applicable general plans that includes the following:*
(3) *A general description of how implementation of the Plan may affect the water supply assumptions of relevant land use plans over the planning and implementation horizon.*

This GSP is not anticipated to impact land use plans by the City or County of Ventura because the estimated sustainable yield of the Basin is sufficient to supply planned groundwater extraction in the Basin, and any new water demands resulting from development will be offset pursuant to the City of Ventura's Net Zero Policy by dedication of an existing water right (i.e. transfer existing rights to extract groundwater from the Mound Basin or the adjacent Oxnard or Santa Clara basins) or payment of a fee that funds development of new City water supplies. In short, land use planning for the Mound Basin is not constrained by the Mound Basin sustainable yield.

The GSP will not impact land use plans elements that address recharge areas because the key recharge area is open space in the hillsides along the northern part of the Basin that is already protected from development by City of Ventura and County of Ventura General Plan policies, SOAR, and HVPPA.

2.2.3.1.3 Impact of Land Use Plans Outside of Basin on Sustainable Groundwater Management [§354.8(f)(5)]

§354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*
(f) *A plain language description of the land use elements or topic categories of applicable general plans that includes the following:*
(5) *To the extent known, the Agency may include information regarding the implementation of land use plans outside the basin that could affect the ability of the Agency to achieve sustainable groundwater management.*

Land use planning for the areas immediately surrounding Mound Basin is addressed in the Ventura County 2040 General Plan (County of Ventura, 2020), described in Section 2.2.3.1. This GSP is not anticipated to be impacted by the County of Ventura 2040 General Plan for the same reasons described in Section 2.2.3.1.1.

2.2.3.2 Well Permitting [§354.8(f)(4)]

§354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*
(f) *A plain language description of the land use elements or topic categories of applicable general plans that includes the following:*
(4) *A summary of the process for permitting new or replacement wells in the basin, including adopted standards in local well ordinances, zoning codes, and policies contained in adopted land use plans.*

Water well permits are obtained from the Ventura County Groundwater Section, a division of Ventura County Public Works Department. Water well permits are issued pursuant to the requirements of Ventura County Water Well Ordinance No. 4468. The Ventura County Groundwater Section oversees compliance with County Water Well Ordinance No. 4468 which is inclusive of California's Water Well Standards Bulletins 74-9, 74-81, and 74-90. Additionally, groundwater production wells within the City limits of the City of Ventura require a water well agreement with the City of Ventura pursuant to Chapter 8.150 of the San Buenaventura Municipal Code. The Ventura County Groundwater Section monitors and enforces these standards by requiring drilling contractors with a valid C-57 license to submit permit applications for the construction, modification, reconstruction (i.e., deepening), or destruction of any well within their jurisdiction and through inspections. Pursuant to the County of Ventura 2040 General Plan (County of Ventura, 2020), Ventura County Groundwater Section will review the MBGSA's GSP and related resolutions and ordinances to ensure the compliance with MBSGA requirements prior to issuing a water well permit within the boundary of the Mound Basin.

In addition to County Water Well Ordinance 4468, the County of Ventura 2040 General Plan includes the following policies on well permitting:

- **WR-4.7 - Discretionary Development and Conditions of Approval – Oil, Gas, and Water Wells**: The County shall require that discretionary development be subject to conditions of approval requiring proper drilling and construction of new oil, gas, and water wells and removal and plugging of all abandoned wells on-site.
- **WR-4.8 - New Water Wells**: The County shall require all new water wells located within Groundwater Sustainability Agency (GSA) boundaries to be compliant with GSAs and adopted Groundwater Sustainability Plans (GSPs).

2.2.4 Additional Plan Elements [§354.8(g)]

§354.8 Description of Plan Area. *Each Plan shall include a description of the geographic areas covered, including the following information:*
(g) *A description of any of the additional Plan elements included in Water Code Section 10727.4 that the Agency determines to be appropriate.*

GSP Emergency Regulations [§354.8(g) allows GSAs to include certain "additional plan elements" in the GSP, including:

(a) Control of saline water intrusion.

(b) Wellhead protection areas and recharge areas

(c) Migration of contaminated groundwater.

(d) A well abandonment and well destruction program.

(e) Replenishment of groundwater extractions.

(f) Activities implementing, opportunities for, and removing impediments to, conjunctive use or underground storage.

(g) Well construction policies.

(h) Measures addressing groundwater contamination cleanup, groundwater recharge, in-lieu use, diversions to storage, conservation, water recycling, conveyance, and extraction projects.

(i) Efficient water management practices, as defined in §10902 , for the delivery of water and water conservation methods to improve the efficiency of water use.

(j) Efforts to develop relationships with state and federal regulatory agencies.

(k) Processes to review land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity.

(l) Impacts on groundwater-dependent ecosystems (GDEs).

MBGSA determined that the following additional plan elements are appropriate to include in this GSP:

- (d) Well Destruction Program: MBGSA will seek to destroy improperly abandoned or constructed wells that act as conduits for migration of poor-quality water from shallow water-bearing units into the principal aquifers. This additional plan element is included in the groundwater quality protection measures management action, which is described in Section 6.5.
- (g) Well Construction Policies: MBGSA will coordinate with the County of Ventura to ensure new wells are properly constructed to prevent migration of poor-quality water from shallow water-bearing units into the principal aquifers. This additional plan element is included in the groundwater quality protection measures management action, which is described in Section 6.5.
- (j) Efficient water management practices, as defined in §10902 , for the delivery of water and water conservation methods to improve the efficiency of water use: MBGSA will seek opportunities to encourage, promote, and support efforts to increase agricultural water use efficiency.
- (k) Processes to review land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity: MBGSA will coordinate with the City of Ventura concerning its General Plan update initiated in November 2020. MBGSA will participate in future general plan updates by the County of Ventura and City of Ventura.

2.3 Notice and Communication [§354.10]

Mound Basin is a relatively small basin with only 26 active wells extracting an average of approximately 6,300 AF/yr. Twenty-two wells supply agricultural beneficial users who formed the Mound Basin Agricultural Water Group (MBAWG) to provide organized input on the GSP. MBAWG selects the Agricultural Stakeholder Director on the MBGSA Board of Directors and the Agency's Stakeholder Engagement Plan (SEP) (Appendix D) specifically charges the Agricultural Stakeholder Director with engaging the Basin's agricultural users of groundwater and representing their interests before the Agency. The remaining wells supply municipal and industrial uses, chiefly the City of Ventura, which has a Director seat on the MBGSA Board of Directors. Thus, all the groundwater users in the Basin except the two industrial well owners have direct representation in the SGMA process by virtue of a director on the MBGSA Board of Directors. There are no active or recently active domestic wells in the Basin. All potable water in the Basin, including that used by disadvantaged communities (DACs) is supplied by the City of Ventura.

In addition to the high degree of direct stakeholder representation on the MBGSA Board of Directors, the MBGSA found it important to develop and implement a SEP to seek, encourage, and consider as much public input on the GSP as possible and to ensure compliance with SGMA requirements (Appendix D). The SEP is tailored to the specific stakeholder landscape of the Basin. The SEP encourages the active involvement of individual stakeholders and stakeholder organizations and other interested parties in the development and implementation of the GSP for the Mound Basin (Appendix D). The SEP was designed and developed to ensure compliance with Water Code §10723.2, which requires GSA to "consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans." The SEP identifies stakeholders, stakeholder outreach and engagement methodologies, opportunities for integration with other overlapping local programs and planning processes, and the public meeting process used by the GSA. The SEP guides notice and communication activities during GSP development and will continue to serve as a guide during GSP implementation. The following subsections provide a summary of information relating to notification and communication by MBGSA with other agencies and interested parties, as required by the GSP Emergency Regulations.

2.3.1 Beneficial Uses and Users [§354.10(a)]

> **§354.10 Notice and Communication.** *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*
>
> ***(a)*** *A description of the beneficial uses and users of groundwater in the basin, including the land uses and property interests potentially affected by the use of groundwater in the basin, the types of parties representing those interests, and the nature of consultation with those parties.*

Water Code §10723.2 requires MBGSA to consider the interests of all beneficial uses and users of groundwater within the Basin. These interests are listed below with a description of the nature of MBGSA's consultation with them.

- **Holders of Overlying Groundwater Rights:**
  - **Agricultural Users**: There are agricultural users of groundwater operating on land overlying the Basin. To account for these users' interests, the Agency designated a seat on its five-member governing board to be filled by an Agricultural Stakeholder Director. The Agricultural Stakeholder Director is appointed from nominations received by MBAWG or the Ventura County Farm Bureau. The Agricultural Stakeholder Director is responsible for engaging the Basin's agricultural users of groundwater and representing their interests before the Agency.
  - **Domestic Well Owners**: No domestic wells were identified during development of the GSP, as confirmed by the County of Ventura, the local well permitting agency. The lack of domestic wells is likely due to the availability of potable water from Ventura Water (City of Ventura) and the significant expense required to drill a domestic water supply well to the depth required to reach a principal aquifer in Mound Basin. Available data suggest that shallow groundwater above the principal aquifers is not suitable for potable use (Figures

3.1-21 and -22). For these reasons, it is not anticipated that domestic wells will be drilled in the future.

- **Industrial Users**: Two industrial wells have been identified in the Basin: Saticoy Lemon Association (lemon-packing facility cooperative) and Ivy Lawn Cemetery Association. Given Saticoy Lemon Association's ties to agriculture, the Agricultural Stakeholder Director is responsible for engaging this stakeholder. The Executive Director is responsible for engaging Ivy Lawn Memorial Park and met with its Board on February 19, 2020.
- **Other Users**: The County of Ventura operates a well for landscape irrigation at the County Government Center. The County is represented on the Agency's Board of Directors.

- **Municipal Well Operators:** The Agency is a JPA created by three local public agencies. One of the Agency's signatory members, the City of San Buenaventura, operates municipal wells within the Basin and is represented on the Agency's Board of Directors.
- **Public Water Systems:**
  - Ventura Water (City of San Buenaventura) operates a public water system serving residents and business within and surrounding the City. The City of San Buenaventura is a signatory member to the JPA Agreement forming the Agency and is represented on the Agency's Board of Directors.
  - Casitas MWD is a wholesale water agency that provides a portion of the potable water supplied by Ventura Water within the Basin. Casitas MWD's service area overlaps with a western portion of the Basin. However, Casitas MWD does not operate any facilities in the Basin because Ventura Water's connection to Casitas MWD is located several miles north of the Basin.
- **Local Land Use Planning Agencies:**
  - The County of Ventura has land use planning authority on unincorporated land overlying the Basin (Figure 2.1-01). The County is a signatory member to the MBGSA JPA Agreement and is represented on the Agency's Board of Directors.
  - The City of Ventura has land use planning authority on incorporated land overlying the Basin (Figure 2.1-01). The City is a signatory member to the MBGSA JPA Agreement and is represented on the Agency's Board of Directors.
  - The City of Oxnard has land use planning authority over a small (0.5 square miles) area in the southwestern corner the Basin (Figure 2.1-01). This area consists of the last approximately 1 mile of the Santa Clara River, including its estuary. This area is designated "Resource Protection" and "Recreation" (a small area lies within the McGrath State Beach). Due to the very small area and the land use designations, it is very unlikely that the land use in this area will change or that groundwater wells would be drilled. Thus, MBGSA concluded that the land use planning by the City of Oxnard will not have a material impact on this GSP.
- **Environmental Users of Groundwater:** There are several environmental organizations dedicated to preserving and maintaining environmental values operating within the boundaries of the Basin. To account for these users' interests, the Agency designated a seat on its five-

member governing board to be filled by an Environmental Stakeholder Director. The Environmental Stakeholder Director is appointed from nominations received from local environmental nonprofit organizations supportive of the Basin's groundwater sustainability. The Environmental Stakeholder Director is responsible for engaging stakeholders within the Basin and representing environmental interests before the Agency.

  - Environmental beneficial uses in the Basin include instream flow uses in interconnected reaches of the lower Santa Clara River and its Estuary and the associated GDE identified as GDE Area 11. However, these beneficial uses are not impacted by groundwater extraction because there is no groundwater extraction from the shallow groundwater units (a.k.a. Shallow Alluvial Deposits) and groundwater extraction from principal aquifers (Mugu and Hueneme aquifers) does not materially influence shallow groundwater levels or surface water flows (see Appendix G for explanation).

- **Surface Water Users:** There are no permitted or licensed surface water diversions in the Basin. Instream beneficial uses are described in the preceding bullet.
- **The Federal Government:** Not applicable because there is no federal land within the Basin.
- **California Native American Tribes:** The Mound Basin lies within the traditional tribal territory of the Chumash; however, there are no tribal trust lands located within the Basin. The Agency ensured that a representative of overlying California Native American tribes was on the Agency's interested parties list, in order to receive notices of all Agency meetings and other stakeholder involvement opportunities.
- **Disadvantaged Communities:** There are no domestic wells, community water supply wells, or mutual water companies serving water to DACs or Severely Disadvantaged Communities (SDACs) in the Basin. The City of Ventura (Ventura Water) serves the areas indicated by DWR as DACs and SDACs. As the water supplier for DACs/SDACs in the Basin, the City represented DAC/SDAC interests through its participate on the MBGSA Board of Directors. In addition, direct outreach to DACs/SDACs was accomplished via Ventura Water bill stuffers and newsletters, including materials provided in Spanish.
- **Entities listed in §10927 that Monitor and Report Groundwater Elevations:**
  - The County of Ventura is the designated CASGEM entity for the Basin. The County is a signatory member to the JPA Agreement forming the Agency and represented on the Agency's Board of Directors.
  - United performs monitoring in the Basin and shares the data it collects with the County and MBGSA. United is a signatory member to the JPA Agreement forming the Agency and is represented on the Agency's Board of Directors.

2.3.2 Public Meetings [§354.10(b)]

§354.10 Notice and Communication. *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*
(b) *A list of public meetings at which the Plan was discussed or considered by the Agency.*

A list of public meetings is included as Appendix E.

2.3.3 Public Comments [§354.10(c)]

§354.10 Notice and Communication. *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*
(c) *Comments regarding the Plan received by the Agency and a summary of any responses by the Agency.*

Public comments and responses are included as Appendix F.

2.3.4 Communication [§354.10(d)]

2.3.4.1 Decision-Making Process [§354.10(d)(1)]

§354.10 Notice and Communication. *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*
(d) *A communication section of the Plan that includes the following:*
(1) *An explanation of the Agency's decision-making process.*

The JPA that created MBGSA requires the GSA to hold public meetings at least quarterly that are noticed and meet all of the requirements of the Ralph M. Brown Act for transparency in California government. To hold a valid meeting the MBGSA must have a quorum of the Board of Directors, which consists of an absolute majority of directors plus one director. With these requirements in mind, the MBGSA:

- Holds board meetings on a regular schedule (no less frequently that quarterly);
- Provides written notice of meetings with meeting agenda and meeting material available at least 72 hours prior to regular meetings;
- Sends email meeting reminders to MBGSA's interested parties list; and
- Posts meeting agendas on https://www.moundbasingsa.org/ and at the meeting location prior to the meeting, as required by law.

MBGSA agendas include general public comments at the beginning of each board meeting. General comments allow community members to raise any groundwater-related issue that is not on the agenda. Public comment time is also given prior to a vote on all agenda items to ensure public opinion can be incorporated into MBGSA Board of Director decisions.

The MBGSA Board directs the Executive Director to fulfill the various requirements of SGMA. To do this, the Executive Director, with support from consultants and United staff, provides the Board with research and recommendation memos, work plans, technical summaries, budgets, and other work products as required to carry out board decisions. Most MBGSA decisions require an affirmative vote of a minimum of three Directors. There are certain matters that come before the MBGSA Board of Directors that require a unanimous vote of all Directors on first reading. If unanimity is not obtained on the first reading of the matter, the Board shall continue a final vote on the matter during a second reading approved by an affirmative vote of a minimum of three (3) Directors, and only if at least one (1) of the affirmative votes is by the City of San Buenaventura's Director or the Agricultural Stakeholder Director. Matters requiring the special voting provisions include of any of the following:

- Annual budget and amendments thereto;
- GSP for the Basin or any amendments thereto;
- Adoption of groundwater extraction fees or charges;
- Adoption of any taxes, fees, or assessments subject to Proposition 218; or
- Any stipulation to resolve litigation concerning groundwater rights within, or groundwater management for, the Basin.

2.3.4.2 Public Engagement [§354.10(d)(2) and (d)(3)]

§354.10 Notice and Communication. *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*
(d) *A communication section of the Plan that includes the following:*
(2) *Identification of opportunities for public engagement and a discussion of how public input and response will be used.*
(3) *A description of how the Agency encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin.*

MBGSA uses a variety of methods create opportunities for public engagement and obtain public input for consideration in GSP development and implementation. These methods are presented in the MBGSA SEP (Appendix D) and include:

- **Stakeholder Directors:** The MBGSA Board of Directors includes two stakeholder directors, one each for environmental and agricultural interests. Pursuant to the SEP, the stakeholder directors are responsible for actively obtaining input from their respective stakeholder constituencies and communicating that input to the MBGSA Board and Executive Director for consideration.
- **Direct Engagement by MBGSA Staff:** The Executive Director met or spoke directly with stakeholders during the GSP process, including Ivy Lawn Memorial Park (industrial well operator), City of Ventura, United, and members of MBAWG.
- **MBGSA Board Meetings:** Regular and Special meetings of the MBGSA Board of Directors provided opportunities for the public to engage with the Board, Executive Director, and consultants and provide direct input. The public is welcomed to comment at each meeting and the MBGSA Board regularly incorporates public suggestions into its deliberations and the decisions it makes during Board meetings. Meeting notes are kept by the Clerk of the Board and submitted to the MBGSA Board for approval. All meeting minutes and notes are collected on the MBGSA Website along with supporting agendas, packets, and presentation materials.
- **GSP Workshops:** MBGSA has held several public workshops to provide in depth discussion of the GSP and obtain stakeholder feedback. The workshops include polls to help facilitate public input on key issues and identify which outreach methods are most effective. Public input received during the GSP Workshops is reviewed with MBGSA Board of Directors during subsequent Board meetings prior to making decisions.

- **Online Comment Form:** MBGSA's website includes a comment submission form. The on-line form provides a convenient method for anyone to provide input on the GSP. All comments received via the website were compiled into a table and considered prior to GSP adoption. All comments submitted on-line were responded to in writing (Appendix F).
- **Contact with Staff:** The public is welcomed to contact MBGSA Executive Director or Clerk of the Boards and may do so via telephone, e-mail, or website inquiry (https://www.moundbasingsa.org/contact-us/).

MBGSA uses a variety of methods to inform stakeholders and encourage the active involvement of diverse social, cultural, and economic elements of the population within the groundwater pursuant to Water Code §10727.8(a). These methods are presented in the MBGSA SEP (Appendix D) and include:

- **Statement Describing the Manner in which Interested Parties May Participate in the Development and Implementation of the Groundwater Sustainability Plan (Water Code §10727.8(a)):** The statement was prepared and posted to DWW's SGMA Portal as part of filing a notice of intent to DWR of the MBGSA decision to develop a GSP for the Basin on September 17, 2018. The statement is included, provided in Appendix A, and was developed into the MBGSA SEP (Appendix D).
- **Development and Maintenance of an Interest Parties List:** MBGA developed an interest parties list prior to electing to become a GSA pursuant to Water Code §10723.8(a)(4) and maintained that list after becoming as GSA pursuant after to Water Code §10723.4. The interested parties list is used it to send e-mail meeting notices, agendas, newsletters, and updates.
- **Public Notices:** In accordance with Water Code §10723(b), §10730(b)(1), and §10728.4, MBGSA published public notices in accordance with Government Code §6066 prior to electing to be a GSA, before imposing or increasing groundwater extraction fees, and before adopting the GSP.
- **MBGSA Website:** The MBGSA website provides SGMA and agency information, includes meeting information, meeting materials, and links to meeting agendas and packets. The website provides links to agency resource materials, maps, newsletters, presentation materials, and meeting recordings.
- **Facebook:** The MBGSA Facebook page is used to push meeting notices and other information.
- **Periodic Newsletters:** MBGSA issues periodic newsletters concerning MBGSA status and activities.
- **Existing Outreach Venues:** MBGSA uses the Member Agencies existing outreach networks to provide regular updates about the GSP Development and, going forward, GSP implementation. This includes information via email newsletters, websites, bill inserts, and social media.
- **Santa Clara River Watershed Committee:** The Executive Director provides MBGSA updates during Santa Clara River Watershed Committee meetings and requests publication of MBGSA workshop notices via the Committee's email network.
- **Direct outreach to Public, including DACs/SDACs**: Ventura Water bill stuffers and newsletters about the MBGSA and GSP process were sent to every potable water user in the Basin, including materials provided in Spanish.

Public input was used to help shape the GSP development. The input was also used to develop content for MBGSA meetings, newsletters, and website content. MBGSA public meetings were designed to encourage input, discussion, and questions. Because the Basin and number of stakeholders is small, the meetings provided ample opportunity for everyone to provide comments and ask questions.

Examples of how public input helped shape the GSP include:

- During the development of the GSP water budget, outreach to the City of Ventura was performed to learn about the City's planned well replacements and planned future groundwater extraction rates. The City's planning estimated were incorporated into the planning process.
- During the development of the GSP water budget, outreach to MBAWG was performed to develop estimates of anticipated future agricultural cropping and groundwater extraction rates. MBAWG's estimates were incorporated into the planning process.
- During the analysis of potential land use change, outreach to MBAWG was performed to obtain input about the potential for development of agricultural land in the Basin. MBAWG's input on this topic was incorporated into the planning process.
- During development of SMC for the land subsidence sustainability indicator, outreach to the City of Ventura was performed to obtain input on critical infrastructure that could be potential impacted by land subsidence. The City provided information about the susceptibility of its sewer main that became a key factor in establishing the SMC for the land subsidence sustainability indicator.
- In addition to the above-described examples, input received from MBAWG and Ivy Lawn Memorial Park about costs helped focus the agency on ensuring the GSP is fit-for-purpose for the Basin and only includes aspects absolutely necessary to maintain sustainable conditions in the Basin.

2.3.4.3 Progress Updates [§354.10(d)(4)]

§354.10 Notice and Communication. *Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:*
(d) *A communication section of the Plan that includes the following:*
(4) *The method the Agency shall follow to inform the public about progress implementing the Plan, including the status of projects and actions.*

MBGSA will continue to follow its adopted SEP to inform the public about progress implementing the GSP, including the status of projects and actions.

3.0 Basin Setting [Article 5, SubArticle 2]

§354.12 Introduction to Basin Setting. *This Subarticle describes the information about the physical setting and characteristics of the basin and current conditions of the basin that shall be part of each Plan, including the identification of data gaps and levels of uncertainty, which comprise the basin setting that serves as the basis for defining and assessing reasonable sustainable management criteria and projects and management actions. Information provided pursuant to this Subarticle shall be prepared by or under the direction of a professional geologist or professional engineer.*

This section describes the information about the characteristics and current conditions of Mound Basin that provide the basis for defining and assessing reasonable SMC, projects, and management actions. As required under §10733.2 of the California Water Code, this section was prepared by a professional geologist and includes subsections that describe the HCM, current and historical groundwater conditions, a water balance, and management areas within Mound Basin based on best available data and information available for Mound Basin at the time of preparation of this GSP.

Most of the information presented in this section is derived from the following sources, which synthesize and summarize and add to historical scientific studies and information:

- "Hydrogeologic Assessment of Mound Basin—United Water Conservation District Open-File Report 2012-01" (United, 2012);
- "Ventura Regional Groundwater Flow Model and Updated Hydrogeologic Conceptual Model: Oxnard Plain, Oxnard Forebay, Pleasant Valley, West Las Posas, and Mound Groundwater Basins—Open-File Report 2018-02" (United, 2018); and
- "Preliminary Hydrogeological Study—Mound Basin Groundwater Conditions and Perennial Yield Study" (Hopkins, 2020).

In addition to the above-listed studies, well construction, groundwater elevation, and groundwater quality data collected by United, VCWPD, and others were relied upon and have been compiled into the MBGSA DMS.

3.1 Hydrogeologic Conceptual Model [§354.14]

§354.14 Hydrogeological Conceptual Model.
(a) Each Plan shall include a descriptive hydrogeologic conceptual model of the basin based on technical studies and qualified maps that characterize the physical components and interaction of the surface water and groundwater systems in the basin.

This section provides a descriptive HCM of the Basin based on technical studies and qualified maps that characterize the physical components and interaction of the surface water and groundwater systems in Mound Basin, to the extent such characterization is possible based on existing best available data and information.

3.1.1 Regional Hydrology

Topography, surface water bodies, and imported water sources and points of delivery in Mound Basin are described below.

3.1.1.1 Topography [§354.14(d)(1)]

§354.14 Hydrogeological Conceptual Model.
(d) Physical characteristics of the basin shall be represented on one or more maps that depict the following:
(1) Topographic information derived from the U.S. Geological Survey or another reliable source.

Topography of Mound Basin is shown on Figure 3.1-01. The topography of Mound Basin consists largely of gently south-sloping coastal plain, coastal and alluvial terraces, and alluvial fans. The Santa Clara River floodplain and estuary occupies the southwest corner of the Basin, and moderately sloping hills rising to 1,000 feet above mean sea level (ft msl) are present along the northern margin of the Basin. Several small stream channels originate in the canyons above the Basin and trend south and southwest within the Basin, forming incised drainage features labeled “barrancas” (Spanish for “gullies”) on United States Geological Survey (USGS) topographic maps of the region. The barrancas typically have a vertical relief in the range of 10 to 30 ft.

3.1.1.2 Surface Water Bodies [§354.14(d)(5)]

§354.14 Hydrogeological Conceptual Model.
(d) Physical characteristics of the basin shall be represented on one or more maps that depict the following:
(5) Surface water bodies that are significant to the management of the basin*.*

Surface water bodies within the Mound Basin include the Santa Clara River, its estuary, and the Pacific Ocean (Figure 3.1-01). In addition, three barrancas (Sanjon, Arundell, and Harmon) tributary to the Santa Clara River in Mound Basin are shown on Figure 3.1-01. The barrancas typically only flow in response to precipitation events. No springs or seeps are shown on USGS topographic maps within or adjacent to the boundaries of Mound Basin.

3.1.1.3 Imported Water [§354.14(d)(6)]

§354.14 Hydrogeological Conceptual Model.
(d) Physical characteristics of the basin shall be represented on one or more maps that depict the following:
(6) The source and point of delivery for imported water supplies.

Sources and approximate points of delivery of imported water supplies used in Mound Basin are shown on Figure 3.1-01. Three water purveyors import water into Mound Basin: Alta Mutual Water Company (Alta MWC), Farmers Irrigation Company (FICO), and the City of Ventura (Ventura Water), as follows:

- Alta MWC conveys approximately 200 AF/yr on average of groundwater extracted from its wells located in the Santa Paula and Oxnard Basins to farms in the eastern Mound Basin (personal communication, John Lindquist of United and Bryan Bondy of Alta Mutual Water Company, April 2020).

- FICO conveys approximately 1,000 AF/yr on average of groundwater extracted from its Santa Paula Basin wells to farms in the eastern Mound Basin (United, 2017a).
- Ventura Water imports water for municipal supply from several sources outside of Mound Basin, as follows (quantities of water reported below are averages for the period from 2015 to 2020 [Ventura Water, 2020a]):
  - Ventura Water extracts approximately 2,700 AF/yr of groundwater from its Saticoy wells in the Santa Paula Basin and supplies that water to portions of the City overlying both the Mound and Santa Paula Basins. Ventura Water has stated that the specific quantity of imported water from this source distributed to each basin is variable and cannot be precisely determined. However, estimating based on the area occupied by the City of Ventura in Santa Paula Basin and typical water use per acre for developed land in the region, it appears that most of the groundwater extracted from Santa Paula Basin by Ventura Water may be used within Santa Paula Basin, and the quantity of groundwater imported by the City of Ventura to Mound Basin is a relatively small portion of the 2,700 AF/yr total extracted.
  - Ventura Water extracts approximately 3,500 AF/yr of groundwater from its "Golf Course" well field in the Oxnard Basin for blending and distribution throughout its service area.
  - Ventura Water obtains approximately 5,000 AF/yr of water from the Ventura River watershed (sources include water from Casitas MWD and Ventura Water's facilities at Foster Park) for blending and distribution throughout its service area.
- Jam Mutual Water Company (agricultural) and several ranches straddle the basin boundary shared with the Oxnard Basin. It is assumed that small quantities of groundwater move across the basin boundary within these entities/parcels. The details of water movement across the basin boundary within these entities/parcels is not known.

3.1.2 Regional Geology [§354.14(b)(1) and (d)(2)]

§354.14 Hydrogeological Conceptual Model.

(b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*

> ***(1) The regional geologic and structural setting of the basin including the immediate surrounding area, as necessary for geologic consistency.***

(d) *Physical characteristics of the basin shall be represented on one or more maps that depict the following:*

> ***(2) Surficial geology derived from a qualified map including the locations of cross-sections required by this Section.***

This subsection describes the regional geologic and structural setting of Mound Basin. The groundwater basins of the Santa Clara River Valley, including Mound Basin, are within the Transverse Ranges geomorphic province of California, characterized by mountain ranges and valleys (basins) that are oriented east-west rather than the typical northwest-southeast trend common in the adjacent Peninsular and Coastal Ranges geomorphic provinces. Structurally, Mound Basin occurs within an elongate, complex syncline referred to as the Ventura structural basin, which trends east to west (Yeats et al., 1981). The province is tectonically active today as a result of transpressional stress related to right-lateral movement along the San Andreas Fault, where the North American tectonic plate contacts the Pacific plate. This transpressional stress occurring in the Transverse Ranges results in ongoing uplift of the adjacent mountains while the basins continue to flex downward (deepen).

The Ventura structural basin is filled with sediments that were deposited in both marine and terrestrial settings (Yeats et al., 1981). Near the coast, sediments were deposited on a wide delta complex that formed at the terminus of the Santa Clara River. The total stratigraphic thickness of these marine and terrestrial deposits in the Ventura structural basin reportedly exceeds 55,000 ft (Sylvester and Brown, 1988). Surface exposures of the major rock units and structural features in the vicinity of Mound Basin are shown in a simplified manner on Figure 3.1-02 and are discussed below. A geologic map that shows more details of the shallow surficial sediments (including landslides, stream terraces, alluvium in active stream channels, artificial fill, alluvial fans, and other near-surface deposits) prepared by the California Geological Survey (Gutierrez et al., 2008) is provided on Figure 3.1-03.

Geologic units (strata) in Mound Basin that may contain freshwater aquifers or aquitards are classified from youngest (top) to oldest (bottom as follows):

- Recent (active) stream-channel deposits along the present course of the Santa Clara River and its tributaries;
- Holocene -age alluvial fan deposits, which cover most of the Mound Basin;
- Stream terrace deposits adjacent to the Santa Clara River;
- Undifferentiated older alluvium of Pleistocene age; and
- Semi-consolidated sand, gravel, and clay deposits of the San Pedro Formation (also referred to as the Saugus Formation and/or Las Posas Formation by some researchers, most recently by Gutierrez et al., 2008), of late Pleistocene age.

Stratigraphic relationships are shown conceptually on Figure 3.1-04. The classification approach shown on Figure 3.1-04 is based largely on hydrogeologic characteristics (United, 2018). Other researchers have divided these deposits in other, equally valid ways, based on geomorphological or other characteristics (e.g., Mukae and Turner, 1975; Dibblee, 1992; USGS, 2003a; Hopkins, 2020). For example, Hopkins Groundwater Consultants, Inc. (Hopkins), mapped the subsurface geologic formations through Mound Basin based upon 10 cross-sections. Cross-sections showing the subsurface geometry of these units are shown on Figures 3.1-05 through 3.1-08.

Older (and typically deeper) strata than those listed above typically are poorly permeable or contain water that is too brackish or saline for municipal or agricultural uses. These strata include (following the descriptions of Burton et al., 2011):

- Sandstone, siltstone, and shale of the Santa Barbara Formation (Yerkes, 1987), of early Pleistocene age. This unit was mapped as the “Mudpit Claystone Member of the Pico formation” by Dibblee (1988, 1992), but several more recent investigations, including those by Burton et al. (2011), the USGS (2003a), and United (2012, 2018), refer to this unit as the Santa Barbara Formation.
- Marine siltstones, sandstones, and conglomerates of the Pico Formation, of Pliocene or early Pleistocene age.

- Marine shales of the Sisquoc and the Monterey Formation, both of Miocene age, which underlie the Pico Formation at depth.

Within the Ventura structural basin, the trend of many (but not all) geologic structures is east-northeast to west-southwest, consistent with regional structural trends (Figure 3.1-02). The Country Club, Oak Ridge, and McGrath (sometimes referred to as Montalvo) faults have previously been identified as significantly limiting or diverting groundwater flow (John F. Mann Jr. & Associates, 1959; Mukae and Turner, 1975; Weber et al., 1975). In general, the older (deeper) geologic units show greater displacement across these faults than the younger (shallower) units. Therefore, groundwater flow in the deeper aquifers can typically be expected to be more disrupted across faults than groundwater flow in shallow aquifers.

Similar to faults in the Ventura structural basin, the axes of major folds (anticlines and synclines) in the sedimentary strata tend to be oriented approximately east-northeast to west-southwest (Figure 3.1-02). The axis of the Ventura-Santa Clara River syncline trends through Mound Basin in an east-west direction, plunging gradually to the west. The Montalvo-South Mountain-Oak Ridge Anticline is approximately parallel to the Ventura-Santa Clara River Syncline and is located near the southern boundary of Mound Basin (Geotechnical Consultants, 1972). Some workers also place a parallel fault at the location of the Montalvo-South Mountain-Oak Ridge Anticline (John F. Mann Jr. & Associates, 1959; Fugro West, 1996). Folding in the Ventura structural basin is ongoing, with older strata (including those that comprise deep aquifers) being more deformed than younger strata (including shallow aquifers). The limbs of these folds are gently dipping within most of the freshwater-bearing strata in Mound Basin and adjacent Oxnard Basin (United, 2018). Therefore, it is unlikely that the folds themselves have a notable direct impact on groundwater flow. However, changes in strata thickness (which affects transmissivity), outcrop area (which affects where recharge occurs), and other hydraulic properties of strata can potentially be indirectly influenced by fold geometry.

3.1.3 Soil Characteristics [§354.14 (d)(3)]

§354.14 Hydrogeological Conceptual Model.

(d) *Physical characteristics of the basin shall be represented on one or more maps that depict the following:*

(3) Soil characteristics as described by the appropriate Natural Resources Conservation Service soil survey or other applicable studies.

The hydrologic characteristics of soils in Mound Basin were downloaded from the Natural Resources Conservation Service (NRCS) online database (NRCS, 2020). Relevant soil information available from the NRCS for groundwater sustainability planning purposes includes soil infiltration capacity, which is shown on Figure 3.1-09. Most of the soils in Mound Basin are reported to have low to very low infiltration rates (Groups C and D, respectively). However, moderate-infiltration-rate soils are reportedly present in an approximately 1-mile-wide band oriented east-to-west along the axis of the Basin (Figure 3.1-09). Smaller areas of high-infiltration-rate soils are reportedly present near the Santa Clara River, Harmon Barranca, and in some of the canyons in the foothills in the north part of Mound Basin.

Some clay-rich soils within the Holocene and Pleistocene alluvial deposits present in Mound Basin may be of sufficiently low vertical permeability to allow the formation of thin, discontinuous lenses or layers of shallow, "perched" groundwater above the primary saturated zone of the Shallow Alluvial Deposits (described in the next subsection of this GSP), which is supported by the presence of tile drainage systems.

Municipal and agricultural return flows contribute substantial quantities of infiltrating water at land surface in Mound Basin, supplementing natural recharge of precipitation (discussed in more detail in Sections 3.1.4.2 and 3.3). When the rate of infiltration exceeds the ability of silt and clay lenses and layers to allow the water to pass through them, small saturated zones can develop in the soil. Groundwater in perched zones typically moves laterally to better-draining soils, where it can then resume its downward infiltration, or it may migrate laterally to nearby depressions in the topography, where it seeps out at land surface, evaporates, or is transpired by vegetation.

3.1.4 Principal Aquifers and Aquitards [§354.14(b)(4)(A)]

§354.14 Hydrogeological Conceptual Model.
(b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*
(4) Principal aquifers and aquitards, including the following information:
(A) Formation names, if defined.

Strata with distinct hydrogeologic characteristics are referred to as hydrostratigraphic units (HSUs). Aquifers have traditionally been defined as those HSUs that are capable of yielding appreciable quantities of groundwater to wells or springs. The SGMA defines "principal aquifers" as "aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems." Aquitards, on the other hand, are poorly permeable HSUs that impede groundwater movement (typically in the vertical direction) and generally do not yield appreciable quantities of groundwater to wells or springs.

The aquifers in Mound Basin consist of layers and lenses of relatively coarse-grained, permeable sediments (primarily sand and gravel) deposited within unconsolidated alluvium and the underlying, semi-consolidated San Pedro Formation (Figure 3.1-04). Aquitards present between the aquifers in Mound Basin consist of layers of poorly permeable fine-grained sediments (primarily silt and clay, Figure 3.1-04).

In Mound Basin, distinct HSUs were identified by United (2018) during their recent update of the HCM for the region. United (2018) observed that electrical-log "signatures" of the Mugu, Hueneme, and Fox Canyon aquifers (and the aquitards between these aquifers) observed in wells in the Oxnard Basin are often recognizable north of the McGrath Fault (Figure 3.1-02). The HSUs are generally grouped into three major "aquifer systems" as follows (from shallow to deep): the Shallow Alluvial Deposits, the Upper Aquifer System (UAS), and the Lower Aquifer System (LAS). Figure 3.1-04 shows the names and relationships between HSUs in Mound Basin, together with their corresponding geologic formations and ages. Details regarding the aquifers and aquitards within each aquifer system are provided below.

3.1.4.1 Physical Properties of Aquifers and Aquitards

3.1.4.1.1 Basin Boundary (Vertical and Lateral Extent of Basin) [§354.14(b)(2),(b)(3), and (c)]

§ 354.14 Hydrogeological Conceptual Model.
(b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*
(2) Lateral basin boundaries, including major geologic features that significantly affect groundwater flow.
(3) The definable bottom of the basin.
(c) The hydrogeologic conceptual model shall be represented graphically by at least two scaled cross-sections that display the information required by this section and are sufficient to depict major stratigraphic and structural features in the basin.

The lateral boundaries of Mound Basin determined by DWR (2020a) are defined as follows:

- **East:** The eastern boundary is defined by the western jurisdictional boundary of the Santa Paula Basin stipulated judgment (adjudication), as approved by DWR (2020a) pursuant to a formal Basin Boundary Modification. This jurisdictional boundary is approximately aligned with the Country Club Fault system (Figure 3.1-02). The Country Club Fault system offsets the aquifers (see cross-section A-A', Figure 3.1-05) and impedes groundwater flow from the Santa Paula Basin into the Mound Basin.
- **Northwest:** The northwestern boundary is defined by the hydraulic divide between Mound Basin, Lower Ventura River Subbasin (Figure 3.1-01).
- **West:** The western boundary is the Pacific Ocean shoreline. However, it should be noted that the UAS and LAS in Mound Basin extend approximately 10 miles offshore under the Pacific Ocean west of the shoreline, where they are mapped as cropping out on the continental shelf, as shown on Figure 3.1-10. The submarine outcrops may be covered with fine-grained marine sediments, such as silt and clay (Greene et al., 1978) that would tend to impede interaction of seawater with fresh water from the aquifers. Although DWR has delineated the western boundary of Mound Basin at the shoreline, the offshore portions of the principal aquifers of Mound Basin are in all likelihood capable of storing and transmitting significant quantities of fresh groundwater that has migrated westward from inland recharge areas. Because DWR (2020a) does not include this offshore area within the boundaries of Mound Basin, it is not included in calculations of area of Mound Basin or volumes of groundwater in storage in each aquifer. However, it must be emphasized that fresh groundwater can flow within the aquifers of Mound Basin either to or from the offshore areas without impediment, and groundwater flowing eastward (landward) across this boundary should not be assumed to consist of seawater.
- **North:** The northern boundary is defined by the contact of the San Pedro Formation (the deepest freshwater-bearing formation in the Basin) with the underlying Santa Barbara Formation (Figure 3.1-02; the Santa Barbara Formation is mapped as the "Mudpit Claystone Member of the Pico formation" by Dibblee [1988, 1992]). The northern boundary of Mound Basin is at the northern edge of cross-section B-B', where the Fox Canyon Aquifer basal aquitard is in contact with the Santa Barbara Formation (Figure 3.1-06).

- **South:** The southern boundary is defined by the northern jurisdictional boundary of the FCGMA, which also serves as boundary between the Mound and Oxnard basins, as approved by DWR (2020a) pursuant to a formal Basin Boundary Modification. This jurisdictional boundary is approximately aligned with the axis of the Montalvo-South Mountain-Oak Ridge Anticline and the McGrath Fault (Figure 3.1-02), which were understood at the time of formation of the FCGMA (early 1980s) to be the approximate northern limit of the Oxnard Basin.

The “bottom” of the Basin is defined by the effective base of fresh water as described by Mukae and Turner (1975), which they mapped as the base of the San Pedro Formation. The lowermost strata of the San Pedro Formation have also been referred to as the Las Posas Sand (Dibblee, 1988, 1992). In Mound Basin, the San Pedro Formation overlies poorly permeable siltstone and shale of the Santa Barbara Formation (where present) and the Pico Formation (note: some investigators, including Dibblee [1988, 1992]) include portions of the Santa Barbara Formation in the Pico Formation). The depth to these units varies from as little as 0 ft below ground surface (bgs) along the northern basin boundary to approximately 2,400 ft bgs along the axis of the Ventura-Santa Clara River syncline, as shown on cross-sections A-A’ through D-D’ (Figures 3.1-05 through 3.1-08).

3.1.4.1.2 Groundwater Flow Barriers [§354.14(b)(4)(C)]

§354.14 Hydrogeological Conceptual Model.
(b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*
(4) *Principal aquifers and aquitards, including the following information:*
(C) Structural properties of the basin that restrict groundwater flow within the principal aquifers, including information regarding stratigraphic changes, truncation of units, or other features.

Geologic structures in Mound Basin affect groundwater flow within the aquifers to varying degrees. The most common example is where upward or downward apparent displacement (throw) of aquifer materials across a fault plane disrupts an aquifer’s lateral continuity. Such an offset can impede groundwater flow through the aquifer along the fault plane. In Mound Basin, faulting has caused greater displacement (and correspondingly greater potential to impede groundwater flow) in the aquifers of the LAS, which are older (and thus have undergone more faulting and folding) than the aquifers of the UAS. The following subsections describe the primary structures that are believed to impact groundwater flow.

Country Club Fault

The trace of the Country Club Fault forms a northwest-trending arc approximately corresponding with the eastern boundary of Mound Basin adjacent to Santa Paula Basin (Figure 3.1-02). It is a steeply dipping (almost vertical) reverse fault with some left-lateral displacement (Turner, 1975). United’s (2012, 2018) inspection of electrical logs for oil wells in the area indicate a displacement of 1,600 to 1,800 ft, with the southwest wall displaced upward relative to the northeast wall (Figure 3.1-05), consistent with the offset reported by previous investigators (Fugro West, 1996; Geotechnical Consultants, 1972). Review of electrical logs for wells in the area suggests that only a portion of the low-permeability Santa Barbara Formation has been uplifted against the San Pedro Formation (which contains the Hueneme and Fox Canyon aquifers). With aquifers of the San Pedro Formation present on both sides of the Country Club Fault above the displaced Santa Barbara Formation, the Country Club Fault is not considered to be a complete barrier to groundwater flow. The fault is not believed to extend upward through the undifferentiated younger alluvium (Geotechnical Consultants, 1972). Consistent with the above geologic information, previous investigators, including USGS (2003a) and United (2018), have noted a consistently steeper hydraulic gradient along the fault at the boundary between Mound Basin and Santa Paula Basin, compared with more gentle hydraulic gradients elsewhere within these basins. Such a steepening of hydraulic gradients is common along faults that impede groundwater flow. To calibrate its groundwater flow model for this area, United (2018) applied a conductance of 0.00001 square ft per day to the Country Club Fault, indicating it is a significant impedance to groundwater flow.

Oak Ridge and McGrath Faults

The Oak Ridge and McGrath Faults trend east-northeast to west-southwest in the southern Mound Basin (Figure 3.1-02). As noted by Yerkes et al. (1987), these faults are buried and known only from subsurface data in this area. Yerkes et al. (1987) describe two pressure ridges in Mound Basin as isolated, elongate northwest-trending structural uplifts. These ridges are described as compressional features and are compatible with left-lateral slip along the adjacent Oak Ridge Fault. Their existence suggests a significant strike-slip component along the Oak Ridge Fault as well as a reverse fault uplift on the south side.

Based on review of electrical logs, United (2012) determined that vertical displacement of approximately 700 ft of vertical displacement occurs along the McGrath Fault, with the up-thrown side on the south. This offset has juxtaposed the low-permeability Santa Barbara Formation against the lower section of the San Pedro Formation (Figures 3.1-06). Another notable feature is the significant difference in San Pedro Formation thickness across the McGrath Fault shown on cross-section B-B' (Figure 3.1-06). The younger deposits overlying the San Pedro Formation (Mugu Aquifer and Shallow Alluvial Deposits), do not appear to have been offset to the same degree as the LAS by either the McGrath or Oak Ridge faults (Figures 3.1-06 and 3.1-07). Calibration of groundwater flow models for the area (USGS, 2003a; United, 2018) required incorporating the Oak Ridge and McGrath faults as horizontal flow barriers, consistent with the concept that these faults restrict flow to some degree. In its regional groundwater flow model, United (2018) found that assigning a conductance to these faults of 0.0001 square ft per day resulted in an acceptable calibration.

Ventura, Pitas Point, and Foothill Faults

The Ventura and Foothill faults trend east to west in the northern part of Mound Basin (Figure 3.1-02). The Pitas Point Fault is the westerly, offshore (mostly) extension of the Ventura Fault (Greene et al., 1978). The Ventura and Pitas Point Faults are reverse faults that dip to the north at a high angle; upward movement of the north side of the fault likely contributed to formation of the foothills in the north part of Mound Basin (Yerkes at al., 1987). The Foothill Fault is included in a USGS database of Quaternary faults (Burton et al., 2011), and an inferred fault is shown in approximately the same location by Yerkes et al. (1987). It is also shown on the geologic map included in the Hopkins (2020) report for Mound Basin. United (2012) hypothesized that the Foothill Fault is a reverse fault that dips to the north, similar to the Ventura and Pitas Point Faults.

As a result of vertical offset of the San Pedro Formation along the Ventura, Pitas Point, and Foothill Faults ranging from tens to hundreds of feet (Figures 3.1-06 and 3.1-07), it is inferred that these faults impede groundwater flow in the aquifers to some degree because, as shown on cross-section B-B' (Figure 3.1-06) the faulting disrupts the lateral continuity of the aquifers and juxtaposes different HSUs across the fault plane. However, no groundwater monitoring wells are located north and south of these faults to detect groundwater elevation changes across them that would allow estimation of conductance across the faults. Neither the USGS (2003a) nor United (2018) modeled these faults as horizontal flow barriers due to lack of data to support calibration of the barrier effect of these faults.

3.1.4.1.3 Hydraulic Properties [§354.14(b)(4)(B)]

§354.14 Hydrogeological Conceptual Model.
(b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*
(4) *Principal aquifers and aquitards, including the following information:*
(B) Physical properties of aquifers and aquitards, including the vertical and lateral extent, hydraulic conductivity, and storativity, which may be based on existing technical studies or other best available information.

This subsection provides a written description of the physical properties of the aquifers and aquitards within Mound Basin, including estimates of their lateral extent, thickness, hydraulic conductivity, and storativity. The lateral and vertical extents of the aquifers and aquitards are depicted on cross-sections A-A' through D-D' (Figures 3.1-05 through 3.1-08). At the time of writing of this GSP, no aquifer test results for hydraulic conductivity or storativity were found in available references. However, well information collected over the past several decades by United (now included in the MBGSA's DMS) from well completion reports includes 10 specific-capacity measurements obtained at water supply and monitoring wells in Mound Basin, which were considered when United (2018) calibrated its numerical groundwater flow model of the region.

For basin-wide estimates of hydraulic conductivity and storativity for each aquifer in Mound Basin, this GSP relies on United's calibrated flow model for the region, which was constructed in 2018 (United, 2018), then expanded and recalibrated in 2020 (United, 2021a). The United model is considered the best available information concerning aquifer and aquitard properties. These estimates are summarized in Table 3.1-01. However, it is recognized that on a local scale, hydraulic conductivity can vary by orders of magnitude over short distances, and there may be areas in Mound Basin where hydraulic conductivity is higher or lower than the values shown on Table 3.1-01.

Shallow Alluvial Deposits

The Shallow Alluvial Deposits in Mound Basin primarily consist of Holocene alluvial fan deposits (USGS, 2003b, 2003c, 2004) deposited by streams emanating from mountain canyons to the north. These deposits are composed of moderately to poorly sorted interbedded sandy clay with some gravel (USGS, 2003b, 2003c, 2004). The Shallow Alluvial Deposits are present in most areas of Mound Basin, except on the hillsides along the northern flank of the Basin (United, 2018). The alluvial fan deposits that comprise the Shallow Alluvial Deposits consist of stream terrace deposits and active wash deposits along the Santa Clara River where the alluvial fan deposits are absent (Figure 3.1-03). The stream terrace deposits include point bar and overbank deposits that consist of poorly sorted clayey sand and sandy clay with gravel (USGS 2003b). The HCM indicates thickness of the Shallow Alluvial Deposits range from less than 50 ft along the margins of Mound Basin to more than 100 ft in the central portion of the Basin (Figures 3.1-05 through 3.1-08) (United, 2018). The Shallow Alluvial Deposits are unconfined across Mound Basin (United, 2012, 2018).

Since 1979, when reporting of groundwater extraction from wells was mandated within United's service area, no extraction has been reported from the Shallow Alluvial Deposits for water supply in Mound Basin (pumping data for water supply wells are included in the Mound Basin DMS), likely due to insufficient saturated thickness and/or poor water quality. The Shallow Alluvial Deposits are not considered a "principal aquifer" at this time for the purpose of groundwater sustainability planning. The analysis and justification for not considering the Shallow Alluvial Deposits as a principal aquifer under SGMA for this GSP is presented in Appendix G.

Based on calibration of its regional groundwater flow model, United (2021a) estimated the horizontal hydraulic conductivity of the Shallow Alluvial Deposits to be 200 feet per day (ft/d) in Mound Basin, and the vertical hydraulic conductivity to be 20 ft/d. The specific yield of the Shallow Alluvial Deposits in the groundwater flow model is 15% (United, 2021a). These values do not apply to localized stream terrace deposits along the Santa Clara River where shallow groundwater interconnects with the Santa Clara River and GDEs are present (i.e. GDE Area No. 11). The presence of tile drains on agricultural lands situated on the stream terrace deposits (Figures 2.1-03 and 3.1-09) suggests that the stream terrace deposits are poorly permeable and, therefore, are not considered to be an aquifer, but may contain perched groundwater zones.

Hydrostratigraphic data, groundwater level data, groundwater quality data, and numerical modeling results demonstrate that shallow groundwater levels within the Shallow Alluvial Deposits and interconnected surface water of the Santa Clara River and its estuary are not materially influenced by extraction from the principal aquifers (please see Appendix G for details).

Upper Aquifer System

The UAS in Mound Basin consists of fine-grained Pleistocene deposits (which behaves as an aquitard) and the Mugu Aquifer. Each of these HSUs is described in more detail below.

Fine-Grained Pleistocene Deposits

United (2018) reports the presence of fine-grained Pleistocene deposits in Mound Basin, consisting primarily of a thick sequence of clays and silts, with sparse interbeds or lenses of sand and gravel. These deposits are stratigraphically equivalent to the Oxnard Aquifer of the Oxnard Basin, but do not yield significant quantities of groundwater in Mound Basin. This HSU has been logged to depths of 350 to 600 ft (typically 100 to 400 ft thick) in a number of wells in Mound Basin (Figures 3.1-05 through 3.1-08). Along the Oxnard Basin boundary these deposits abut or interfinger with the Oxnard Aquifer. Because of its fine-grained nature, this HSU generally is poorly permeable and is rarely targeted for groundwater production; therefore, few data are available regarding its hydraulic parameters. It is possible that sand and gravel layers or lenses in this HSU could contain modest volumes of fresh groundwater.

Based on calibration of its regional groundwater flow model, United (2021a) estimated the horizontal hydraulic conductivity of the fine-grained Pleistocene deposits to be 0.01 ft/d, typical of an aquitard rather than an aquifer, and vertical hydraulic conductivity to be 0.001 ft/d. The specific yield and storage coefficient for this unit were estimated by United (2021a) to be approximately 5% and 0.001 (dimensionless), respectively. This HSU acts as a confining unit for the Mugu Aquifer in Mound Basin, except along the northern margin of the Basin where the San Pedro Formation (which includes the Hueneme and Fox Canyon aquifers) is exposed at land surface and, therefore, is unconfined.

Mugu Aquifer

The Mugu Aquifer consists of marine and non-marine sands and gravels with interbedded silt and clay that lie below the fine-grained Pleistocene deposits and unconformably overlie the San Pedro Formation (Figures 3.1-05 through 3.1-08). Thickness of the Mugu Aquifer in Mound Basin is variable, ranging from approximately 100 to 425 ft, based on borehole geophysical logs reviewed by United (2018). The Mugu Aquifer is generally thickest along the northeast-southwest axis of the Basin, and thins to the north, where it pinches out south of the northern basin boundary. The Mugu Aquifer also thins (to approximately 200 ft) in the south toward the boundary with the Oxnard Basin. Several water supply wells in Mound Basin are screened in the Mugu Aquifer, as it is generally the first aquifer encountered when drilling that yields significant quantities of acceptable-quality groundwater.

Based on calibration of its regional groundwater flow model, United (2021a) estimated the horizontal hydraulic conductivity of the Mugu Aquifer to be 100 ft/d in Mound Basin, and vertical hydraulic conductivity to be 10 ft/d. The specific yield and storage coefficient used in the model (United, 2021a) were approximately 15% where unconfined (along the northern basin margin) and 0.001 (dimensionless) where confined (throughout most of the Basin), respectively.

As described in more detail in Section 3.1.4.4, the Mugu Aquifer stores, transmits, and yields significant or economic quantities of groundwater to wells; therefore, it is considered a “principal aquifer” of Mound Basin.

Lower Aquifer System

The LAS in Mound Basin includes the Hueneme and Fox Canyon aquifers, as well as the aquitards present between each aquifer. These aquifers and aquitards consist of relatively coarse- and fine-grained strata, respectively, of the San Pedro Formation, which is Pleistocene in age. The LAS, being older than the UAS, has undergone more faulting and folding. It has also been eroded, creating an unconformity that separates the UAS from the LAS (Turner, 1975). Except near the northern margin of Mound Basin, the LAS is overlain unconformably by the UAS. The San Pedro Formation crops out in the foothills near the northern boundary of the Basin, attaining a maximum thickness of 2,300 ft in this region (Geotechnical Consultants, 1972). In this area, the aquifers of the San Pedro Formation are not overlain by confining units, and, therefore, are unconfined. The aquifers of the LAS are isolated from each other vertically by relatively low-permeability silt and clay layers called the “Hueneme-Fox Canyon Aquitard.” The base of the LAS is considered to be the base of fresh water (Mukae and Turner, 1975). Beneath the LAS lie older sedimentary rocks that are generally considered to contain brackish to saline water or to be poorly transmissive (Mukae and Turner, 1975) and are not used for water supply in Mound Basin. More details regarding each aquifer and aquitard comprised by the LAS are provided below.

Mugu-Hueneme Aquitard

The upper portion of the LAS in Mound Basin (immediately below the Mugu Formation) consists of poorly permeable sediments with relatively high silt and clay content. This unit is referred to by United (2018) as the Mugu-Hueneme Aquitard. Electrical logs for oil and water wells in the region show that this aquitard is present throughout most of Mound Basin between the Mugu and Hueneme aquifers, except along the northern margin of the Basin where this unit has been uplifted by the Ventura-Pitas Point Fault and eroded away. Thickness of this aquitard ranges from approximately 100 ft at the northern margins of the Basin to 200 ft near the center of the Basin (Figures 3.1-05 through 3.1-08).

Based on calibration of its regional groundwater flow model, United (2021a) estimated the horizontal hydraulic conductivity of the Mugu-Hueneme Aquitard to be approximately 0.01 ft/d in Mound Basin, and vertical hydraulic conductivity to be 0.001 ft/d. The specific yield for the Mugu-Hueneme Aquitard in Mound Basin in the model is 5% where unconfined (along the northern basin margin), and the storage coefficient is 0.0005 (dimensionless) where confined (throughout most of the Basin).

Hueneme Aquifer

A series of interbedded, water-bearing sands in the upper approximately two-thirds of the San Pedro Formation comprise the Hueneme Aquifer (United, 2018). Structural complexities have resulted in thinning of these beds in the southern part of Mound Basin (south of the Oak Ridge and McGrath faults), compared to the central axis of Mound Basin (Figures 3.1-06 and 3.1-07). In the central and northern parts of the Basin, resistivity-log signatures indicate some lithologic differences in this unit compared to its lithology in the Oxnard Basin; specifically, some of the coarse-grained strata of the Hueneme Aquifer thin or become increasingly lenticular in the northward direction (United, 2012). However, thick (up to 1,000 ft) sections of the Hueneme Aquifer (or time-equivalent strata) do occur in Mound Basin, as oil well electrical logs interpreted by United (2012) indicate variable amounts of coarse-grained (permeable) materials. Borehole geophysical (resistivity) logs reviewed by United (2018) indicate the Hueneme Aquifer is generally thickest (typically 1,000 ft) along the northeast-southwest axis of the Basin, becoming thinner (200 to 600 ft) along the northern and southern basin boundaries. Most of the water supply wells in Mound Basin are screened primarily or entirely in the Hueneme Aquifer.

Based on calibration of its regional groundwater flow model, United (2021a) estimated the horizontal hydraulic conductivity of the Hueneme Aquifer to be 20 ft/d throughout Mound Basin, and vertical hydraulic conductivity to be 2 ft/d. The specific yield for the Hueneme Aquifer in Mound Basin in the model is 10% where unconfined (along the northern basin margin), and the storage coefficient is 0.005 (dimensionless) where confined (throughout most of the Basin).

As described in more detail in Section 3.1.4.4, the Hueneme Aquifer stores, transmits, and yields significant or economic quantities of groundwater to wells; therefore, it is considered a “principal aquifer” of Mound Basin.

Hueneme-Fox Canyon Aquitard

Below the Hueneme Aquifer, laterally extensive deposits of silt and clay of the San Pedro Formation up to approximately 100 ft thick (Figures 3.1-05 through 3.1-08) with interbeds of sand and gravel form an aquitard between the Hueneme and Fox Canyon aquifers throughout Mound Basin. This HSU is referred to by United (2018) as the Hueneme-Fox Canyon Aquitard.

Based on calibration of its regional groundwater flow model, United (2021a) estimated the horizontal hydraulic conductivity of the Hueneme-Fox Canyon Aquitard to be 0.01 ft/d in most of Mound Basin, and vertical hydraulic conductivity to be 0.001 ft/d. The specific yield for the Mugu-Hueneme Aquitard in Mound Basin in the model is 5% where unconfined (along the northern basin margin), and the storage coefficient estimated to be 0.0005 (dimensionless) where confined (throughout most of the Basin).

Fox Canyon Aquifer

Lower portions of the San Pedro Formation consist principally of sand and gravel zones with variable thicknesses of interstratified clay and silt (United, 2018). In a northerly direction across Mound Basin, these coarser-grained water-bearing strata are somewhat lenticular and generally become thinner (John F. Mann Jr. & Associates, 1959; Geotechnical Consultants, 1972), similar to the Hueneme Aquifer. The sand and gravel zone located at or near the base of the San Pedro Formation is known as the Fox Canyon Aquifer in the Oxnard Basin, and United (2012, 2018) extends that nomenclature for this HSU to Mound Basin as well. Electrical-log data and outcrops near the base of the San Pedro Formation in the foothills on the north side of Mound Basin do not indicate the same aquifer thickness or sediment coarseness as observed at the location in Fox Canyon on the south flank of South Mountain, 11 miles southeast of Mound Basin (Geotechnical Consultants, 1972; United, 2012). However, the distinct borehole resistivity-log signature of the Fox Canyon Aquifer is discernible across Mound Basin and adjacent areas (United, 2012). The Fox Canyon Aquifer commonly occurs at depths greater than 1,000 ft in Mound Basin and is not targeted for groundwater supply (United, 2012), with the exception of two active water supply wells that are screened partly in the Fox Canyon Aquifer and partly in the overlying Hueneme Aquifer (Table 3.1-02).

Borehole resistivity logs reviewed by United (2018) indicate that the Fox Canyon Aquifer in Mound Basin is typically 400 to 600 ft thick (Figures 3.1-05 through 3.1-08). However, as discussed above, the coarser-grained layers that comprise the main water-producing zones of the Fox Canyon Aquifer thin and become more lenticular in a northerly direction across Mound Basin, as shown on the resistivity logs on Figures 3.1-06 and 3.1-07. In the Oxnard Basin, John F. Mann Jr. & Associates (1959) further divided the Fox Canyon Aquifer into a “main” (sometimes called “upper”) member and a “basal” member (at the base of the San Pedro Formation), separated by a 50-ft-thick aquitard consisting primarily of fine-grained sediments. United (2018) incorporated this subdivision of the Fox Canyon Aquifer into their regional groundwater flow model. No water supply wells in Mound Basin are screened to the depth needed to reach the basal Fox Canyon Aquifer; therefore, the hydraulic characteristics of this unit are uncertain.

Based on calibration of its regional groundwater flow model, United (2021a) estimated the horizontal hydraulic conductivity of the main Fox Canyon Aquifer to be 10 ft/d in most of Mound Basin, and vertical hydraulic conductivity to be 1 ft/d. The specific yield for the main Fox Canyon Aquifer in Mound Basin in the model is 10% where unconfined (along the northern basin margin), and the storage coefficient is 0.005 (dimensionless) where confined (throughout most of the Basin). Identical hydraulic parameters are assumed for the basal Fox Canyon Aquifer (United, 2021a).

Owing to the lack of wells screened in the Fox Canyon Aquifer, it does not meet the SGMA definition of a principal aquifer because it does not currently (and has not, historically) “store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems” in Mound Basin. If future water supply wells are screened in the Fox Canyon Aquifer, then this designation should be reconsidered as part of the required periodic GSP update process.

3.1.4.2 Groundwater Recharge and Discharge Areas [§354.14(d)(4)]

§354.14 Hydrogeological Conceptual Model.
(d) Physical characteristics of the basin shall be represented on one or more maps that depict the following:
(4) Delineation of existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas, including significant active springs, seeps, and wetlands within or adjacent to the basin.

Multiple sources of groundwater recharge (water that enters an underlying groundwater system from land surface) occur in Mound Basin (United, 2018), including:

- Infiltration of precipitation—Most infiltration of precipitation recharges the Shallow Alluvial Deposits, although some infiltration of precipitation occurs in outcrops of the Hueneme and Fox Canyon aquifers in the foothills in the northern part of Mound Basin.
- Mountain-front recharge—For this report, the term "mountain-front recharge" refers to infiltration of runoff from the foothills north of Mound Basin, where many of the small drainages in Mound Basin have watersheds that extend northward beyond the basin boundary. Both United (2018) and the USGS (2003a) computed monthly runoff in each of these small catchment areas based on rainfall and incorporated infiltration of this runoff into aquifers as a recharge component in their regional numerical models. Infiltration of this runoff is assumed to occur within a short distance (2,000 ft) south of the basin boundary, where the Hueneme and Fox Canyon aquifers are exposed at land surface. In Mound Basin, infiltration of this runoff recharges the Hueneme and Fox Canyon aquifers. To simplify the input to United's (2021a) regional groundwater flow model, all areal recharge (as well as mountain-front recharge) in the northern foothills of Mound Basin was simulated to infiltrate the Hueneme Aquifer. This simplification should not significantly affect the aquifer-specific groundwater budgets discussed in Section 3.3, because recharge entering the Hueneme Aquifer is allowed to flow vertically to the Fox Canyon Aquifer in the model if a downward hydraulic gradient is present between the aquifers. If the model is updated in the future such that the model grid is refined (smaller grid cells) in the northern foothills, apportionment of areal recharge between the Hueneme and Fox Canyon aquifers can potentially be revised to better reflect the outcrop area of each aquifer.
- M&I return flows—This term refers to water applied for landscape irrigation, leaked water from water supply and wastewater pipelines, and storm water that is collected in detention basins or other facilities and allowed to infiltrate into the ground. Most of these return flows recharge the Shallow Alluvial Deposits, but some may contribute to recharge of the Hueneme Aquifer and Fox Canyon Aquifer in the foothills in the north part of Mound Basin, where residential development exists on the hillsides.
- Agricultural return flows— This term refers to water applied for agricultural irrigation (in addition to rainfall) that infiltrates deeper than the root zone of crops. Some "excess" irrigation of farmland is required to leach salts from shallow soil, and some irrigation inefficiencies occur due to the variability in irrigation application and soil infiltration capacity. These infiltrating return flows may be intercepted by perched zones in near-surface soil horizons or continue downward to the uppermost aquifer, which in most of Mound Basin is the Shallow Alluvial Deposits. However, some return flows in the foothills in the north part of Mound Basin may contribute to recharge of the Hueneme Aquifer and Fox Canyon Aquifer, where avocado and other orchards are present in areas where these aquifers are present at or near land surface.

- Stream-channel recharge—This term refers to infiltration of surface water flows in "losing" reaches of major streams (excluding areas of mountain-front recharge as described above). The quantity of recharge occurring in the narrow channels of the barrancas in Mound Basin, most of which only flow briefly following storm events, is so small as to be considered by United (2018) to be indistinguishable from areal recharge of agricultural and M&I return flows. The Santa Clara River is the only major stream in Mound Basin, and the reach of the Santa Clara River in Mound Basin is considered to usually be the site of groundwater discharge, rather than recharge (Stillwater Sciences, 2011; United, 2018). However, the lower Santa Clara River in the area of its estuary is reported to fluctuate from gaining to losing cycles as water levels rise and fall in response to breaching of the barrier sand at the mouth of the river (Stillwater Sciences, 2011). When the elevation of surface water in the estuary rises (following closure of the barrier bar), some of the rising water infiltrates (recharges) the shallow deposits adjacent to the river. Then, typically in the following winter or spring, a large storm will produce sufficient flows in the river that it will breach the barrier bar and cause rapid decline of surface water levels in the estuary, causing groundwater in the adjacent shallow deposits to discharge back into the river over a sustained period.

Areas where these sources of recharge occur in Mound Basin are shown on Figure 3.1-11, and further discussion of the nature and quantities of these sources of recharge are discussed in Section 3.3. In addition to the types of recharge (from land surface) listed above, subsurface inflow of groundwater also occurs in Mound Basin as a result of groundwater underflow from adjacent basins (United, 2018), as discussed in Section 3.3.

Within Mound Basin, groundwater discharge occurs from the Shallow Alluvial Deposits along the lower, gaining reach of the Santa Clara River (area 11 on Figure 3.1-11), and via tile drains installed under farmland adjacent to the river, as noted on Figure 3.1-11. These areas of groundwater discharge in Mound Basin are shown on Figure 3.1-11, and their quantities are discussed in Section 3.3. As noted in Section 3.1.1.2, no springs or seeps are shown on USGS topographic maps within or adjacent to the boundaries of Mound Basin. In addition to the types of discharge listed above, extraction of groundwater also occurs in Mound Basin at water supply wells, as discussed in Section 3.1.4.4.

3.1.4.3 Groundwater Quality [§354.14(b)(4)(D)]

§354.14 Hydrogeological Conceptual Model.

(b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*

(4) *Principal aquifers and aquitards, including the following information:*

(D) General water quality of the principal aquifers, which may be based on information derived from existing technical studies or regulatory programs.

Available groundwater quality data and existing technical studies were reviewed to understand the age, major-ion chemistry, and spatial and temporal trends in key groundwater quality indicator constituents, such as total dissolved solids (TDS), sulfate, chloride, and nitrate, in the principal aquifers of Mound Basin.

Groundwater quality data are available from wells screened in three HSUs in Mound Basin: the fine-grained Pleistocene deposits, Mugu Aquifer, and Hueneme Aquifer. Maps of recent (2017) concentrations of the key indicator constituents and time-series graphs of historical concentrations detected at selected wells are shown on Figures 3.1-12 through 3.1-25. Water quality data for 2017 (VCWPD, 2021) were selected for these maps because 2017 was the most recent year when a relatively large number of Mound Basin wells were sampled; fewer wells were sampled in 2018 by VCWPD due to staffing issues. The major-ion chemistry of the HSUs is shown using stiff diagrams on Figures 3.1-21 through Figure 3.1-23. Comparison of the stiff diagrams reveals that groundwater in the fine-grained Pleistocene deposits has a very different chemistry than groundwater in the principal aquifers (Mugu and Hueneme aquifers). Groundwater in the fine-grained Pleistocene deposits is 3 to 5 times more mineralized and has a different major-ion signature than groundwater in the Mugu and Hueneme aquifers. The degree of mineralization and major-ion chemistry in the Mugu and Hueneme aquifers are similar, with Hueneme Aquifer groundwater generally being slightly more mineralized. One exception is the shallow, dedicated monitoring well at Community Park (CWP-510), which is screened in the upper Hueneme Aquifer and has major-ion chemistry that bears similarities to the fine-grained Pleistocene deposits (Figure 3.1-23). The dramatic difference between groundwater chemistry in the fine-grained Pleistocene deposits versus the Mugu and Hueneme aquifers is explained by different geochemical processes operative in the shallow HSUs versus the deeper, principal aquifers. S.S. Papadopulos & Associates, Inc. (SSP&A, 2020) concluded that groundwater in the principal aquifers appears to be similar in composition to regional groundwater in other local basins; in contrast, shallow groundwater is additionally influenced by reactions with local aquifer minerals, principally gypsum and perhaps other evaporites that do not appear to be present in the principal aquifers.

SSP&A (2020) further concluded that there is no significant evidence for interactions between groundwater in the principal aquifers and shallow groundwater (CWP-510 is included here) or deeper, mineralized water. SSP&A (2020) also concluded that groundwater at the sample locations in the Basin is at least 1,000 years old. These conclusions together suggest that vertical movement of water percolating from land surface is not a major source of recharge to the principal aquifers, except where they are exposed at land surface in the northern portion of the Basin.

Groundwater quality in each of the principal aquifers, as discussed further below, is relatively stable at many Mound Basin wells having long-term groundwater quality records, consistent with the conclusion by previous investigators that natural causes are the primary source of elevated concentrations of dissolved constituents in groundwater.

The Basin Plan of the Regional Water Quality Control Board (RWQCB), Los Angeles region (RWQCB-LA) establishes groundwater quality “objectives” (WQOs) as “the allowable limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area” (RWQCB-LA, 2019). The WQOs for Mound Basin are shown in Table 3.1-03.

Mugu Aquifer

Maximum TDS, sulfate, chloride, and nitrate concentrations detected in 2017 at five wells screened in the Mugu Aquifer (including wells with screens that extend above or below the Mugu Aquifer) were reported to or obtained by United (Figures 3.1-12 through 3.1-15). Four of these five wells are located along the west-southwest to east-northeast axis of the Basin, and one is located in the southeast quadrant of the Basin. Also shown on Figures 3.1-12 through 3.1-15 are water quality data at wells in adjacent areas of the Oxnard and Santa Paula basins, as they may provide some insight to groundwater quality along the southern and eastern margins of Mound Basin.

The maximum TDS concentrations detected in 2017 at wells screened in the Mugu Aquifer in Mound Basin ranged from 880 to 3,040 milligrams per liter (mg/L) (Figure 3.1-12). The two highest TDS concentrations were detected at wells 02N22W07P01S (near the intersection of U.S. Highway 101 and State Highway 126, in the central portion of Mound Basin) and well 02N22W08G01S (near the intersection of State Highway 126 and Victoria Avenue, also in the central portion of Mound Basin). The TDS concentrations detected at these wells are not considered representative of Mugu Aquifer groundwater quality. After excluding the unrepresentative results, the range of maximum TDS concentrations measured in the remaining three wells is 880 to 1,420 mg/L (Figure 3.1-12). For comparison and as shown in Table 3.1-03, the RWQCB-LA WQO for TDS in confined aquifers of the lower Santa Clara River basins (including Mound Basin) is 1,200 mg/L (RWQCB-LA, 2019). The California Division of Drinking Water (DDW) lists a "recommended secondary" maximum contaminant level (MCL) range (MCLR) for TDS in public water supplies of 500 mg/L.

The maximum sulfate concentrations detected in 2017 at wells screened in the Mugu Aquifer in Mound Basin ranged from 312 to 1,550 mg/L (Figure 3.1-13). Similar to TDS, the two highest TDS concentrations were detected at wells 02N22W07P01S and well 02N22W08G01S, in the central portion of the Basin. Similar to TDS, the sulfate results from these wells are not considered representative of Mugu Aquifer groundwater quality. After excluding the unrepresentative results, the range of maximum sulfate concentrations measured in the remaining three wells is 312 to 698 mg/L (Figure 3.1-13). The RWQCB-LA's applicable WQO for sulfate (Table 3.1-03) in Mound Basin is 600 mg/L (RWQCB-LA, 2019). The DDW-recommended secondary MCLR for sulfate in public water supplies is 250 mg/L. DDW also lists an "upper secondary" MCLR for sulfate in public water supplies of 500 mg/L.

The maximum chloride concentrations detected in wells screened in the Mugu Aquifer in Mound Basin ranged from 45 to 138 mg/L (Figure 3.1-14). Similar to TDS and sulfate, the two highest TDS concentrations were detected at wells 02N22W07P01S and well 02N22W08G01S, in the central portion of the Basin. Similar to TDS and sulfate, the chloride results from these wells are not considered representative of Mugu Aquifer groundwater quality. After excluding the unrepresentative results, the range of maximum chloride concentrations measured in the remaining three wells is 45 to 76 mg/L (Figure 3.1-14). The RWQCB-LA's applicable WQO for chloride (Table 3.1-03) in Mound Basin is 150 mg/L (RWQCB-LA, 2019). DDW's recommended secondary MCLR for chloride in public water supplies is 250 mg/L and DDW's upper MCLR for chloride in public water supplies is 500 mg/L.

The maximum nitrate as (as nitrate [NO_3]) concentrations detected in 2017 at wells screened in the Mugu Aquifer in Mound Basin ranged from less than the detection limit (0.4 mg/L) to 64.6 mg/L (Figure 3.1-15). Nitrate concentrations are occasionally reported by laboratories in equivalent weight as nitrogen; in this GSP, nitrate results reported as nitrogen have been recalculated to equivalent concentrations as NO_3, unless otherwise noted. Similar to the other common dissolved constituents noted above, the highest nitrate concentrations in the Mugu Aquifer in 2017 were detected at wells 02N22W07P01S and well 02N22W08G01S, in the central portion of the Basin. Similar to TDS, sulfate, and chloride, the nitrate concentrations in these wells are anomalously high compared to other Mugu Aquifer wells in the Basin, suggesting influence of shallow groundwater through a possibly compromised well seal or well casing. Nitrate concentrations were below the detection limit at two of the three remaining (representative) wells in the Mugu Aquifer and 8.4 mg/L at well 02N22W09K01S (Figure 3.1-15). The RWQCB-LA's applicable WQO for nitrate (as NO_3) in Mound Basin is 45 mg/L (RWQCB-LA, 2019). Similarly, DDW lists a "primary" MCL for nitrate in public water supplies of 45 mg/L (as NO_3).

Figures 3.1-20 through 3.1-25 show times series of measured historical TDS, chloride, and sulfate in selected wells in Mound Basin, including three wells screened in the Mugu Aquifer. At Well 02N23W14K01S, which is screened in both the Mugu and Hueneme aquifers, TDS exceeded the WQO of 1,200 mg/L for the Basin from the early 1930s to 1957. However, for the rest of the period of historical record (from the mid-1960s through the early 1980s), TDS concentrations at well 02N23W14K01S remained below the current WQO, with the exception of two samples from the late 1960s. Sulfate concentrations measured at the same well have been below the current WQO of 150 mg/L from the early 1930s through the last sample taken in the early 1980s, with the exception of one sample from the early 1960s that appears to be an outlier. Chloride concentrations measured at the same well have been below the WQO of 150 mg/L from the early 1930s through the last sample taken in the early 1980s, with the exception of one sample (also from the early 1960s) that appears to be an outlier. TDS, chloride, and sulfate concentrations at other wells (Figure 3.1-21 and 3.1-22) have been at or below the WQO throughout the available period of record from 1995 through 2020, with the exception of three detections of TDS above the WQO of 1,200 mg/L prior to 2010. TDS, sulfate, and chloride concentrations have been below the RWQCB-LA WQOs for the entire period of record at Marina Park and Camino Real Park monitoring wells 02N23W15J02S and 02N22W07M02S, screened in the Mugu Aquifer (Figures 3.1-21 and 3.1-22).

Measured historical boron concentration slightly exceeded the Basin WQO in October of 2013 at only one well (02N22W07P01S). The average boron concentration measured at Well 02N22W07P01S over the available period of record of 2000 to 2017 was 0.71 mg/L. The one-time exceedance was likely due to the major drought that occurred in 2013. It is also noted that this well has consistently had anomalously high concentrations of common constituents, suggesting influence of shallow groundwater within this well, possibly through a compromised well seal or well casing; therefore, boron results from this well are considered non-representative of the Mugu Aquifer. All the samples taken after October 2013 at the same well had concentrations less than the Basin WQO and did not show any specific trend.

Hueneme Aquifer

Maximum TDS, sulfate, chloride, and nitrate concentrations detected in 2017 at nine wells screened in the Hueneme Aquifer (including wells with screens that extend above or below the Hueneme Aquifer) were reported to or obtained by United (Figures 3.1-16 through 3.1-19). Five of these nine wells are located along the west-southwest to east-northeast axis of the Basin, and four are located in the southeast quadrant of the Basin. Figures 3.1-21 through 3.1-25 show concentrations of TDS, sulfate, and chloride over time at selected wells with historical data available in Mound Basin, including six wells screened in the Hueneme Aquifer. It is noted that wells 02N23W13K03S, 02N22W08F01S, and 02N22W09L04S exhibit anomalously high concentrations of TDS, sulfate, chloride, and nitrate, suggesting influence of shallow groundwater, possibly through a compromised well seal or well casing. Thus, the elevated concentrations of TDS, sulfate, and chloride reported for these wells should not be considered representative of Hueneme Aquifer groundwater quality.

The maximum TDS concentrations detected in 2017 at wells screened in the Hueneme Aquifer in Mound Basin ranged from 1,060 to 6,390 mg/L (Figure 3.1-16). The highest TDS concentration was detected at monitoring well 02N22W09L04S, in the southeast quadrant of the Basin. As stated above, the TDS result from this well and two others are not considered representative of Hueneme Aquifer groundwater quality. After excluding the unrepresentative results, the range of maximum TDS concentrations measured in the remaining six wells is 1,060 to 1,420 mg/L (Figure 3.1-16). Four of the six representative wells have TDS concentrations below the RWQCB-LA WQO and two are above.

The maximum sulfate concentrations detected in 2017 at wells screened in the Hueneme Aquifer in Mound Basin ranged from 412 to 3,620 mg/L (Figure 3.1-17). Similar to TDS in the Hueneme Aquifer, the single highest sulfate concentration was detected at monitoring well 02N22W09L04S, in the southeast quadrant of the Basin. As stated above, the sulfate result from this well and two others are not considered representative of Hueneme Aquifer groundwater quality. After excluding the unrepresentative results, the range of maximum sulfate concentrations measured in the remaining six wells is 412 to 698 mg/L (Figure 3.1-17). Five of the six representative wells have sulfate concentrations below the RWQCB-LA WQO and one is above.

The maximum chloride concentrations detected in 2017 at wells screened in the Hueneme Aquifer in Mound Basin ranged from 67 to 181 mg/L (Figure 3.1-18). Similar to TDS and sulfate in the Hueneme Aquifer, the single highest chloride concentration was detected at monitoring well 02N22W09L04S, in the southeast quadrant of the Basin. As stated above, the chloride result from this well and two others are not considered representative of Hueneme Aquifer groundwater quality. After excluding the unrepresentative results, the range of maximum chloride concentrations measured in the remaining six wells is 67 to 86 mg/L (Figure 3.1-18). All six representative wells have chloride concentrations below the RWQCB-LA WQO.

The maximum nitrate concentrations detected in 2017 at wells screened in the Hueneme Aquifer in Mound Basin ranged from less than the laboratory detection limit (0.4 mg/L) to 136 mg/L (Figure 3.1-19). Similar to the other common dissolved constituents detected in the Hueneme Aquifer, the single highest nitrate concentration in the Hueneme Aquifer was detected at monitoring well 02N22W09L04S, in the southeast quadrant of the Basin. It is noted that the nitrate concentrations in this well (together with well 02N23W13K03S) are anomalously high compared to other Hueneme Aquifer wells in Mound Basin, suggesting influence of shallow groundwater, possibly through a compromised well seal or well casing. Nitrate concentrations were below the detection limit at five wells in the Hueneme Aquifer in Mound Basin (Figure 3.1-19).

Municipal water supply well 02N22W08F01S (Victoria 2) is one of the few wells in Mound Basin where increasing trends are clearly discernible in past (1995 to 2006) TDS and sulfate concentrations (Figure 3.1-24). This well has three screened intervals (580 to 640; 900 to 940; and 1,060 to 1,180 ft bgs) in the Hueneme Aquifer. As noted above, concentrations of these constituents are anomalously high, suggesting a potential influence of an overlying HSU on water quality at these wells, possibly through a compromised well seal or well casing. As groundwater production increased from this well in the 1990s, TDS concentrations increased from approximately 1,000 mg/L to approximately 1,500 mg/L by 2006. Concentrations have since stabilized and have not increased further. The cause of the groundwater quality changes at this well is currently unknown. It is noted that all other wells screened in the Hueneme Aquifer with historical water quality data exhibit generally stable trends for all constituents (Figures 3.1-21 through 3.1-25).

Measured historical boron concentrations have exceeded the Basin WQO at five wells screened in the Hueneme Aquifer. The maximum measured boron concentrations at these wells ranged from 1.05 to 1.30 with the exception of one well (02N23W24G01S), which only had reported data during the 1950s. The reported concentrations at Well 02N23W24G01S show that boron was 7.0 mg/L in October 1953, whereas the rest of the reported concentrations at the same well were below 0.59 mg/L. The 7.0 mg/L reported for October 1953 appears to be an outlier and thus should not be considered. Boron concentrations at the remaining four wells screened in the Hueneme Aquifer show boron concentrations below the Basin WQO for the entire period of record with the exception of one or two samples from one well (02N22W08F01S); these results are not typical of the record of sampling data, which are consistently below the WQO.

3.1.4.4 Primary Beneficial Uses [§354.14(b)(4)(E)]

§354.14 Hydrogeological Conceptual Model.
(b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*
(4) *Principal aquifers and aquitards, including the following information:*
(E) Identification of the primary use or uses of each aquifer, such as domestic, irrigation, or municipal water supply.

The primary uses of each principal aquifer in Mound Basin (Mugu and Hueneme) are reflected in the extraction records that are reported to United (and included in the MBGSA DMS). Importantly, there are no active or recently active domestic wells in the Basin. Recent (as of 2019) extraction records for groundwater in Mound Basin reported to United include agricultural water supply (at 22 wells) and M&I water supply (at 4 wells). In 2019, 2,873 AF (45% of the total of 6,319 AF of groundwater extracted from Mound Basin) was used for agriculture, and 3,446 AF (55% of the total) was used for M&I purposes. The locations of all 26 water supply wells active in Mound Basin in 2019 and relative volumes of groundwater extracted by each well are shown on Figure 3.1-26. The quantities of groundwater extracted for agricultural and M&I uses from the principal aquifers underlying Mound Basin during the past 40 years (1980 through 2019) are shown on Figures 3.1-27 through 3.1-29. None of the wells active in 2019 were reportedly used for domestic supply, likely due to the availability of potable water from Ventura Water and the significant expense required to drill a domestic water supply well to the depth required to reach a principal aquifer in Mound Basin. The following subsections provide more detail regarding the primary uses of groundwater extracted from each principal aquifer in Mound Basin.

Shallow Alluvial Deposits

No wells extract groundwater from the Shallow Alluvial Deposits in the Basin.

Mugu Aquifer Extraction

Five active wells are screened solely in the Mugu Aquifer and one active well is believed to produce water primarily from the Mugu Aquifer, despite possibly being screened partly in the Hueneme Aquifer (Table 3.1-02). In 2019, five of these six wells supplied 948 AF of groundwater for agricultural use, which was approximately 15% of the total extracted from Mound Basin that year. The remaining well supplied 1,740 AF of groundwater for M&I use, which was approximately 28% of the total extracted from Mound Basin in 2019.

Hueneme Aquifer Extraction

Ten active wells are screened solely in the Hueneme Aquifer and one active well is believed to produce water primarily from the Hueneme Aquifer, despite possibly being screened partly in the Mugu Aquifer (Table 3.1-02). In 2019, three of these wells supplied 1,706 AF of groundwater for M&I use, which was approximately 27% of the total extraction from Mound Basin. The remaining eight wells supplied 1,129 AF of groundwater for agricultural use, which was approximately 18% of the total extracted from Mound Basin in 2019.

Extraction from Wells Screened Across Multiple Aquifers

Four active water supply wells are screened in (and are assumed to withdraw significant quantities of groundwater from) both the Mugu and Hueneme aquifers; all groundwater extracted from these wells is used for agricultural purposes (Table 3.1-02). In 2019, a total of 134 AF was extracted from these wells, which was approximately 2% of the total extracted from Mound Basin that year.

Two active water supply wells are screened in both the Hueneme and Fox Canyon aquifers; the water extracted from these wells is used for agricultural purposes (Table 3.1-02). In 2019, a total of 191 AF was extracted from this well, which was about 3% of the total quantity of groundwater extracted from Mound Basin that year. Due to the generally higher hydraulic conductivity and transmissivity of the Hueneme Aquifer in Mound Basin compared to the Fox Canyon Aquifer, most of the groundwater extracted from these wells likely was derived from the Hueneme Aquifer.

Extraction from Wells with Unknown Screened Intervals

The depths of the screened intervals for three active water supply wells in Mound Basin have not been reported. The water extracted from these wells is used for agricultural purposes (Table 3.1-02). In 2019, a total of 472 AF was extracted from these wells, which was approximately 7% of the total extracted from Mound Basin that year.

Other Beneficial Uses

In addition to groundwater production from the principal aquifers, discharge of small quantities of groundwater from the Shallow Alluvial Deposits to the lower reach of the Santa Clara River in Mound Basin may contribute to GDEs. This potential beneficial groundwater use is further described in Section 3.2.7 and Appendix G.

3.1.5 Data Gaps and Uncertainty [§354.14(b)(5)]

§354.14 Hydrogeological Conceptual Model.

(b) *The hydrogeologic conceptual model shall be summarized in a written description that includes the following:*

(5) Identification of data gaps and uncertainty within the hydrogeologic conceptual model.

The discussion of data gaps and uncertainty within the HCM of Mound Basin is provided below, organized according to the HCM elements listed in the GSP Emergency Regulations.

Topography [§354.14(d)(1)]

No data gaps or significant uncertainties were identified.

Surface Water Bodies [§354.14(d)(5)]

No data gaps or significant uncertainties were identified.

Imported Water [§354.14(d)(6)]

No data gaps or significant uncertainties were identified.

Regional Geology and Structural Setting [§354.14(b)(1),(d)(2)]

No data gaps or significant uncertainties were identified.

Soil Characteristics [§354.14(d)(3)]

No data gaps or significant uncertainties were identified.

Vertical and Lateral Extent of Mound Basin [§354.14(b)(2),(b)(3),(c)]

The precise location, orientation, and hydraulic impact of the Basin-bounding McGrath Fault (south boundary) and Country Club Fault (east boundary) are not known precisely because they do not offset surficial units within the Basin. However, the south and east boundaries are jurisdictional and thus do not depend on precise knowledge of the fault locations. Going forward, MBGSA will work with the adjacent basin institutions (Santa Paula Basin Technical Advisory Committee and FCGMA), as well as United, to improve the understanding of the location and hydraulic barrier effects of the Basin-bounding faults, when opportunities arise.

With regard to the western Basin boundary, it is defined as the Pacific Ocean shoreline, of which the location is known with certainty. From a purely hydraulic perspective, the western Basin boundary is more appropriately considered to be the location where the principal aquifers are exposed to seawater. The principal aquifers of Mound Basin are believed to extend up to approximately 10 miles offshore under the Pacific Ocean west of the shoreline, to the location where they are mapped as cropping out on the continental shelf edge, as shown on Figure 3.1-10. However, it is unknown if the aquitards that separate the principal aquifers from the seafloor have been eroded away or otherwise compromised by faulting or folding between the shoreline and the continental shelf edge. This is a very significant uncertainty in the HCM that directly impacts management relative to the seawater intrusion sustainability indicator.

The vertical extent (definable bottom) of the Basin is known only from a relatively small number of oil well logs. This is because few wells tap the deepest freshwater aquifer and none fully penetrate it. The uncertainty in the vertical extent of the Basin is not considered a significant data gap or uncertainty in the HCM because there is little, if any, groundwater extracted from the deepest freshwater aquifer.

Groundwater Flow Barriers [§354.14(b)(4)(C) and (c)]

The prior discussion of uncertainty concerning the location, orientation, and hydraulic impact of the Basin-bounding faults (McGrath and Country Club Faults) also applies to this part of the HCM.

In addition, the hydraulic impact of Pitas Point, Ventura, and Foothill faults, located in the northern portion of the Basin, are uncertain. These faults have uplifted the principal aquifers in the northern portion of the Basin, exposing them at land surface. Given the significant offset of the principal aquifers and the juxtaposition of different HSUs across the fault plane, it can be inferred that these faults likely impede groundwater flow in the principal aquifers to some degree. There are no groundwater monitoring wells located north and immediately south of these faults to detect groundwater elevation change across the faults. Neither the USGS (2003a) nor United (2018) regional groundwater flow models incorporated these faults as horizontal flow barriers because of this lack of data. This is considered a significant uncertainty in the HCM because MBGSA's knowledge of groundwater flow directions is largely derived from United's groundwater model (2021a), which currently assumes no impedance of flow from the principal aquifer outcrops north of these faults. If these faults impede flow, the groundwater flow directions and water budget for Mound Basin derived from the groundwater flow model might be significantly different. MBGSA will work with United to test alternative model calibrations that consider varying degrees of potential barrier effects of these faults to evaluate uncertainty in groundwater flow directions and water budget and the resulting impact on Basin management decisions.

Formation Names and Hydraulic Properties [§354.14(b)(4)(A), (b)(4)(B)]

The lateral and vertical extents of the Basin HSUs are well established, except for the bottom of the deepest freshwater aquifer, as discussed above.

As noted in Section 3.1.4, no aquifer tests have been reported in the literature. The best available information for aquifer and aquitard hydraulic properties in Mound Basin is from the calibrated regional groundwater flow model (United, 2018). Use of model-derived hydraulic properties values is considered appropriate and, therefore, the lack of aquifer tests results is not considered a significant data gap or uncertainty at this time. Going forward, MBGSA will work with well owners in the Basin to conduct aquifer tests when opportunities arise, such as when new or replacement wells are constructed.

Groundwater Recharge and Discharge Areas [§354.14(d)(4)]

No data gaps or significant uncertainties were identified; however, as described above, the degree of hydraulic connectivity of the principal aquifer outcrops in the northern part of Mound Basin with the remainder of the Basin (south of the Ventura, Pitas Point, and Foothills faults) is uncertain.

Water Quality [§354.14(b)(4)(D)]

Groundwater in the principal aquifers in the northern and western portions of Mound Basin has not been sampled in recent years (and in some areas, it has never been sampled) for water quality analysis. No wells currently are known to exist that can be used to obtain samples in these areas. However, there is no groundwater production in these portions of the basins, so this is not considered to be a significant data gap or uncertainty in the HCM.

Primary Beneficial Uses [§354.14(b)(4)(E)]

No data gaps or significant uncertainties were identified.

3.2 Groundwater Conditions [§354.16]

This subsection provides a description of current and historical groundwater conditions in the principal aquifers of the Mound Basin, based on best available information. Groundwater conditions during the past 10 years, and particularly from 2015 to present, are the primary focus of this subsection, although historical data are also discussed where such data provide relevant information about long-term trends in groundwater conditions. Additional details regarding historical groundwater conditions in Mound Basin and the vicinity in the first half of the 20th century are provided by Mukae and Turner (1975) and John F. Mann Jr. & Associates (1959). In addition, USGS (2003a) estimated groundwater levels and movement throughout the region from the 1890s to the early 1990s, based on data synthesis and modeling. United and other local agencies have been collecting groundwater elevation and groundwater quality data from wells in Mound Basin and adjacent basins since the 1920s. United maintains a comprehensive, up-to-date database of groundwater elevations in Mound Basin, incorporating selected data from the VCWPD and other sources that supplement the data collected by United. Therefore, the source of most of the data relied upon in this subsection is United's database, supplemented with additional data from the City of Ventura, the County of Ventura, and other agencies as appropriate. All of the above-described data have been incorporated into the MBGSA DMS.

3.2.1 Groundwater Elevations [§354.16(a)]

Maps of groundwater elevation data combined with hydrographs showing changes in groundwater elevations over time can help illustrate groundwater occurrence and movement in an aquifer system. Groundwater elevation data are available for nearly 60 wells located within Mound Basin. However, not all of these wells are being monitored at present. The distribution of wells is heavily skewed towards the southern half of the Basin, with relatively few wells existing in the northern half of the Basin (north of Highway 126). As noted in Section 3.1, faults near the southern and eastern boundaries of the Basin affect groundwater movement. Therefore, groundwater level data from adjacent areas of the Oxnard and Santa Paula basins are also presented in this section to help define lateral gradients along the eastern and southern boundaries of Mound Basin.

3.2.1.1 Groundwater Elevation Contours [§354.16(a)(1)]

§354.16 Groundwater Conditions. *Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:*

(a) *Groundwater elevation data demonstrating flow directions, lateral and vertical gradients, and regional pumping patterns, including:*

(1) Groundwater elevation contour maps depicting the groundwater table or potentiometric surface associated with the current seasonal high and seasonal low for each principal aquifer within the basin.

The contouring of groundwater levels in Mound Basin is complicated by the sparse data, particularly in the northern portion of the Basin. Groundwater level measurements obtained from wells screened in the

Mugu and Hueneme aquifers (the principal aquifers in Mound Basin) during 2012 and 2019 are shown on Figures 3.2-01 through 3.2-08. Year 2012 was the most recent year when groundwater levels in Mound Basin were representative of average conditions, while year 2019 represents more recent conditions, which continue to be influenced by overall drought conditions that started in 2012 and the associated deficit of groundwater recharge compared to discharge. The groundwater elevations posted on Figures 3.2-01 through 3.2-08 are seasonal high and seasonal low groundwater levels, which typically occur during the spring and fall, respectively, of each year. Data shown were generally collected in March or April (for spring highs) and September or October (for fall lows). Due to the limited distribution of wells where groundwater elevations can be measured, groundwater elevations simulated by United using the Ventura Regional Groundwater Flow Model (United, 2018, 2021a, 2021b) for the Mugu and Hueneme aquifers in 2012 and 2019 were contoured to illustrate groundwater flow directions and horizontal groundwater gradients throughout Mound Basin and are shown on Figures 3.2-01 through 3.2-08.

As discussed in the HCM (Section 3.1), Mound Basin is structurally complex. The main groundwater flow pattern is from east-northeast to the west-southwest, along the axis of the Mound Basin, towards the Pacific Ocean (United, 2012). Available information indicates that Mound Basin receives groundwater underflow from both the Santa Paula Basin to the east and the Oxnard Forebay/ Oxnard Plain to the south (United, 2018). Generalized conceptual groundwater flow paths in the principal aquifers of Mound Basin are depicted on Figure 3.2-09. More detail regarding inflows and outflows of groundwater in Mound Basin are presented in Section 3.3.

Figures 3.2-01 and 3.2-02 show modeled groundwater elevation contours in the Mugu Aquifer during spring and fall of 2012, together with spring-high and fall-low groundwater level measurements reported for wells screened in the Mugu Aquifer. Overall, the pattern of groundwater contours in the Basin during spring and fall are similar, with groundwater levels about 10 ft lower in the fall than spring. The groundwater flow direction in the Mugu Aquifer is consistent with the typical flow pattern, from the eastern side of the Basin to the west-southwest toward the Pacific Ocean, with a gradient of approximately 0.002 ft/ft. Groundwater flows from areas of high groundwater elevation to areas of low groundwater elevation. The highest contoured groundwater elevation in the Mugu Aquifer during 2012, 210 ft msl, occurred in the northeastern portion of the Basin. The lowest contoured groundwater elevations in the Mugu Aquifer in 2012, 20 ft msl and 10 ft msl, occurred during spring and fall, respectively, in the central portion of Mound Basin. During the fall, a 5 ft msl contour in the Oxnard Basin extends slightly into the southwest corner of the Mound Basin.

Figures 3.2-03 and 3.2-04 show modeled groundwater elevation contours in the Hueneme Aquifer during spring and fall of 2012, together with spring-high and fall-low groundwater levels measured at wells screened in the Hueneme Aquifer. The groundwater flow direction in the Hueneme Aquifer during the spring was consistent with the typical flow pattern, from the eastern side of the Basin to the west-southwest toward the Pacific Ocean, with a gradient of approximately 0.002 ft/ft. However, during the fall of 2012, groundwater flow was to the south toward the boundary with the Oxnard Basin with a gradient of approximately 0.002 ft/ft. Groundwater levels in the Basin were more than 10 ft lower in the fall than spring. The highest contoured groundwater elevation in the Hueneme Aquifer during 2012, 295 ft msl, again occurred in the northeastern portion of the Basin. The lowest contoured groundwater elevation in the Hueneme Aquifer during spring 2012, 15 ft msl, occurred in the southwest portion of Mound Basin. The lowest contoured groundwater elevation in the Hueneme Aquifer in fall 2012, 0 ft msl (equal to mean sea level), occurred at the southern boundary with Oxnard Basin.

Figures 3.2-05 and 3.2-06 show modeled groundwater elevation contours in the Mugu Aquifer during spring and fall of 2019, together with spring-high and fall-low groundwater level measurements reported for wells screened in the Mugu Aquifer. Contours show the ongoing effects of the 2012-2016 drought in the region, with groundwater elevations across much of the Basin below sea level during both spring and fall. Overall, the pattern of groundwater contours in Mound Basin during spring and fall are similar, with groundwater levels about 5 ft lower in the fall than spring. The hydraulic gradients (groundwater flow directions) in both the Mugu and Hueneme aquifers in spring and fall of 2019 are consistently toward the southwest in the east part of the Basin (magnitude of the hydraulic gradient in this area is approximately 0.002 ft/ft), shifting southward in the central area of the Basin. The potentiometric surface is nearly flat in the central and western portions of the Basin in 2019. The highest contoured groundwater elevation in the Mugu Aquifer during 2019, 220 ft msl, occurred in the northeastern portion of the Basin. The lowest contoured groundwater elevations in the Mugu Aquifer in 2019, -15 ft msl and -20 ft msl (spring and fall, respectively), occurred in the central and west portions of Mound Basin.

Figures 3.2-07 and 3.2-08 show modeled groundwater elevation contours in the Hueneme Aquifer during spring and fall of 2019, together with spring-high and fall-low groundwater levels measured at wells screened in the Hueneme Aquifer. Similar to the Mugu Aquifer, contours show drought conditions, with heads in much of the Basin measured below sea level. The groundwater flow direction in the Hueneme Aquifer was westward in the eastern portion of the Basin (magnitude of the hydraulic gradient was approximately 0.002 ft/ft), shifting southward in the central part of Mound Basin. Overall, the pattern of groundwater contours in Mound Basin during spring and fall are similar, with groundwater levels about 5 ft lower in the fall than spring. Again, the potentiometric surface is nearly flat in the central and western portions of the Basin in 2019. The highest contoured groundwater elevation in the Hueneme Aquifer during spring 2019, 295 ft msl, occurred in the northeastern portion of the Basin. The lowest contoured groundwater elevations in the Hueneme Aquifer in 2019, -15 ft msl and -25 ft msl (spring and fall, respectively) occurred at the southern boundary with Oxnard Basin.

3.2.1.2 Groundwater Elevation Hydrographs [§354.16(a)(2)]

> **§354.16 Groundwater Conditions.** *Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:*
> ***(a)*** *Groundwater elevation data demonstrating flow directions, lateral and vertical gradients, and regional pumping patterns, including:*
> ***(2) Hydrographs depicting long-term groundwater elevations, historical highs and lows, and hydraulic gradients between principal aquifers.***

Groundwater elevations in Mound Basin fluctuate in response to seasonal, annual, and longer-term changes in rainfall, which influences several water-balance components in Mound Basin (as discussed in Section 3.3). Changes in groundwater levels can vary both by location and by aquifer within Mound Basin, although the general patterns of decline and recovery are similar throughout the Basin within the principal aquifers. The cumulative departure from the average precipitation is used to identify historical wet and dry periods to aid in interpretation of groundwater level trends over time. The cumulative departure from average precipitation is calculated by accumulating the annual differences between annual precipitation and the long-term average annual precipitation. Precipitation records from rain gage station 222 (at "Ventura, Thille Ranch") and station 222A (at the Ventura County Government Center) were used to calculate the cumulative departure curves, which are shown on the graphs included in Figures 3.2-10 through 3.2-13. These stations were selected because of their central location and long period of record (1926 to present). During this period, the calculated average annual precipitation in the central Mound Basin is 15.56 inches. For the discussion of groundwater elevation hydrographs below, wells have been grouped geographically within Mound Basin (south, north, central, east, west) with locations shown on Figures 3.2-10 through 3.2-13. In general, extended periods of low groundwater levels were recorded between the late 1920s and early 1930s, late 1940s and early 1950s, mid-1980s, early 1990s, and 2012 to 2018. These time periods are coincident with multi-year droughts, as shown in the declining limb of the curve showing cumulative departure from average precipitation, plotted on Figures 3.2-10 through 3.2-13. Groundwater elevations in both principal aquifers briefly declined below sea level during the historical droughts, but recovered during the subsequent wet periods.

Measured groundwater levels in southern Mound Basin have varied over about a 120-ft range over the period of record, ranging from approximately -60 to +60 ft msl (Figure 3.2-10). Groundwater levels generally rise and fall consistent with the cumulative departure curve for rainfall (Figure 3.2-10). Groundwater elevations at wells located south of the Oak Ridge Fault are similar to groundwater elevations measured at wells in the adjacent Oxnard Basin, to the south (Figure 3.2-10). Wells located in the southeast Mound Basin closest to the Forebay area of the Oxnard Basin (e.g., well 02N22W16K01S) exhibit the greatest annual variability in groundwater elevations, as a response to the large volumes of artificial recharge and extraction that occur in the Forebay area, although the range of recorded groundwater levels in Mound Basin is smaller than the range in the Forebay area (United, 2017b).

Groundwater level records are known to exist for only one well in the northern portion of Mound Basin, 02N23W01P01S, with a total depth of 300 ft (Figure 3.2-11). No information about the screened interval of this well is available; only total depth was provided by the VCWPD. However, the total depth of 300 ft suggests this well likely is screened in the fine-grained Pleistocene deposits instead of a principal aquifer. Groundwater level records for this well are available solely for the mid-1970s; at that time, groundwater levels at this well were about 100 ft higher than in wells located in the central portion of the Basin.

Measured groundwater levels in central Mound Basin have varied about a 120-ft range over the period of record, ranging from approximately -40 to +80 ft msl (Figure 3.2-11). The high groundwater levels shown for monitoring well 02N22W07M03S reflect groundwater levels in the fine-grained Pleistocene deposits.

Measured groundwater levels in eastern Mound Basin have varied over about a 140-ft range during the period of record, ranging from approximately -40 to +100 ft msl (Figure 3.2-12). Groundwater elevations in some principal aquifer wells in the eastern Mound Basin are approximately 80 to more than 100 ft lower than similarly screened wells in western Santa Paula Basin (Figures 3.2-01 through 3.2-08). This differential in groundwater elevations produces a large hydraulic gradient across the basin boundary between Santa Paula Basin and Mound Basin (DBSA, 2017; United, 2018). However, groundwater elevations at other wells in this area are similar to western Santa Paula Basin groundwater levels (Figure 3.2-12). These differences are likely related to the complex structural geology in the eastern Mound Basin area that is associated with the intersection of the Country Club and Oak Ridge faults. The time domain electromagnetic (TDEM) surface geophysical survey conducted by United (2020), documented changes in resistivity of the sediments across the Mound-Santa Paula and adjacent Oxnard Basin (Forebay area) boundaries. Anomalous zones of high and low resistivity (indicating sands/gravels and silts/clays, respectively) were observed in eastern Mound Basin, consistent with structural complexities related to faulting in this area (United, 2020).

Measured groundwater levels in western Mound Basin have varied over about a 60-ft range over the period of record, ranging from approximately -20 to +40 ft msl (Figure 3.2-13). Near the coast, few wells existed prior to the 1990s. In 1995, United and the City of Ventura jointly funded installation of three monitoring wells at Marina Park near the north side of Ventura Harbor to assess groundwater conditions at the coast. Artesian conditions (aquifer with sufficient water pressure to cause the groundwater level in a cased well to rise above land surface) are common in the shallowest of these wells, 02N23W15J03S, which is screened in the fine-grained Pleistocene deposits (170 to 240 ft bgs), as shown on Figure 3.2-13. Artesian heads of 30 ft above land surface are commonly recorded at this well. Coincident with overall drought conditions since 2012, groundwater levels in most wells in the western Mound Basin have been below sea level since approximately 2014, but heads in the monitoring well screened in the fine-grained Pleistocene deposits have remained artesian. The deeper wells at Marina Park (well 02N23W15J02S, screened from 480 to 660 ft bgs in the Mugu Aquifer and 02N23W15J01S (screened from 970 to 1070 ft bgs in the Hueneme Aquifer) commonly displayed weak artesian conditions before the recent drought began in 2012. In the agricultural area east of Ventura Harbor, groundwater levels commonly are below sea level during dry periods (Figure 3.2-13). For example, groundwater elevations of 25 ft below sea level were recorded in 1991 and 14 ft below sea level in 2004; since 2014 groundwater levels have declined up to 20 ft below sea level.

Vertical groundwater gradients between principal aquifers in Mound Basin are measured using groundwater level data collected at two of the three monitoring well clusters in Mound Basin. One cluster-well site is at Marina Park (wells 02N23W15J01S, 02N23W15J02S, 02N23W15J03S), located at the coast north of the Ventura Harbor (Figure 3.2-14). Another site is at Camino Real Park (wells 02N22W07M01S, 02N22W07M02S, 02N22W07M03S), located 2 miles inland near the intersection of U.S. Highway 101 and State Highway 126 (Figure 3.2-15). The last site (wells 02N22W09L03S, 02N22W09L04S) is farther east at the Community Water Park on Kimball Rd (Figure 3.2-16), but both wells in this cluster are interpreted to be screened within the Hueneme Aquifer. The sites at Marina Park and Camino Real Park have three monitoring wells, one screened in each of the following HSUs: fine-grained Pleistocene deposits, Mugu Aquifer, and Hueneme Aquifer. Hydrographs for these monitoring wells are shown on Figures 3.2-14 through 3.2-16. Groundwater levels in the shallowest wells, screened in the fine-grained Pleistocene deposits, are shown with a green line; groundwater levels in the middle depth wells, screened in the Mugu Aquifer, are shown with an orange line; and groundwater levels in the deepest wells, screened in the Hueneme Aquifer, are shown with a blue line. Since the monitoring wells at the Community Water Park are both screened in the Hueneme Aquifer, the groundwater level for the deeper screened well is shown in a darker blue than the groundwater level record for the shallower well. Table 3.2-01 provides the calculated vertical gradients at the three monitoring well sites. This includes the vertical gradient from the fine-grained Pleistocene deposits to the underlying Mugu Aquifer and from the Mugu Aquifer to the underlying Hueneme Aquifer at Marina Park and Camino Real Park. The vertical gradient is also calculated from upper to deeper strata of the Hueneme Aquifer at the Community Water Park, near Kimball Road. Vertical gradients were calculated using the available data record, from 1995 through 2019 at Marina Park and Camino Real Park and from 2008 through 2019 at the Community Water Park near Kimball Road. A positive vertical gradient value represents downward flow, and a negative vertical gradient value represents an upward flow.

Near the coast, groundwater levels in the well screened in the fine-grained Pleistocene deposits at Marina Park are significantly higher than those in the deeper wells (Figure 3.2-14), indicating that this aquitard is in poor hydraulic communication with the underlying principal aquifers of Mound Basin. The vertical gradient from the fine-grained Pleistocene deposits to the underlying Mugu Aquifer ranged from 0.009 to 0.120 ft/ft and averaged 0.075 ft/ft. Groundwater levels in the well screened in the Mugu Aquifer at this location are generally higher than the deepest well, which is screened in the Hueneme Aquifer, indicating a downward vertical gradient. Since the recent drought began in 2012, groundwater levels for the wells screened in the Mugu and Hueneme aquifers are similar (Figure 3.2-14). The vertical gradient from the Mugu Aquifer to the underlying Hueneme Aquifer ranged from -0.020 to 0.033 ft/ft and averaged 0.008 ft/ft.

Farther inland at Camino Real Park, groundwater levels in the well screened in the fine-grained Pleistocene deposits are significantly higher than the deeper wells (Figure 3.2-15), again indicating limited hydraulic communication with deeper aquifers. The vertical gradient from the fine-grained Pleistocene deposits to the underlying Mugu Aquifer ranged from 0.219 to 0.325 ft/ft and averaged 0.276 ft/ft. Prior to 2010, groundwater levels in the well screened in the Mugu Aquifer at this location were generally higher than those in the deepest well, indicating a downward vertical gradient. After 2010, groundwater levels in the deepest well, screened in the Hueneme Aquifer, were usually similar to or occasionally higher than the groundwater level in the well screened in the Mugu Aquifer, indicating neutral to slightly upward vertical gradient. The vertical gradient from the Mugu Aquifer to the underlying Hueneme Aquifer ranged from -0.028 to 0.043 ft/ft and averaged 0.008 ft/ft.

The monitoring well site furthest inland at the Community Water Park at Kimball Road show that groundwater levels in the shallower well are usually higher than the deeper well, indicating a downward vertical gradient (Figure 3.2-16). The vertical gradient from the shallow to deeper depth in the Hueneme Aquifer ranged from -0.018 to 0.070 ft/ft and averaged 0.038 ft/ft. Both wells in this cluster are interpreted to be screened within the Hueneme Aquifer. The electric log at this location indicates the Hueneme Aquifer consists of a series of coarse-grained zones separated by fine-grained zones of varying thickness. The electric log shows fine-grained zones between the monitoring well screen intervals, including a 30-ft-thick clay unit. The water quality data from the upper well at this location show anomalous major-ion chemistry, and groundwater levels recover very slowly after sampling events, sometimes taking several months to return to a similar groundwater level as before the sampling event. Thus, the vertical gradients reported at this location may not be representative of vertical gradients throughout the Hueneme Aquifer.

3.2.2 Change in Storage [§354.16(b)]

§354.16 Groundwater Conditions. *Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:*

(b) A graph depicting estimates of the change in groundwater in storage, based on data, demonstrating the annual and cumulative change in the volume of groundwater in storage between seasonal high groundwater conditions, including the annual groundwater use and water year type.

The annual change in volume of groundwater stored in a basin is the product of change in potentiometric head (measured as groundwater elevation), the storativity, and the area of each HSU. Similar to contouring of groundwater levels in Mound Basin (as described above), estimation of historical changes in groundwater stored in the Basin is complicated by sparse groundwater elevation data, particularly in the northern portion of the Basin and in HSUs with few monitoring points. Due to these limitations, annual and cumulative changes in groundwater in storage were estimated using United's (2018, 2021a, 2021b) groundwater flow model, which is generally well calibrated on a regional scale to groundwater elevation measurements.

Figure 3.2-17 graphically depicts the estimated annual change in groundwater storage in Mound Basin from 1986 through 2019, which is the historical period used to calibrate and validate United's (2018, 2021a, 2021b) model. The changes in storage estimated by the model from March 31 of a given year to March 31 of the subsequent year is depicted on Figure 3.2-17 as "estimated annual change in groundwater in storage" (seasonal high groundwater elevations in Mound Basin most commonly occur in March or April of each year). Also depicted on Figure 3.2-17 are:

- the cumulative change in storage, calculated as the sum of annual changes in storage up to the given year.
- the estimated groundwater use (volume of groundwater extracted) in Mound Basin during each water year.
- water year type.

The annual changes in groundwater storage in Mound Basin result from multiple groundwater inflows and outflows, as described in Section 3.3 of this GSP. However, some notable general trends are apparent from inspection of Figure 3.2-17, including:

- During most years with below-average rainfall ("dry years") and near-average rainfall ("average years"), groundwater in storage typically declined modestly (2,000 to 5,000 AF), although greater declines in storage (up to 9,000 AF annually) occurred during the exceptional droughts of 1987-1990 and 2012-2016. The greatest annual decreases in storage have not consistently been associated with years of the highest extraction rates, suggesting that other water budget components can have a significant influence on groundwater in storage.
- During most years with above-average rainfall ("wet years"), groundwater in storage often increased by 7,000 to 13,000 AF. These increases in groundwater storage were typically much larger than the annual declines observed during dry and average years, reflecting the importance of the region's infrequent wet years in recharging groundwater basins.
- The estimated cumulative change in groundwater in storage in Mound Basin declined markedly during the two exceptional droughts that occurred in the region (1987-1990 and 2012-2016). Cumulative change in storage quickly rebounded to pre-drought conditions in the four years following the 1987-1990 drought and remained positive (greater than initial conditions in 1986) until the next exceptional drought in the region (2012-2016). During the 2012-2016 exceptional drought, cumulative change in groundwater in storage sharply declined again, although not to the same magnitude as occurred from 1987-1990, likely due to the smaller volumes of groundwater extracted from Mound Basin in the past decade compared to the late 1980s. Unlike the 1987-1990 drought, wet years did not immediately follow the 2012-2016 drought;

consequently, cumulative change in storage remained at approximately 2016 levels through 2019.

3.2.3 Seawater Intrusion [§354.16(c)]

§354.16 Groundwater Conditions. *Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:*

(c) Seawater intrusion conditions in the basin, including maps and cross-sections of the seawater intrusion front for each principal aquifer.

SGMA defines seawater intrusion as "the advancement of seawater into a groundwater supply that results in degradation of water quality in the basin, and includes seawater from any source." The primary cause for seawater intrusion in coastal aquifers is development of a landward hydraulic gradient in areas where groundwater extraction has caused groundwater elevations to decline below the hydraulic head necessary to prevent landward movement of seawater. If groundwater elevations inland of the coast fall below this protective elevation, and assuming there is a pathway for seawater to enter one of the principal aquifers, then landward migration of seawater from the ocean into freshwater aquifers can occur. This process is referred to herein as "lateral seawater intrusion." The principal aquifers of the adjacent Oxnard Basin are highly vulnerable to lateral seawater intrusion due to the existence of two deep submarine canyons just offshore from Port Hueneme and Point Mugu where erosion during periods of lower sea level (ice age) exposed the aquifers to seawater in the canyon walls at a very close distance to the shoreline (Figure 3.1-10). However, no such submarine canyons exist offshore of Mound Basin, greatly reducing the likelihood that seawater can find a near-shore path for intrusion into the principal aquifers (Mugu and Hueneme aquifers) (Figure 3.1-10). Instead, the Mound Basin principal aquifers may only be exposed to seawater where they crop out on the continental shelf edge, approximately 10 miles offshore (Figure 3.1-10).

Previous investigators (John F. Mann Jr. & Associates, 1959; Geotechnical Consultants, 1972; Fugro West, 1996) did not find evidence of lateral seawater intrusion into the principal aquifers of Mound Basin. Geotechnical Consultants (1972) conducted the most detailed review to that point and determined that "to date, there is no evidence that seawater intrusion has occurred historically or that it is occurring presently in Mound Basin." Their report notes that a landward hydraulic gradient existed in the area of Pierpont Bay from 1957 to 1961, as a result of extraction from municipal water supply wells in the Pierpont Bay area. Those wells have since been decommissioned. The landward gradient was a concern as a potential source of seawater intrusion at that time, and chloride concentrations increased at the former Pierpont Bay wells in the same general timeframe. However, Geotechnical Consultants (1972) proposed that downward movement of poor-quality groundwater from shallower aquifer zones via "improper well seals and/or over-extended gravel envelopes" was the cause for the increasing chloride concentrations detected at the Pierpont Bay wells, rather than seawater intrusion. Monitoring data at the Marina Park cluster of monitoring wells, located near Pierpont Bay, have shown no signs of seawater intrusion in the principal aquifers (Figure 3.1-21).

Consistent with the findings of Geotechnical Consultants (1972) nearly 50 years ago, recent water quality data for wells near the coast do not show evidence of lateral seawater intrusion into the aquifers of Mound Basin. The maximum recorded chloride concentrations from the 2017 calendar year are shown on

Figures 3.1-14 and 3.1-18 (data for 2017 are shown because data are available for most wells in Mound Basin; fewer wells were sampled in 2018 by VCWPD due to staffing issues). Most coastal well samples contained chloride concentrations below 100 mg/L; however, four wells located farther inland (Figures 3.1-14 and 3.1-18) had chloride concentrations at or above 100 mg/L, a target water quality threshold for many agricultural operations. These chloride concentrations are not believed to be associated with seawater intrusion, as they are farther inland than coastal monitoring wells that did not show indications of seawater intrusion. The shallowest well in the Marina Park coastal monitoring well cluster, 02N23W15J03S (Figure 3.1-21), is screened from 170 to 240 ft bgs in the fine-grained Pleistocene deposits and has the poorest water quality in the area. In this well, TDS concentrations are above 3,000 mg/L and chloride values average nearly 100 mg/L. However, strong artesian heads (well above sea level) are consistently measured in this well (Figure 3.2-14). The high artesian heads in this well indicate offshore groundwater gradients in this vicinity. Groundwater quality in the principal aquifers at the Marina Park monitoring well cluster have not shown any evidence of seawater intrusion (Figure 3.1-21). Groundwater levels in the principal aquifers at this location have been typically above sea level, except briefly in 2004 and since 2014, suggesting that offshore groundwater flow has occurred more frequently than onshore flow (Figure 3.2-14). Well 02N23W14K01S, located approximately 0.75 miles inland of the Marina Park monitoring well cluster (Figure 3.1-20), has produced groundwater of good quality for the period of record (1933 to 1981). Concentrations for most analytes are fairly stable, with TDS concentrations averaging less than 1,200 mg/L (Figure 3.1-20). This agricultural well is screened in the Mugu Aquifer from 475 to 915 ft bgs. One outlier of elevated chloride (376 mg/L) was detected in 1962; otherwise, water quality data from this coastal production well show no evidence of saltwater intrusion. In summary, available data do not indicate that seawater is or has been present in the onshore portions of the principal aquifers to date. There are no available data concerning the presence or absence of seawater in the offshore portions of the aquifers.

Due to the lack of evidence of seawater intrusion in onshore portions of the Basin and lack of data concerning the location of any offshore seawater intrusion front in the principal aquifers, the maps and cross-sections of the seawater intrusion front required pursuant to §354.16(c) cannot be prepared.

3.2.4 Groundwater Quality Impacts [§354.16(d)]

§354.16 Groundwater Conditions. *Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:*

(d) Groundwater quality issues that may affect the supply and beneficial uses of groundwater, including a description and map of the location of known groundwater contamination sites and plumes.

This section describes groundwater quality issues that may affect the supply and beneficial uses of groundwater.

Groundwater Contamination Sites and Plumes

Information available on the State Water Resources Control Board (SWRCB) GeoTracker mapping site (SWRCB, 2020) and the Department of Toxic Substances Control (DTSC) mapping website (DTSC, 2020) were reviewed for locations of known groundwater contamination sites and plumes. Sixteen sites out of approximately 200 leaking underground storage tank (LUST) sites and other soil or groundwater cleanup sites are identified as open cases in Mound Basin on GeoTracker. None of the DTSC sites were noted as having groundwater contamination. A map showing the locations of the open Geotracker cases is presented in Figure 3.2-18. Based on review of the open LUST cases, none are reported to have impacted groundwater quality in the principal aquifers (Mugu and Hueneme aquifers). The uppermost principal aquifer in the developed portion of Mound Basin is the Mugu Aquifer, which is vertically separated from the known waste sites by the fine-grained Pleistocene deposits aquitard (generally 350 to 585 ft thick in Mound Basin) and the Shallow Alluvial Deposits (typically 50 to 100 ft thick). Releases from most LUST sites in southwestern Ventura County, which typically involve fuel spills, do not commonly impact groundwater below the shallowest water table. No contamination sites were identified where the deeper aquifers crops out at land surface in the hillside area along the northern margin of Mound Basin (this is in an area of mostly undeveloped land, approximately 1 mile from the nearest currently active water supply well). Based on the review of open cases, the principal aquifers in Mound Basin do not appear to have been impacted by contamination sites and plumes.

Nitrate concentrations in excess of the drinking water MCL of 45 mg/L (as NO_3) were detected at three agricultural water supply wells that are screened in principal aquifers (Mugu and Hueneme aquifers) in Mound Basin in 2017 (the most recent year with abundant water quality data), as follows:

- 02N22W07P01S—Nitrate was detected at a concentration of 64.6 mg/L at this well screened in the Mugu Aquifer near the center of Mound Basin (Figure 3.1-15).
- 02N23W13K03S—Nitrate was detected at a concentration of 61.4 mg/L at this well screened in the Hueneme Aquifer in the southwest part Mound Basin (Figure 3.1-19).
- 02N22W09L04S—Nitrate was detected at a concentration of 136 mg/L at this well screened in the Hueneme Aquifer in the southeast part Mound Basin (Figure 3.1-19).

It should be noted that none of these wells are used for municipal or industrial water supply, and that wells 02N22W07P01S, 02N23W13K03S, and 02N22W09L04 also exhibit anomalously high concentrations of TDS, sulfate, and chloride, suggesting influence of shallow groundwater, possibly through a compromised well seal or well casing (as discussed in Section 3.1.4.3), rather than presence of nitrate “plumes” in the Mugu and Hueneme aquifers in Mound Basin. It is further noted that other wells in the Basin do not exhibit elevated nitrate concentrations, further reinforcing the conclusion that nitrate is not a widespread issue in the Mound Basin principal aquifers.

As discussed in Section 3.1.4.3, the common ion chemistry of the groundwater in the Mugu and Hueneme principal aquifers is not ideal, but is beneficially used by municipal and agricultural users across the Basin. Common ions with RWQCB-LA WQOs include sulfate, boron, and chloride (RWQCB-LA, 2019). TDS also has a WQO. In general, TDS, sulfate, boron, and chloride concentrations are lower in the Mugu Aquifer and meet the WQOs with few exceptions. In general, TDS, sulfate, boron, and chloride concentrations are higher in the Hueneme Aquifer and meet the WQOs for the majority of the sampled locations. Dissolved constituents are derived from natural sources, and groundwater extraction does not appear to be correlated with common ion chemistry concentrations. Elevated TDS and sulfate concentrations relative to drinking water secondary MCLRs are mitigated by blending with other water sources by the City of Ventura. The City of Ventura is pursuing its VenturaWaterPure Project (fully advanced treated recycled water) and an interconnection to facilitate delivery of its SWP entitlement, both of which may provide further opportunities to blend water produced from its Mound Basin wells.

Groundwater Quality Trends at Clustered Monitoring Wells

Three monitoring wells (02N23W15J01S, 02N23W15J02S, and 02N23W15J03S), jointly funded by United and the City of Ventura, were installed in 1995 in a cluster near the coast at Marina Park, on the north side of Ventura Harbor. Groundwater quality in these three wells has been fairly stable since the wells were installed, as indicated by the chemical hydrographs shown on Figure 3.1-21. The shallowest well at this location, well 02N23W15J03S, is screened in the fine-grained Pleistocene deposits from 170 to 240 ft bgs and has the poorest groundwater quality, with TDS typically above the WQO, exceeding 3,000 mg/L; however, there is no groundwater production from this unit in the Basin. The deepest well, screened in the Hueneme Aquifer from 970 to 1,070 ft bgs, routinely records TDS concentrations near 1,300 mg/L, slightly above the WQO, and sulfate concentrations of approximately 500 mg/L, below the WQO. Well 02N23W15J02S, screened in the Mugu Aquifer between 480 and 660 ft bgs, records lower TDS and sulfate concentrations, with TDS around 900 mg/L and sulfate around 400 mg/L, both below WQOs. Chloride concentrations at all three of these wells typically are approximately 100 mg/L, which is less than the RWQCB-LA WQO and lower than chloride concentrations detected at many of the wells located farther inland in Mound Basin, indicating that none of the monitored zones at this location are impacted by seawater intrusion. Additionally, results from a geochemical investigation by SSP&A (2020) suggest that groundwater from the shallow well is not impacted by seawater intrusion, noting that samples were more depleted in bromide, boron, and iodide compared to typical groundwater that has mixed with saline water.

A cluster of three monitoring wells (02N22W07M01S, 02N22W07M02S, and 02N22W07M03S) was also installed by United and the City of Ventura at Camino Real Park in the central portion of the Basin. These wells are the site of the only groundwater quality samples collected from north of Highway 126 in Mound Basin. As with the Marina Park wells, solute concentrations are slightly higher in the Hueneme Aquifer (well 02N22W07M01S, with a screen depth of 1,200 to 1,280 ft bgs) than in the Mugu Aquifer (well 02N22W07M02S, with a screen depth of 710 to 780 ft bgs). In the deeper screened interval, TDS concentrations of 1,100 mg/L are commonly recorded, which is below the WQO for the Basin. TDS is generally less than 1,000 mg/L in the well screened in the Mugu Aquifer (Figure 3.1-22), which is less than the RWQCB-LA WQO. Sulfate accounts for about half of the TDS of the groundwater, as is typical for other wells in the Basin. Well 02N22W07M03S, which is the shallowest of the three wells at the Camino Real Park site (screened from 210 to 280 ft bgs in the fine-grained Pleistocene deposits), has the poorest water quality in the cluster. TDS in this well sometimes exceeds 5,000 mg/L. Chloride and nitrate are also found at high concentrations in this well. However, there is no groundwater production from this unit in the Basin. The recent geochemical investigation by SSP&A (2020) found that the primary dissolved anion in samples collected from the shallow well was sulfate, which if derived from local aquifer minerals and evaporates implies a potential similar evaporitic origin for chloride.

Two monitoring wells (2N22W09L04S and 2N22W09L03S) were installed in Mound Basin near Kimball and Telegraph Roads in 2008 as part of a siting study for a potential new production well for the City of Ventura (Hopkins, 2009). These two wells are in the southeast quadrant of Mound Basin near the boundary between Mound and Santa Paula Basins. Groundwater quality data are available for these wells since 2011. Groundwater quality has consistently been very poor in the shallower well (2N22W09L04S, which is screened in the upper strata of the Hueneme Aquifer, from 480 to 510 ft bgs). Groundwater samples from this well routinely contain TDS concentrations over 6,000 mg/L and sulfate concentrations over 3,500 mg/L. Nitrate and chloride concentrations are also high. Such concentrations exceed the WQOs for the Basin. Groundwater samples from the deeper well (screened in deeper strata of the Hueneme Aquifer, from 890 to 950 ft bgs) contain dissolved constituent concentrations that are more typical of Hueneme Aquifer elsewhere (Figures 3.1-16 through 3.1-19).

3.2.5 Land Subsidence [§354.16(e)]

§354.16 Groundwater Conditions. *Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:*

(e) The extent, cumulative total, and annual rate of land subsidence, including maps depicting total subsidence, utilizing data available from the Department, as specified in Section 353.2, or the best available information.

A review of available reports during preparation of this GSP did not indicate any documented groundwater-related subsidence. DWR (2014) prepared a summary of recent, historical, and future subsidence potential for groundwater basins, described in detail in DWR Bulletin 118 (DWR, 2021a). The stated intent of the document was to provide screening-level information with respect to subsidence. Mound Basin was listed as having a "low" overall estimated potential for future subsidence.

DWR provides subsidence data on their "SGMA Data Viewer" web-based geographic information system (GIS) viewer (DWR, 2020b) to support development of GSPs. The DWR data includes land subsidence estimates for Mound Basin based on interferometric synthetic aperture radar (InSAR) measurements for the period from June 13, 2015, through September 19, 2019 (TRE Altamira, 2020). This subsidence dataset is provided by DWR as a raster image depicting the range of estimated average vertical displacement values in 100-ft by 100-ft grid cells throughout Mound Basin and adjacent groundwater basins. This subsidence dataset was downloaded, mapped, and reviewed (as presented in Figure 3.2-19). The data accuracy report for the InSAR data (Towill, 2020) states that "InSAR data accurately models change in ground elevation to an accuracy tested to be 16 millimeters (mm) at 95% confidence." The measurement accuracy when converting from the raw InSAR data to the maps provided by DWR is 0.048 feet with 95% confidence level. The total estimated error is therefore 0.1 ft.

Areas falling below the reported accuracy are shown in gray on Figure 3.2-19. Areas depicted in color on Figure 3.2-19 indicate measurable subsidence above the accuracy tolerance. Although a sizeable area of the Basin shows measured subsidence that exceeds the accuracy tolerance of the InSAR data, there are several considerations that should be accounted for when evaluating the data.

As shown on Figure 3.2-19, the highest subsidence rate reported in the InSAR raster data set are concentrated in the southwestern area of the Basin. This InSAR raster data set was apparently derived by interpolating the data points shown on the same figure as black squares. As shown on the figure, there is relatively sparse coverage by the InSAR data points used to derive a full coverage of raster data within this area. In addition, it appears that deriving this high subsidence rate area was highly influenced by interpolating data points that represent a hot spot located outside the Basin. Such a hot spot represents a landfill that is located in the Oxnard Basin. It also appears that values in the southwestern portion of the Mound Basin were estimated by interpolating data points from outside the Basin across the McGrath Fault, which appears to have resulted in erroneous estimates of subsidence in the southwestern portion of the Mound Basin.

Another important consideration is the fact that the InSAR results do not differentiate between subsidence caused by groundwater withdrawal and other potential causes, such as tectonic activity. The Mound Basin is located in a high tectonic activity area characterized by north-south compression. In fact, the Mound Basin is a synclinal basin, caused by ongoing downwarping associated with this compression. The west-east axis of the Basin follows along the Ventura-Santa Clara River Syncline (a downwarp or downward fold) that plunges (deepens) to the west. Additionally, the Mound Basin is bounded by faults to the north (Ventura-Pitas Point Fault) and south (McGrath Fault), along which the majority of the Basin is being down-dropped (Figures 3.1-05 through 3.1-08). Thus, it is to be expected that tectonic activity may be causing the observed subsidence. In fact, inspection of the InSAR data (Figure 3.2-19) reveals that the limits of measurable subsidence are constrained by the Ventura-Pitas Point Fault on the north and narrow to the west, consistent with a west-plunging synclinal structure. Unfortunately, the lack of InSAR data points to the south, and interpolation artifacts associated with the Oxnard Basin landfill prevent further evaluation of tectonic origins of subsidence along the southern Mound Basin boundary.

In addition to the InSAR results, data from a continuous Ground Positioning System (GPS), VNCO, which is maintained by a non-profit university consortium, were reviewed (Figure 3.2-19) (UNAVCO, 2020). The VNCO site is the only continuous GPS location in the Basin. The VNCO GPS site indicates a steady decline in ground position during the period of record, which began in 2000. Comparison with groundwater level data shows that the rate of ground position decline does not vary with groundwater levels, suggesting that the subsidence is unrelated to groundwater levels or extraction (Figure 3.2-19). This comparison further suggests that the measured subsidence in the Basin is of tectonic origin.

In summary, available data suggest that the Mound Basin south of the Ventura-Pitas Point Fault is subsiding at steady rate of approximately 5 mm per year due to tectonic activity. Further investigation may be warranted to confirm these conclusions and more conclusively rule out groundwater levels as a causal factor in the observed subsidence.

3.2.6 Interconnected Surface Water Systems [§354.16(f)]

§354.16 Groundwater Conditions. *Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:*

(f) Identification of interconnected surface water systems within the basin and an estimate of the quantity and timing of depletions of those systems, utilizing data available from the Department, as specified in Section 353.2, or the best available information.

Available data and numerical modeling analysis suggest that depletion of interconnected surface water systems within Mound Basin caused by groundwater use does not occur. The following paragraphs summarize available information regarding groundwater-surface water interaction that support this conclusion. Detailed information is provided in Appendix G.

Santa Clara River

The lowest approximate 1-mile reach of the Santa Clara River from its mouth (at the Pacific Ocean), including its estuary and adjacent areas of riparian vegetation, is within Mound Basin. The Santa Clara River flows perennially during most years along some or all of the 5-mile reach upstream from its mouth to approximately one-quarter mile northeast of the U.S. Highway 101 bridge between the cities of Ventura and Oxnard (Figure 3.1-11) at the southwest limit of the Forebay area of the Oxnard Basin. Baseflow in the perennial reach has been estimated at approximately 2 cubic feet per second (cfs), which is equivalent to an annual discharge of 1,500 AF/yr (Stillwater Sciences, 2018). Much of this baseflow is groundwater discharge from the semi-perched aquifer of the Oxnard Basin (approximately ¾ of the perennial reach of the Santa Clara River overlies the Oxnard Basin). Total annual flow (including storm flows) in the Santa Clara River, like most streams in southern California, is highly variable, and can exceed 400,000 AF/yr during particularly wet years. Figure 3.2-20 shows records for three stream gages located along the Santa Clara River near Mound Basin; all three gages are located in the adjacent Oxnard Basin (gage locations are shown on Figure 3.1-01). No permanent stream gages have ever existed on the Santa Clara River within Mound Basin. Thus, any change in baseflow downstream of the gage 723, including within Mound Basin, is not known. It should be noted that gage 723 is poorly calibrated to low flows in the river (Stillwater Sciences, 2018).

There are multiple inferred sources of baseflow in the perennial reach of the Santa Clara River. These sources include discharge from the stream terrace deposits of the Mound Basin, discharge from the semi-perched aquifer in Oxnard Basin, agricultural tile drain systems present in both basins, and urban runoff via storm drains. The contributions of these different sources have not been documented in literature.

As discussed in Section 3.1.4.1.3, the presence of tile drains on agricultural lands situated on the stream terrace deposits (Figure 3.1-10) suggests that the stream terrace deposits are poorly permeable and, therefore, are not considered to be an aquifer, despite the occurrence of perched water in these deposits. Perched water within the stream terrace deposits, fed by percolating rainfall and agricultural return flows, is the primary groundwater that is interconnected with Santa Clara River baseflow within Mound Basin. It can be concluded that there is no direct depletion of interconnected surface water of the Santa Clara River and its estuary because there is no groundwater extraction from the Shallow Alluvial Deposits. Indirect depletion of Santa Clara River flows by groundwater extraction from the deeper, principal aquifers does not occur at material rates because the thick zone of fine-grained materials that lies between the Shallow Alluvial Deposits and the Mugu Aquifer significantly limits the propagation of hydraulic responses between these units. A detailed analysis of the potential for indirect depletion is presented in Appendix G. The results of that analysis indicated that there is no material depletion of surface water. The lack of material indirect depletion of interconnected Santa Clara River flows will be further confirmed with data obtained from a future monitoring well planned for the construction at the Ventura Wastewater Treatment Plant (WWTP) and planned interim shallow groundwater data collection and analysis along the Santa Clara River (see Section 6.6).

Barrancas

Surface water flows in the various barrancas crossing Mound Basin are brief in response to precipitation events. These flows may be briefly interconnected with the Shallow Alluvial Deposits or perched groundwater, but this cannot be verified with available data. Regardless of the questions and uncertainty surrounding interconnection of the Shallow Alluvial Deposits with surface water flows in the barrancas, it can be concluded that there is no direct depletion of interconnected surface water in the barrancas because the Shallow Alluvial Deposits do not have any known groundwater extractions within the Mound Basin. Additionally, there is no groundwater extraction north of the Pitas Point-Ventura-Foothill Faults in the northern portion of the Basin where the principal aquifers are exposed and underlie the barrancas. Based on the foregoing, extraction from the principal aquifers is not believed to deplete surface water in the barrancas. Indirect depletion of barranca flows by groundwater extraction from the deeper, principal aquifers does not occur at material rates because the thick zone of fine-grained materials that lies between the Shallow Alluvial Deposits and the Mugu Aquifer significantly limits the propagation of hydraulic responses between these units. A detailed analysis of the potential for indirect depletion of the Santa Clara River is presented in Appendix G, which also applies to the brief flows in the barrancas. The results of that analysis indicated that there is no material depletion of surface water.

3.2.7 Groundwater-Dependent Ecosystems [§354.16(g)]

§354.16 Groundwater Conditions. *Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:*

(g) Identification of groundwater dependent ecosystems within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information.

This section summarizes the current best available information concerning potential GDEs in Mound Basin. Detailed assessment of potential GDEs is presented in Appendix H. This understanding is primarily informed by regional information sources including (1) the DWR statewide database of iGDEs and supporting documentation and (2) descriptions of vegetation alliances from the United States Department of Agriculture (USDA) Classification and Assessment with Landsat of Visible Ecological Groupings (CALVEG), which generally correspond with the Natural Communities Commonly Associated with Groundwater (NCCAG) classifications discussed below.

The Natural Communities (NC) dataset is a compilation of 48 publicly available state and federal agency datasets that map vegetation, wetlands, springs, and seeps in California. A working group comprised of DWR, the California Department of Fish and Wildlife (CDFW), and The Nature Conservancy (TNC) reviewed the compiled dataset and conducted a screening process to exclude vegetation and wetland types less likely to be associated with groundwater and retain types commonly associated with groundwater, based on criteria described in Klausmeyer et al. (2018) and available online from the California Natural Resources Agency (2020). Because there is uncertainty in the knowledge of when and how plants and animals depend on groundwater, the spatial database identifies ecosystems that potentially rely on groundwater and, therefore, are referred to as "indicators of groundwater-dependent ecosystems (iGDEs)" (TNC, 2019). TNC suggests using the iGDEs as a starting point for the identification and analysis of GDEs under SGMA, including specifically steps to validate the groundwater dependency of iGDEs with local information (TNC, 2019). Determining whether an iGDE is actually a GDE requires local detailed data about the land use, groundwater levels, surface water hydrology, and geology. Per TNC guidance (TNC, 2019), it is suggested that this statewide database be refined using local information to ensure that the map accurately reflects local conditions. Once a connection from the iGDE to groundwater is determined/ground-truthed, the Basin's GDE map can be finalized (TNC, 2019).

The iGDEs are categorized into the following two NCCAG classifications:

- Wetland features commonly associated with the surface expression of groundwater under natural, unmodified conditions. Note, the wetlands class also includes wetlands within the channel of rivers which may also be referred to as aquatic habitat in other publications.

- Vegetation types commonly associated with the subsurface presence of groundwater (phreatophytes) (CNRA, 2020).

Figure 3.1-11 shows areas of iGDEs mapped in Mound Basin. A map of each numbered iGDE area is presented in Appendix H, indicating the NCCAG class or classes mapped. Each iGDE was screened in general accordance with TNC recommendations to evaluate groundwater dependency (TNC, 2018). The screening results are presented in Appendix H.

As presented in Appendix H, iGDE areas 1 through 10 have been screened out and are not considered GDEs, because the plants present in the mapped iGDE areas appear to meet their transpiration needs using non-groundwater sources of water, such as urban runoff (iGDEs mapped along barrancas) or irrigation (iGDEs located within or adjacent to parks or backyards).

The Area 11 iGDEs is retained as a GDE because the vegetation in this area appears to be at least partially dependent on groundwater encountered within the Shallow Alluvial Deposits (specifically, groundwater and agricultural drainage encountered within the stream terrace deposits). However, it is noted that there is no known groundwater extraction from the Shallow Alluvial Deposits within Mound Basin. Indirect impacts from deep, principal aquifer groundwater extractions on shallow groundwater levels—and, hence, the Area 11 GDE—do not occur because the thick zone of fine-grained materials that lies between the Shallow Alluvial Deposits and the Mugu Aquifer significantly limits the propagation of hydraulic responses between these units. A detailed analysis of the potential for deep, principal aquifer extraction effects on shallow groundwater levels and the Area 11 GDE is presented in Appendix G. The results of that analysis indicated that there are no material effects. The lack of material effects on the Area 11 GDE will be further confirmed with data obtained from a future monitoring well planned for the construction at the Ventura WWTP and planned limited-duration shallow groundwater level monitoring the Santa Clara River (see Section 6.6). Additionally, MBGSA will monitor well permit applications for proposed uses of shallow groundwater in the vicinity of Area 11 and take appropriate actions if the potential for significant and unreasonable effects is indicated by analysis of the proposed uses.

Area 11 includes federally designated critical habitat for southern California Distinct Population Segment steelhead, tidewater goby, western snowy plover, and southwestern willow flycatcher. Additionally, the area provides potential habitat for eight special status plant species and twenty-eight special status wildlife species. As such, the Area 11 GDE Unit is of high ecological value. See Appendix H for more information on the GDEs within Area 11.

3.3 Water Budget [§354.18(a),(b)(1),(b)(2),(b)(3),(b)(4),(b)(6),(e), and (f)]

§354.18 Water Budget.

(a) *Each Plan shall include a water budget for the basin that provides an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current and projected water budget conditions, and the change in the volume of water stored. Water budget information shall be reported in tabular and graphical form.*

(b) *The water budget shall quantify the following, either through direct measurements or estimates based on data:*

- ***(1)*** *Total surface water entering and leaving a basin by water source type.*
- ***(2)*** *Inflow to the groundwater system by water source type, including subsurface groundwater inflow and infiltration of precipitation, applied water, and surface water systems, such as lakes, streams, rivers, canals, springs and conveyance systems.*
- ***(3)*** *Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow.*
- ***(4)*** *The change in the annual volume of groundwater in storage between seasonal high conditions.*
- ***(6)*** *The water year type associated with the annual supply, demand, and change in groundwater stored.*

(e) *Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater flow. If a numerical groundwater and surface water model is not used to quantify and evaluate the projected water budget conditions and the potential impacts to beneficial uses and users of groundwater, the Plan shall identify and describe an equally effective method, tool, or analytical model to evaluate projected water budget conditions.*

(f) *The Department shall provide the California Central Valley Groundwater-Surface Water Simulation Model (C2VSIM) and the Integrated Water Flow Model (IWFM) for use by Agencies in developing the water budget. Each Agency may choose to use a different groundwater and surface water model, pursuant to Section 352.4.*

This section presents the estimated water budgets for the Mound Basin, including information required by the SGMA Regulations and information that is important for developing an effective plan to achieve sustainability. In accordance with the SGMA Regulations §354.18, the GSP must include a water budget for the Basin that provides an accounting and assessment of the total annual volume of surface water and groundwater entering and leaving the Basin, including historical, current, and projected water budget conditions, and the change in the volume of water stored. Water budgets must be reported in graphical and tabular formats, where applicable. A description of each water budget term and data sources is provided below, and the historical, current, and projected (future) quantitative water budgets for Mound Basin are presented below in Subsections 3.3.1, 3.3.2, and 3.3.3, respectively.

In accordance with GSP Emergency Regulations §354.18(e), MBGSA relied up on the best available information and best available science to quantify the water budget for the Basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater flow. A numerical groundwater flow model was used to quantify and evaluate the projected water budget conditions and the potential impacts to beneficial uses and users of groundwater (United, 2018, 2021a, 2021b, 2021c). The numerical model is based on available hydrogeologic and land use data from the past several decades, previous studies of Basin hydrogeologic conditions, and an earlier version of the model (United, 2018). The numerical model gives insight into how the complex hydrologic processes are operating in the Basin. During previous studies, available data and a peer-review process were used to calibrate the numerical model to Basin hydrogeologic conditions (United 2018). Results of the previous calibration process demonstrated that the modeled groundwater and surface water flow conditions were similar to observed conditions. The numerical model was updated in 2020 (United, 2021a), and the calibration was improved compared to the previous model (United, 2021a). Based on the developments of the model, it is considered appropriate for the GSP.

Estimates and projections of groundwater flow components made with the numerical model have uncertainty due to limitations in available data and limitations from assumptions made to develop the model (United, 2018, 2021a). Model uncertainty was considered when developing the water budgets during the planning process and is discussed in Section 3.3.3.

In accordance with GSP Emergency Regulations §354.18(d), MBGSA utilized the following required information, provided by DWR or other data of comparable quality, to develop the water budget:

- Historical water budget information for mean annual temperature, mean annual precipitation, water year type, and land use;
- Current water budget information for temperature, water year type, evapotranspiration (ET), and land use; and
- Projected water budget information for population, population growth, climate change, and sea level rise.

Precipitation (specifically rainfall, as snow is extremely uncommon in Mound Basin) is not a direct groundwater or surface water budget component. However, precipitation is an important parameter that strongly influences several groundwater and surface water budget components directly or indirectly, such as groundwater recharge and surface water flows in streams. Data sources are provided in Table 3.3-01.

Qualitative descriptions of each inflow or outflow component of the water budgets are detailed below:

Surface Water Entering and Leaving Mound Basin

Surface water enters and leaves Mound Basin via the Santa Clara River and several smaller and ephemeral streams (barrancas) where they cross the Basin's boundaries, as shown on Figure 3.1-01. More detail regarding characteristics and sources of data are discussed in Section 3.1.1.2, and how these surface water components are incorporated in the water budget is discussed below:

Santa Clara River

Surface water flows in the Santa Clara River enter Mound Basin along the Basin's southern boundary (Figure 3.1-01) and leave Mound Basin approximately 1 mile downstream from this entry point, discharging into the Pacific Ocean.

Stream gages for surface flows in the Santa Clara River are located upstream from Mound Basin (Figure 3.1-01), in the Oxnard Basin. These gages are operated by the VCWPD and USGS. Stillwater Sciences (2018) noted the following uncertainties regarding stream gaging data in the Santa Clara River: "The Santa Clara River discharge is based upon a stage versus flow rating curve over a large width with a seasonally variable cross-section due to sediment mobilization. In addition to periodic stage measurement equipment malfunctions, the Santa Clara River discharge rating curve is inaccurate at low flows (i.e., when water depth is below the lowest rating curve value) and during periods after storms between rating curve adjustments." However, considering the negligible interaction between surface water and groundwater in the principal aquifers of Mound Basin (as described in Section 3.2.6 and Appendix G), the uncertainty in surface water flow rates does not impact the groundwater sustainable management of the Basin. Surface water flows and rates of groundwater recharge from and discharge to the Santa Clara River are estimated using United's (2021a, 2021b, 2021c) numerical models, as discussed later in this section.

It is noted that United diverts surface water from the Santa Clara River via the Vern Freeman Diversion located approximately 10 miles upstream of where the Santa Clara River enters the Mound Basin. The water budgets presented in this GSP account for historical and projected diversions by United.

Ephemeral streams that cross Mound Basin's boundaries

Review of USGS topographic maps for the Oxnard (1949), Ventura (1951), and Saticoy (1967) 7.5-minute quadrangles indicates the presence of five subwatersheds in the foothills north of Mound Basin that convey ephemeral surface water flows across the northern boundary of Mound Basin (Figure 3.1-01). These subwatersheds north of Mound Basin include the areas supplying ephemeral flows to:

- an unnamed drainage north of Kalorama Street in northwestern Mound Basin (289 acres).
- Sanjon Barranca (171 acres).
- Prince Barranca and Hall Canyon (2,878 acres).
- the combined subwatershed areas of Sexton Canyon, Barlow Canyon, and Arundell Barranca (2,261 acres).
- Harmon Canyon and Barranca (1,838 acres).

Surface flows in these five subwatersheds are most likely to occur during and immediately following moderate to heavy rainfall events, typically in winter and spring. Some of this stormflow infiltrates permeable sediments of the San Pedro Formation along the northern Mound Basin boundary (Figure 3.1-11) in a process referred to as mountain-front recharge by United (2018) and is described as "ungauged streamflow" by the USGS (2003a). The remainder of these ephemeral flows are rapidly conveyed across Mound Basin in barrancas, some of which are partially lined with concrete, before discharging to the Pacific Ocean or Santa Clara River.

Within Mound Basin, the VCWPD operates one stream gage each in Prince, Arundell, and Harmon barrancas (Figure 3.1-01). Records are available for storm-event peak discharges in Prince (period of record from 1974 through 2017) and Harmon (1971-2018) barrancas, while both storm-event peak discharges (1963-2016) and average daily flows (1963-2006) are available for Arundell Barranca. The locations of these gages (in the central portion of Mound Basin) do not allow calculation of the difference between ephemeral surface water flows that enter and exit Mound Basin via these or the other, smaller drainage courses. However, average daily flow data available for Arundell Barranca were used to estimate annual (water year) surface flows in all five of the watersheds and subwatersheds in Mound Basin from

1986 through 2006 and extrapolated to estimate flows for the remainder of the historical period (1986-2015; Section 3.3.1) and current period (2016-2019; Section 3.3.2). The data was also used to estimate future annual surface flows for the projected period (2022-2096; Section 3.3.3). Specifically, VCWPD data for rainfall at Ventura County Government Center and average daily streamflow in Arundell Barranca for 1986-2006 (VCWPD, 2021) were compared to develop a correlation between annual rainfall (in inches) and annual streamflow (in AF) at the Arundell stream gage (Station 700), per acre of watershed area contributing to flows in Arundell Barranca (7,452 acres total, including 2,261 acres north of Mound Basin and 5,191 acres within Mound Basin upstream from Station 700). The linear best-fit regression is:

*Annual streamflow in Arundell Barranca (at Station 700) per acre of watershed area = 0.043 * annual rainfall – 0.1652*

The coefficient of determination (R-squared) for this relationship is 0.93, indicating a good correlation. This relationship was applied to the subwatersheds draining into Mound Basin (excluding the Santa Clara River, which is discussed separately, above) to estimate total surface water flows entering Mound Basin in the barrancas each year. To estimate surface water exiting Mound Basin from the barrancas, surface water flows generated within Mound Basin in response to rainfall (applying the above relationship to the total area of Mound Basin) were added to the water entering Mound Basin in the barrancas (as described above). The volume of surface flows in the barrancas were then calculated by United's (2021a, 2021b, 2021c) model to be "lost" to mountain-front recharge each year and were subtracted from the surface water budget.

The surface water entering the Basin via these ephemeral drainages consist chiefly of storm flows, which are conveyed rapidly across the Basin in narrow and sometimes lined channels and discharge to the ocean or the Santa Clara River. The surface water flows are expected to have a small to negligible interaction with groundwater in Mound Basin, and ET of these surface flows is assumed to be negligible. Rates of recharge resulting from these flows were estimated from precipitation data and input to United's (2021a) groundwater flow model, as discussed later in this section. Interaction between surface water and groundwater in the Harmon Barranca was modeled (United 2021a) explicitly using MODFLOW's (McDonald and Harbaugh, 1988) stream (SFR) package, due to the relatively large area of its watershed compared to other barrancas in Mound Basin.

Imported water

Surface water and groundwater are imported from adjacent basins via pipeline for M&I and agricultural uses in Mound Basin (see Section 3.1.1.3; B. Bondy, 2020; United, 2021c; Ventura Water, 2020b). Surface water is imported to Mound Basin via pipeline from Casitas MWD and from Ventura Water's groundwater extraction facilities at Foster Park in the Upper Ventura River Basin. In addition, the City of Ventura is planning to begin importing SWP water to Mound Basin by 2025 (Ventura Water, 2020b). Each purveyor reports the quantities of imported water conveyed to Mound Basin. Surface water imported to Mound Basin by Ventura Water (from Casitas MWD) is primarily used for M&I purposes; therefore, the majority of this surface water "exits" the Basin via consumptive use. Specifically, after use it is assumed that 95% of this imported surface water is either conveyed to Ventura's WWTP for treatment and discharge to the Santa Clara River estuary (immediately upstream from the Pacific Ocean) or evapotranspired following application to outdoor landscaping and parks. The remaining 5% of imported surface water is estimated to recharge underlying HSUs as M&I return flows, as described below.

Inflows to the Groundwater System by Water Source Type

Subsurface groundwater inflow

As described in Sections 3.1 and 3.2, groundwater underflow into and out of Mound Basin occurs at the boundaries with the adjacent Santa Paula and Oxnard Basins. The boundary between Mound Basin and the Lower Ventura River Basin consists of a hydraulic divide, which by definition means little to no groundwater underflow occurs across this boundary. The direction and magnitude of inflow and outflow from Santa Paula and Oxnard Basins vary by aquifer, location, and time, depending largely on the direction of the hydraulic gradient within each aquifer at any given time. Another factor affecting groundwater underflow between basins is the nature of each boundary: the boundary between Santa Paula Basin and Mound Basin consists of a low-permeability fault zone with an offset of bedding, which constrains the quantity of groundwater that can flow between the two basins (see Section 3.2.1.1). Hydrogeologic conditions underlying the boundary between Oxnard Basin and Mound Basin are more complex, including a fault, a fold, and stratigraphic changes (described in Section 3.1.4.1). These features allow underflow to varying degrees, depending on depth (aquifer) and location along the boundary. In addition to groundwater underflow across basin boundaries, subsurface groundwater inflow to (or outflow from) Mound Basin may occur along the coastline for portions of the aquifers that extend west of Mound Basin under the floor of the Pacific Ocean. Because of the complexity and variability of subsurface inflow to Mound Basin, United's (2021a) calibrated groundwater flow model is the best available tool for estimating quantities of interbasin flows and was therefore used to quantify subsurface flows for the water budget.

Recharge to the groundwater system

Precipitation, runoff, streamflow, or other indirect sources of recharge that infiltrate to the underlying aquifer are collectively defined as recharge. The sources of recharge known to occur in Mound Basin are described in Section 3.1.4.2 of this GSP. Similar to groundwater underflow, described above, recharge is subject to temporal and spatial variability. Details regarding how recharge rates were estimated for input to United's (2018, 2021a, 2021c) groundwater model for the region are summarized as follows:

- **Infiltration of Precipitation**: Infiltration of precipitation can recharge aquifers exposed at land surface, including the Shallow Alluvial Deposits, Hueneme Aquifer, and Fox Canyon Aquifer in Mound Basin. Monthly precipitation from Ventura County (VCWPD, 2021) and land use data from Southern California Association of Governments (SCAG) (SCAG, 2008) were utilized to estimate infiltration of precipitation. Land use changes throughout the historical model period were updated using the California Department of Conservation's "Farmland Monitoring and Mapping Program" GIS data (California Department of Conservation, 2018) at years 1990, 1996, 2002, 2008, and 2012 to adjust the baseline land use (from SCAG) designations over time. On agricultural and undeveloped land, United (2018) estimated infiltration of precipitation based on monthly precipitation. Specifically, when monthly precipitation in an agricultural or undeveloped area exceeded 0.75 inches, a fraction of that precipitation ranging from 10 to 30% of the monthly total was assumed to infiltrate deeply enough to become recharge. For developed lands, including residential, commercial, and industrial areas, a fixed ratio of 5% of monthly precipitation was assumed to become recharge. In United's (2018, 2021a) model, infiltration of precipitation includes all recharge that occurs in response to rainfall, unless explicitly modeled as mountain-front recharge or stream-channel recharge in the Santa Clara River and Harmon Barranca.

- **Mountain-front Recharge**: United (2018, 2021a) uses the term mountain-front recharge to describe infiltration of runoff at a small portion of the San Pedro formation in the northern margin of Mound Basin (Figure 3.1-11). The source of this surface water is rainfall in the small sub-watersheds in the foothills immediately north of Mound Basin. The USGS (2003a) describes this as “ungauged streamflow” in their modeling report for the Santa Clara-Calleguas watersheds. The USGS estimated this ungauged streamflow as a percentage of the precipitation occurring in each mountain sub-watershed area that drains to the study area. Similar to the USGS (2003a) approach, United (2021a, 2021c) estimated mountain-front recharge rates in outcrops of the San Pedro Formation in the northern part of Mound Basin based on monthly precipitation rates and the area of each sub-watershed receiving the precipitation. As described in the HCM (Section 3.1.4.2), the United model (2021a) assumes mountain-front recharge in the northern Mound Basin to model layers representing the Hueneme and Fox Canyon aquifers of the San Pedro formation. The Mugu Aquifer is not known to crop out at land surface within Mound Basin (Figures 3.1-07 and 3.1-08), as it underlies the fine-grained Pleistocene deposits. Therefore, the Mugu Aquifer does not receive direct areal recharge. This assumption does not have a substantial effect on the water budgets for the Basin or for individual aquifers.
- **M&I Return Flows**: M&I return flows include leakage from distribution pipelines, recharge of “excess” water applied to residential and municipal landscaping, and infiltration of storm water that is retained in urban or suburban areas of communities. Sources for M&I water supply that contribute to M&I return flow in Mound Basin include groundwater extracted from within Mound Basin and imported groundwater and surface water from other basins, as described in Section 3.1.4.4. The magnitude of these M&I return flows varies substantially in both location and timing. Most of the City of Ventura overlies alluvial and stream terrace deposits; therefore, infiltrating M&I return flows have the potential to reach the Shallow Alluvial Deposits if they are not intercepted by the thin perched groundwater zones described in Section 3.1.3. In developed hillside areas of the City that directly overlie the San Pedro Formation, M&I return flows may contribute to recharge in the Hueneme and Fox Canyon aquifers. The United (2018) groundwater model applied M&I return flows of 5% of the total M&I water use, which resulted in a good model calibration. During development of the Ventura Regional Groundwater Flow Model (VRGWFM), a study of urban recharge in a portion of Los Angeles County was completed by the Water Replenishment District of Southern California and the USGS (Hevesi and Johnson, 2016). Their investigation used a daily precipitation runoff model to estimate recharge and runoff for the greater Los Angeles area, and found average recharge in the urban portion of their study area to be 8% of the combined inflow from precipitation and urban irrigation. Applying the Hevesi and Johnson (2016) results to urban portions of the United (2018, 2021a) model area, and assuming that 50% of M&I water is used for outdoor irrigation (landscaping and parks), the calculated percentage of M&I water that becomes return-flow recharge is 4%, which is close to the 5% adopted by United (2018).
- **Agricultural Return Flows**: Farmers apply irrigation water to meet evaporation, transpiration, and salt-leaching requirements on their fields when rainfall is insufficient to meet those demands, with the goal of maintaining acceptable crop yields. The primary sources of water used for agricultural irrigation in Mound Basin are groundwater extracted from wells in Mound Basin, and groundwater extracted from wells in Santa Paula and Oxnard Basins that is imported to Mound Basin via pipeline (Section 3.1.1.3 of this GSP). The salt-leaching requirement is the

percentage of "excess" irrigation water required to control salt concentrations in the root zone of agricultural fields. Water applied to meet the leaching requirement is assumed to flow past the root zone to recharge the underlying groundwater. Initially, United (2018) input agricultural return flows of 14% of applied water on farmland (based on previous research in the region [United, 2013]), and assumed that the leaching requirement was the sole driver for "excess" irrigation. However, during model calibration the initial agricultural return-flow estimates were evaluated and adjusted upward or downward to improve calibration. In Mound Basin, increasing model-input agricultural return flows to 20% resulted in improved model calibration. Most agriculture in Mound Basin occurs in the southern half of the Basin; therefore, most of the agricultural return flows provide recharge to units located above the principal aquifers. Tile drains are present under some farmland in southern Mound Basin (Figure 3.1-11), which intercept agricultural return flows almost immediately after infiltration, then convey them to the Santa Clara River via drainage ditches. In avocado and citrus orchards present in the foothills where the San Pedro Formation crops out, agricultural return flows are modeled as contributing to recharge in the Hueneme and Fox Canyon aquifers.

- **Stream-channel Recharge**: As described in Sections 3.1.4.2 and 3.2.6 a small amount of stream-channel recharge may occur in the barrancas flowing across the alluvial and stream terrace deposits in Mound Basin, which may reach the Shallow Alluvial Deposits. This stream-channel recharge is distinct from mountain-front recharge, as it occurs throughout the Basin—not just along the northern margins. Stream-channel recharge in most of the barrancas in Mound Basin (excluding Harmon Barranca) was modeled as part of United's (2021a) estimates of "infiltration of precipitation" determined during model calibration, as described above. Stream-channel recharge in Harmon Barranca and the Santa Clara River in Mound Basin was modeled explicitly by United (2021a) using MODFLOW's (McDonald and Harbaugh, 1988) stream (STR) package.

Outflows from the Groundwater System

Evapotranspiration

ET of groundwater occurs where the water table is present at very shallow depths (in United's [2018, 2021a] groundwater flow model, ET is assumed to occur within the upper 5 ft of the soil zone). In Mound Basin, such conditions occur in and adjacent to the Santa Clara River in the southwest part of the Basin, and ET rates in these areas are computed by United's (2021a) groundwater model based on computed groundwater elevations and estimates of the other parameters that control ET (ET surface elevation, extinction depth, and maximum flux rate).

Groundwater extraction (by use sector)

Historical groundwater extractions by use sector (M&I and agriculture) in Mound Basin are described in detail in Section 3.1.4.4 and illustrated on Figures 3.1-27 through 3.1-29. Extraction (pumping) data for water supply wells in Mound Basin consist of records for two 6-month periods (January 1 through June 30 and July 1 through December 31) reported to United by pumpers each year as required by United pursuant the authority provided in California Water Code §74500-74554. For the purpose of estimating monthly extraction from each well during a given year, United developed a precipitation-weighted formula that assumes an inverse relationship between groundwater extraction and rainfall (United, 2018), since both agricultural and, to a lesser extent, M&I water demand are inversely correlated with monthly precipitation.

United's (2021a) MODFLOW (McDonald and Harbaugh, 1988) groundwater flow model is calculated with uniform 2,000 ft X 2,000 ft grid cells, which do not align precisely with the boundaries of Mound Basin (i.e., there is a small amount of overlap and undercutting of no more than a few hundred feet). As a result, one well in Oxnard Basin (02N22W19J03S), located approximately 130 ft south of Mound Basin's boundary, is captured within the model grid. Extraction from this well is included in the water budget estimates and represents around 5% of the total groundwater extraction rates from Mound Basin; thus, inclusion of this well in the water budget is not considered to create a significant discrepancy. Extraction from this well cannot simply be subtracted from the modeled groundwater budget for Mound Basin without creating a small imbalance in the modeled groundwater flow budget. Therefore, it was determined that it would be better to retain the extraction at this well in the Mound Basin groundwater budget for the purpose of developing this GSP. If United's model grid is discretized differently in future model updates, this issue can be revisited.

Groundwater discharge to surface water

As described in Section 3.2.6, groundwater discharge from the Shallow Alluvial Deposits may contribute to the perennial flow observed during most years in the Santa Clara River in the southwestern part of Mound Basin, together with discharge from tile drains, drainage ditches, and perched zones in shallow soils of the Mound Basin and sources from the Oxnard Basin. Similar to stream-channel recharge, as described above, groundwater discharge to the Santa Clara River is dependent on the difference between river stage and groundwater elevations in the underlying perched zones or the Shallow Alluvial Deposits, as well as the physical characteristics of the riverbed (width and slope) and is calculated by United's (2021a) groundwater flow model. Discharge of groundwater from the principal aquifers (Mugu and Hueneme) to the barrancas in Mound Basin is not known to occur and is not included in United's (2021a) groundwater flow model for the region.

Groundwater discharge to tile drains

Tile or other agricultural drainage systems are reported (Isherwood and Pillsbury, 1958) to have been installed across much of the Oxnard Plain in the 20th century and extend into the southern Mound Basin (United, 2018; location shown on Figure 3.1-11 of this GSP). Tile drains were installed to prevent waterlogging of the roots of crops in areas where the water table may rise close to land surface. In the area of Mound Basin where tile drains exist, the water table in the Shallow Alluvial Deposits could potentially approach land surface if tile drains were not present. Similar to groundwater discharge to stream channels, as described above, the rate of groundwater discharge to tile drains depends on the difference between the depth and conductance of tile drains and groundwater elevations in the underlying Shallow Alluvial Deposits. Groundwater discharge from the Shallow Alluvial Deposits to tile drains is calculated by United's (2021a) groundwater flow model using MODFLOW's (McDonald and Harbaugh, 1988) drain (DRN) package.

Subsurface groundwater outflow

Similar to subsurface groundwater inflow, subsurface groundwater outflow can occur from Mound Basin to the adjacent Santa Paula and Oxnard Basins. Subsurface groundwater outflow from Mound Basin may also occur along the coastline at the Basin's western boundary to portions of the aquifers which extend offshore under the floor of the Pacific Ocean. As noted previously in this section, United's (2021a) calibrated groundwater flow model is the best available tool for quantifying these flows.

Change in the Annual Volume of Groundwater in Storage between Seasonal high Conditions

Annual changes in the volume of groundwater in storage in the Basin reflect annual imbalances between inflows and outflows. In years when inflow (recharge) exceeds outflow (discharge), the volume of groundwater in storage increases; such conditions manifest as a rise in groundwater levels in wells. Conversely, when outflows exceed inflows, the volume of groundwater in storage in an aquifer decreases (referred to in this GSP as "groundwater released from storage"), and declining groundwater levels are observed in wells. Groundwater storage cannot be directly measured; rather it can only be estimated using groundwater levels and knowledge of the basin geometry and subsurface hydraulic properties., There is a significant amount of uncertainty in such an approach, particularly in a basin such as the Mound Basin that has a multiple principal aquifers and a significant uncertainty in the distribution of storage properties between HSUs and within the transitional areas between confined and unconfined portions of the Basin. Therefore, United's (2021a) groundwater flow model is considered to be the best available tool for estimating changes in groundwater storage in the Mound Basin.

Water Year Types

GSP Emergency Regulations §354.18(b)(6) requires presentation of the water year type associated with annual water budget terms. GSP Emergency Regulation §351(an) defines "water year type" as the "classification provided by the Department to assess the amount of annual precipitation in a basin." DWR provided a water year type designation for each year (from 1931 through 2018) for the entire Santa Clara River watershed—including the portion in Los Angeles County. The DWR based their designation system on spatially averaged rainfall throughout the watershed in a given year and the previous year, relative to the 30-year moving average rainfall amounts for the region (DWR, 2021b). Unfortunately, the DWR designations do not correlate well with observed groundwater conditions (i.e., rising and falling groundwater levels) in Mound Basin. Therefore, MBGSA elected to develop an alternative water year type classification that is more representative of local trends. Years when rainfall is 75% or less of the average are referred to herein as "dry years." Years when rainfall is 125% or more of the average are referred to as "wet years." Years when annual rainfall is between 75 and 125% of the average are referred to as "near-average years." These quantitative breakpoints for defining dry, near-average, and wet years correlate well with periods of increasing, approximately stable, and decreasing groundwater elevations in Mound Basin, as described subsequently in this section.

3.3.1 Historical Water Budget [§354.18(b)(1),(2),(3),(4),(6),(c)(2)(B), and (d)(1)]

§354.18 Water Budget.

(b) *The water budget shall quantify the following, either through direct measurements or estimates based on data:*

(1) *Total surface water entering and leaving a basin by water source type.*

(2) *Inflow to the groundwater system by water source type, including subsurface groundwater inflow and infiltration of precipitation, applied water, and surface water systems, such as lakes, streams, rivers, canals, springs and conveyance systems.*

(3) *Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow.*

(4) *The change in the annual volume of groundwater in storage between seasonal high conditions.*

(6) *The water year type associated with the annual supply, demand, and change in groundwater stored.*

(c) *Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:*

(2) *Historical water budget information shall be used to evaluate availability or reliability of past surface water supply deliveries and aquifer response to water supply and demand trends relative to water year type. The historical water budget shall include the following:*

(B) *A quantitative assessment of the historical water budget, starting with the most recently available information and extending back a minimum of 10 years, or as is sufficient to calibrate and reduce the uncertainty of the tools and methods used to estimate and project future water budget information and future aquifer response to proposed sustainable groundwater management practices over the planning and implementation horizon.*

(d) *The Agency shall utilize the following information provided, as available, by the Department pursuant to Section 353.2, or other data of comparable quality, to develop the water budget:*

(1) *Historical water budget information for mean annual temperature, mean annual precipitation, water year type, and land use.*

The SGMA Regulations require that the historical surface water and groundwater budget be based on a minimum of 10 years of historical data. Water years 1986 through 2015 (30 years) were selected to represent the historical water budget. Water year 1986 is the first complete water year included in United's regional groundwater flow model (United, 2021a), which is the primary source of information for several key water budget components estimated for Mound Basin. Prior to January 1985, groundwater extraction data were increasingly sparse, which is why United selected water year 1986 as the first year for their historical model calibration. The historical period is long enough to capture typical climate variations and include two significant drought cycles (1987-1990 and 2012-2016).

The historical surface water and groundwater budgets are presented in the following tables and figures and described below:

- Surface Water Budget: Table 3.3-02 and Figure 3.3-01
- Basin Groundwater Budget: Table 3.3-03 and Figures 3.3-02 and 3.3-03
- Hydrostratigraphic Unit Groundwater Budgets: Table 3.3-04

Historical Surface Water Budget

Inspection of Table 3.3-02 and Figure 3.3-01 indicates that the largest source of surface water inflow to and outflow from Mound Basin during the historical period is the Santa Clara River, with inflows ranging from less than 100 AF/yr during drought periods to over 1,000,000 AF/yr during high-rainfall years. The historical average of surface flows in the Santa Clara River entering and exiting Mound Basin is nearly an order of magnitude or greater than the average of all other inflows or outflows combined (Table 3.3-02). As noted previously, much of this flow occurs during or soon after (days to weeks) major storms; baseflow in the Santa Clara River is estimated to be only about 1,500 AF/yr (Section 3.2.6). Surface water inflows and outflows in the Santa Clara River during water years 1993, 1995, 1998, and 2005 were particularly large, correlating with El Nino/Southern Oscillation (ENSO) and Pacific Decadal Oscillation (PDO)-driven high-rainfall events. As shown on Figure 3.1-01, the length of the reach of the Santa Clara River that is within Mound Basin is only 1 mile; therefore, high flows that follow storm events pass rapidly through this reach with little groundwater interaction (Section 3.2.6). However, a small fraction of these flows infiltrates the river channel and banks to become stream-channel recharge to the underlying Shallow Alluvial Deposits during high-flow years (Table 3.3-02).

Ephemeral streamflows entering, generated within, and leaving Mound Basin in barrancas are typically the next largest components of surface water inflows and outflows, after Santa Clara River. Identical to the Santa Clara River, the majority of the higher flows occur during and immediately following storms, with little to no baseflow other than leakage of return flows from perched zones of the Shallow Alluvial Deposits and fine-grained Pleistocene deposits, as described in Section 3.2.6. Imported surface water to Mound Basin can exceed ephemeral streamflows during some years, particularly those with low rainfall (Table 3.3-02).

Historical Groundwater Budget

Inspection of Tables 3.3-03 and 3.3-04, and Figure 3.3-02 and 3.3-03, indicates that the largest sources of groundwater inflow to Mound Basin during the historical period included underflow from the Santa Paula Basin, areal recharge (the sum of infiltration of precipitation, M&I return flows, and agricultural irrigation return flows), and mountain-front recharge. Surface water percolation from Santa Clara River and Harmon Barranca provided considerably less recharge to the Basin. Outflow of groundwater from Mound Basin largely occurs as groundwater extractions (pumping) and groundwater outflow to the Oxnard Basin during dry periods. Groundwater flow to the offshore portions of HSUs, ET from the Shallow Alluvial Deposits, and groundwater discharge from the Shallow Alluvial Deposits to surface water are secondary mechanisms of discharge.

Some groundwater budget components are consistently positive (representing inflows to Mound Basin), including underflow from Santa Paula Basin, areal recharge, mountain-front recharge, and return flows. Other components are consistently negative (outflows from Mound Basin), including groundwater extractions (pumping from wells), ET from the Shallow Alluvial Deposits, and discharge to tile drains. Some water budget components vary in sign (negative, representing outflow; to positive, representing inflow) over time, which is largely dependent on rainfall (i.e., recharge), as shown on Figure 3.3-02.

Each of these variable components is described further as follows:

- **Groundwater Underflow between the Mound and Oxnard Basins**: Groundwater underflow between the Mound and Oxnard Basins typically occurred as outflow from Mound Basin during dry years, and as inflow to Mound Basin during wet years. During near-average years, a modest volume of groundwater (usually less than 2,000 AF) flowed either into or out of Mound Basin along its boundary with Oxnard Basin. During the droughts in 1987-1990 and 2012-2016, groundwater underflow from Mound Basin to Oxnard Basin was typically the second-largest outflow component of the groundwater budget for Mound Basin, after groundwater extractions from wells. During the extended wet period from 1992 through 2005, this condition reversed, and groundwater underflow from Oxnard Basin to Mound Basin was frequently an important inflow component of the groundwater budget for Mound Basin, occasionally exceeding the annual volumes of recharge in Mound Basin and underflow from Santa Paula Basin. The reversal in flow direction is correlated with United's artificial recharge operations in the Oxnard Basin.
- **Groundwater Exchange Between Onshore and Offshore Areas**: Groundwater underflow between the Mound Basin and offshore areas west of the coastline has typically consisted of net outflow from Mound Basin (Figure 3.3-02 and Table 3.3-03). However, modest volumes of inflow to Mound Basin occurred across the coastline during the droughts from 1987-1990 and 2012-2016. As described in Section 3.1.4 and depicted in Figure 3.1-10, the offshore portions of the principal aquifers of Mound Basin store significant quantities of fresh groundwater. For this reason, groundwater flowing into Mound Basin from across the coastline during droughts should not be assumed to consist of seawater. As described in Section 3.2.3 of this GSP, there are no historical or recent data suggesting that seawater intrusion has occurred in the principal aquifers within Mound Basin.
- **Groundwater Exchange with Santa Clara River**: Figure 3.3-02 and Table 3.3-03 indicate a modest volume (generally less than 2,000 AF) of groundwater has discharged from the Shallow Alluvial Deposits to the lower Santa Clara River in Mound Basin during most average to dry years. During wet years and two average years (2017 and 2019), the stage in the Santa Clara River was higher than groundwater elevations in the Shallow Alluvial Deposits, resulting in surface water percolating into the Shallow Alluvial Deposits as recharge. These modeled surface water and groundwater interactions are consistent with field observations of discharge to the Santa Clara River (Stillwater Sciences, 2018).
- **Groundwater Exchange with Harmon Barranca**: In every year except 1998, the model estimated that the net effect of groundwater/surface water interaction in Harmon Barranca was to provide a small volume of recharge to the underlying aquifers. The sole exception, water year 1998, had the highest rainfall total during the historical period (1986-2015); the model estimated that a small volume (142 AF) of groundwater was discharged to the channel of Harmon Barranca that year (Table 3.3-03).
- **Groundwater Storage**: In response to the annual variability in inflows and outflows to the groundwater system in Mound Basin, the volume of groundwater in storage in the Basin has increased or decreased, reflected in rising and falling groundwater elevations that can be measured in wells. In wet years, groundwater inflows (e.g., recharge) often exceeded outflows (e.g., groundwater extraction from wells), resulting in rising groundwater levels and adding to the volume of groundwater in storage in the Basin. When groundwater is added to storage in the Basin, for accounting purposes it is counted as an outflow from the groundwater budget. That groundwater added to storage remains in the Basin as a "reserve" of groundwater that can

be drawn from in subsequent dry years. When that reserve of groundwater in storage is used for water supply or flows out of the Basin—corresponding to declining groundwater elevations—it is counted in the groundwater budget as an inflow. As can be seen on Figure 3.3-02, these changes in the volume of groundwater in storage in Mound Basin balance any difference between inflows and outflows each year (shown by white bars with a dashed black outline) such that total inflows equaled total outflows. The result is that the groundwater budget each year remained in balance on both an annual basis and over the historical period, with an average net decline in groundwater in storage of 469 AF/yr.

While the GSP Emergency Regulations do not require water budgets for each principal aquifer, sustainable management of the Mound Basin benefits from such an understanding. The historical water budget for each HSU, including the principal aquifers, is presented in Table 3.3-04. Review of water budget components for specific aquifers (Table 3.3-04) indicates that average groundwater inflows and outflows have varied substantially from aquifer to aquifer within Mound Basin. Table 3.3-04 also shows average vertical groundwater flow volumes between aquifers within Mound Basin; with this information, the model-estimated groundwater budget for each aquifer was balanced (sum of all components for each aquifer equals zero). Following are some of the salient conclusions that can be drawn from review of the HSU breakdown of the historical water budget:

- As expected, all ET, discharge to tile drains, and interaction between groundwater and surface water in the Santa Clara River occurred in the Shallow Alluvial Deposits, which is the uppermost aquifer across most of Mound Basin. Most areal recharge (including infiltration of precipitation, agricultural return flows, and M&I return flows) infiltrated to the Shallow Alluvial Deposits, with smaller volumes infiltrating into outcrops of the Hueneme and Fox Canyon aquifers in the foothills of the north part of Mound Basin. The Mugu Aquifer is not known to crop out at land surface within Mound Basin (Figures 3.1-07 and 3.1-08), as it underlies the fine-grained Pleistocene deposits. Therefore, the Mugu Aquifer does not receive direct areal recharge. A significant volume (approximately 2,600 AF) of mountain-front recharge occurred in Mound Basin in the northern foothills, primarily into the Hueneme Aquifer.
- Nearly all groundwater extraction (pumping from wells) occurred in the Mugu and Hueneme aquifers, as was described in Section 3.1.4.4 of this GSP. A minor amount of groundwater extraction occurred in the Fox Canyon Aquifer and no extraction occurred in the Shallow Alluvial Deposits.
- Vertical exchanges of groundwater with overlying and underlying HSUs can be important flow components for the principal aquifers.
- Most groundwater inflow to Mound Basin from Santa Paula Basin occurred in the Hueneme and Fox Canyon aquifers. Although the Country Club fault system at the boundary between the Mound and Santa Paula basins impedes groundwater flow to some degree (evidenced by steeper groundwater elevation contours along this boundary as described in Section 3.1.4 of this GSP), approximately 4,400 AF/yr of groundwater flow into Mound Basin occurred during the historical water budget period.
- Most of the groundwater inflow to the Mound Basin from Oxnard Basin (approximately 2,600 AF/yr, on average) during the historical period occurred in the Shallow Alluvial Deposits and in the fine-grained Pleistocene deposits, which is stratigraphically equivalent to the Oxnard

Aquifer in the Oxnard Basin (Section 3.1 of this GSP). Most of the groundwater outflow from Mound Basin to Oxnard Basin (approximately 3,900 AF/yr, on average) occurred in the Hueneme and Fox Canyon aquifers

- Approximately 1,800 AF/yr of groundwater flowed from Mound Basin to the offshore (submarine) areas of the aquifers in the Shallow Alluvial Deposits during the historical period, while much smaller volumes of groundwater outflow occurred in the Mugu and Fox Canyon aquifers. A modest quantity (500 AF/yr) of groundwater flowed into Mound Basin from offshore areas in the Hueneme Aquifer. As noted above and in Section 3.2.3, significant quantities of fresh groundwater are present in the aquifers offshore from Mound Basin. Intrusion of seawater has not been detected in the aquifers of Mound Basin to date.
- Cumulative changes in groundwater in storage (from April of each year through March of the next year) in the principal aquifers (Mugu and Hueneme), together with annual groundwater extractions in Mound Basin, are shown on Figure 3.3-03. Changes in storage in the principal aquifers generally correlate with changes in storage in the Basin as a whole but are more subdued.

3.3.1.1 Reliability of Historical Surface Water Supplies [§354.18(c)(2)(A)]

§354.18 Water Budget.
(c) *Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:*
(2) *Historical water budget information shall be used to evaluate availability or reliability of past surface water supply deliveries and aquifer response to water supply and demand trends relative to water year type. The historical water budget shall include the following:*
(A) *A quantitative evaluation of the availability or reliability of historical surface water supply deliveries as a function of the historical planned versus actual annual surface water deliveries, by surface water source and water year type, and based on the most recent ten years of surface water supply information.*

As described in Section 3.1.1.3 and summarized at the beginning of Section 3.3, surface water is imported to Mound Basin via pipeline from Casitas MWD by the City of Ventura for use within the Casitas MWD service area (Figure 2.2-01).

Figure 3.3-04 shows surface water deliveries and groundwater production for the City of Ventura in Mound Basin for the past 10 years. Inspection of Figure 3.3-04 indicates that during 2010 and 2011, prior to the 2012-2016 drought in Ventura County, total surface water imports from the Ventura River to Mound Basin averaged approximately 4,100 AF/yr. From 2012 through 2014 (the first three years of the 2012-2016 drought), total surface water imports declined to approximately 3,600 AF/yr. Conservation and increased groundwater extraction from the City's wells in Mound Basin and Oxnard Basin increased to make up the difference. From 2016 through 2019, total surface water imports declined further to an average of approximately 1,500 AF/yr. Table 3.3-05 summarizes the City of Ventura's planned (Kennedy/Jenks Consultants, 2011; 2016) and actual (Ventura Water, 2020b) imports of surface water from Casitas MWD for the 10-year period from 2010 through 2019. The values shown on this table include surface water imports from Casitas MWD delivered to the City's entire service area, not just the portion in Mound Basin. Review of the differences between planned and actual surface water deliveries indicates that less surface water from Casitas MWD was actually delivered than was planned from 2012 through

2019; this period included an exceptional drought from 2012 through 2016. The lower-than-anticipated surface water deliveries were related to a combination of factors, including mandated conservation goals along with the associated penalties.

3.3.1.2 Impact of Historical Conditions on Basin Operations [§354.18(c)(2)(C)]

§354.18 Water Budget.

(c) *Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:*

(2) *Historical water budget information shall be used to evaluate availability or reliability of past surface water supply deliveries and aquifer response to water supply and demand trends relative to water year type. The historical water budget shall include the following:*

(C) *A description of how historical conditions concerning hydrology, water demand, and surface water supply availability or reliability have impacted the ability of the Agency to operate the basin within sustainable yield. Basin hydrology may be characterized and evaluated using water year type.*

GSP Emergency Regulations §354.18(c)(2)(C) require a description of how historical water budget conditions have impacted the ability of MBGSA to operate that Basin within sustainable yield. The estimated sustainable yield for Mound Basin is provided in Section 3.3.4. Prior to adoption of this GSP, MBGSA has had neither the regulatory authority nor the technical justification to "operate the basin within sustainable yield." Thus, GSP Emergency Regulations §354.18(c)(2)(C) appear inapplicable to the Mound Basin. However, the impacts of historical conditions can provide insight into what challenges MBGSA may have faced had it existed historically and with authority to manage the Basin.

Review of the historical water budgets indicates that a small amount of declining groundwater storage occurred over time (the average groundwater released from storage between seasonal highs is 469 AF/yr; Table 3.3-03). This suggests a relatively minor amount of overdraft may have occurred during the historical period equal to approximately 6.3% of the average groundwater extraction rates during that timeframe. However, undesirable results were not reported during the historical period, suggesting negligible, if any, impacts on the ability of the Basin to operate within the sustainable yield.

The existence of multiple sources of water (local groundwater, imported groundwater, and imported surface water) available to meet demand in Mound Basin is a key reason why the Mound Basin has not historically experienced undesirable results for the sustainability indicators. The City of Ventura seeks to maximize wet-year water supplies from Casitas MWD and its facilities in the Upper Ventura River Basin and rely less on Mound Basin groundwater and other basin groundwater supplies and vice versa. In addition, the City implements a water shortage contingency plan to reduce water demands through increased conservation. The diverse water supply portfolio and conservation actions have helped reduce pressure on Mound Basin groundwater supplies, keeping basin operations within the sustainable yield and preventing significant and unreasonable effects from occurring.

3.3.2 Current Water Budget [§354.18(b)(1),(2),(3),(4),(6),(c)(1), and (d)(2)]

§354.18 Water Budget.

(b) *The water budget shall quantify the following, either through direct measurements or estimates based on data:*

- ***(1)*** *Total surface water entering and leaving a basin by water source type.*
- ***(2)*** *Inflow to the groundwater system by water source type, including subsurface groundwater inflow and infiltration of precipitation, applied water, and surface water systems, such as lakes, streams, rivers, canals, springs and conveyance systems.*
- ***(3)*** *Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow.*
- ***(4)*** *The change in the annual volume of groundwater in storage between seasonal high conditions.*
- ***(6)*** *The water year type associated with the annual supply, demand, and change in groundwater stored.*

(c) *Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:*

- ***(1)*** *Current water budget information shall quantify current inflows and outflows for the basin using the most recent hydrology, water supply, water demand, and land use information.*

(d) *The Agency shall utilize the following information provided, as available, by the Department pursuant to Section 353.2, or other data of comparable quality, to develop the water budget:*

- ***(2)*** *Current water budget information for temperature, water year type, evapotranspiration, and land use.*

The SGMA Regulations require that the current surface water and groundwater budget be based on the most recent hydrology, water supply, water demand, and land use information. Water year 2019 is the last complete water year included in United's regional groundwater flow model (United, 2021b), which is the primary source of information for most water budget components estimated for Mound Basin. Therefore, water years 2016 through 2019 were selected to represent the current water budget, as they are representative of recent water use trends and groundwater conditions in Mound Basin. The current water budget period corresponds to a period of average to dry annual precipitation, with an average of about 14% less precipitation than the historical average. It should also be noted that the current water budget period was preceded by an exceptional drought that occurred in the region from 2012 through 2016. As a result of the antecedent groundwater conditions caused by this drought (i.e., record- or near-record-low groundwater elevations at most wells in Mound Basin and adjacent basins), combined with below-average rainfall during water year 2018, estimated volumes for some of the water budget components during the current period are significantly different than they were during the historical period. As a result, the current water budget period represents a drier than average condition with antecedent drought conditions in the Basin and is therefore not appropriate for sustainability planning.

The current surface water and groundwater budgets are presented in the following tables and figures and described below:

- Surface Water Budget: Table 3.3-02 and Figure 3.3-01
- Basin Groundwater Budget: Table 3.3-03 and Figures 3.3-02 and 3.3-03
- Hydrostratigraphic Unit Groundwater Budgets: Table 3.3-04

Current Surface Water Budget

Inspection of Table 3.3-02 and Figure 3.3-01 indicates that the largest source of surface water inflow and outflow for Mound Basin during the current period is the Santa Clara River, consistent with the historical water budget. A notable difference is that both average inflow from the Santa Clara River and from imported water from Casitas MWD during the current water budget period are both less than half of what they were during the historical water budget period (Table 3.3-02). This difference is due to the relatively low average rainfall during the current period compared to the historical period. The averages for most other surface water budget components during the current period largely remained similar to values estimated for the historical period, although they are overall less than the historical, resulting from overall drier conditions can be seen in Table 3.3-02.

Current Groundwater Budget

Average volumes of groundwater estimated to comprise each component of the current water budget for the principal aquifers together with the Shallow Alluvial Deposits and fine-grained Pleistocene deposits HSU in Mound Basin are quantified in Table 3.3-03.

Following are key aspects of the current groundwater budget and notable differences compared to the historical groundwater budget:

- Groundwater underflow from Mound Basin to Oxnard Basin was substantially greater during the current period compared to the average over the historical period. This increase in outflow comprises the largest difference between the historical and current groundwater budgets for Mound Basin and is a result of greater drawdown in the Oxnard Basin than in Mound Basin since 2012 (largely due to the 2012-2016 drought). This differential drawdown temporarily created a steeper hydraulic gradient—inducing greater groundwater underflow—from the Mound Basin to Oxnard Basin.
- The net direction and magnitude of groundwater underflow across the coastline (to and from areas where the aquifers underlie the seafloor) changed substantially during the current period as compared to the historical period. During the historical period, the net direction of groundwater underflow was seaward (toward the ocean), with small to modest volumes of landward flow, on average, in the fine-grained Pleistocene deposits and the Hueneme Aquifer. During the current period, landward groundwater underflow occurred in all HSUs, except for the Shallow Alluvial Deposits (where seaward flow continued). However, monitoring results do not indicate intrusion of seawater into the aquifers of the Mound Basin during this period, as described in Section 3.2.3 of this GSP.
- As a result of below-average annual rainfall during the current water budget period, recharge volumes were also less than the average historical values during the current water budget period.
- Less ET and discharge to tile drains occurred during the current water budget period compared to the historical period, due to lower groundwater elevations in the Shallow Alluvial Deposits.
- Average annual groundwater extraction rates (pumping from wells) were lower in the current period than in the historical period.

- As can be seen on Figure 3.3-03 and Tables 3.3-03 and 3.3-04, a small decline in the quantity of groundwater stored in Mound Basin (and the principal aquifers) occurred during the current water budget period.

3.3.3 Projected Water Budget

SGMA Regulations require the development of a projected surface water and groundwater budget to estimate future baseline conditions of supply, demand, and aquifer response to GSP implementation. The future water budget provides a baseline against which management actions will be evaluated over the GSP implementation period from 2022-2041. The projected water budget was developed for a 77-year period that is subdivided into three periods, including the 20-year implementation period required under SGMA (water years 2022-2041), the 30-year sustaining period under SGMA (water years 2042-2071), and a 25-year post-SGMA period (water years 2072-2096). This section describes the methods used to estimate the projected water budget for Mound Basin, provides a quantitative estimate for each projected water budget component, and evaluates uncertainty in the projected water budget by considering potential effects of future DWR-recommended climate change scenarios. The DWR's climate change scenarios could result in changes to inflows and outflows in Mound Basin compared to the "baseline" future water budget.

3.3.3.1 Projected Water Budget Calculation Methods [§354.18(c)(3)(A),(c)(3)(B),(c)(3)(C),(e), and (f)]

§354.18 Water Budget.

(c) *Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:*

(3) *Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:*

(A) *Projected hydrology shall utilize 50 years of historical precipitation, evapotranspiration, and streamflow information as the baseline condition for estimating future hydrology. The projected hydrology information shall also be applied as the baseline condition used to evaluate future scenarios of hydrologic uncertainty associated with projections of climate change and sea level rise.*

(B) *Projected water demand shall utilize the most recent land use, evapotranspiration, and crop coefficient information as the baseline condition for estimating future water demand. The projected water demand information shall also be applied as the baseline condition used to evaluate future scenarios of water demand uncertainty associated with projected changes in local land use planning, population growth, and climate.*

(C) *Projected surface water supply shall utilize the most recent water supply information as the baseline condition for estimating future surface water supply. The projected surface water supply shall also be applied as the baseline condition used to evaluate future scenarios of surface water supply availability and reliability as a function of the historical surface water supply identified in Section 354.18(c)(2)(A), and the projected changes in local land use planning, population growth, and climate.*

(e) *Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater flow. If a numerical groundwater and surface water model is not used to quantify and evaluate the projected water budget conditions and the potential impacts to beneficial uses and users of groundwater, the Plan shall identify and describe an equally effective method, tool, or analytical model to evaluate projected water budget conditions.*

(f) *The Department shall provide the California Central Valley Groundwater-Surface Water Simulation Model (C2VSIM) and the Integrated Water Flow Model (IWFM) for use by Agencies in developing the water budget. Each Agency may choose to use a different groundwater and surface water model, pursuant to Section 352.4.*

The projected water budget for Mound Basin was developed using the same tools and methods as the historical and current water budgets, and is primarily based on United's (2018, 2021a, 2021b, 2021c) surface water and groundwater flow modeling, modified to incorporate projections of future hydrology and demand, as described in the following subsections. The future projections utilize United's best available estimates of future surface water diversions from the Santa Clara River via the Vern Freeman Diversion.

3.3.3.1.1 Projected Hydrology [§354.18(c)(3)(A)]

> **§354.18 Water Budget.**
> ***(c)*** *Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:*
> ***(3)*** *Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:*
> ***(A)*** *Projected hydrology shall utilize 50 years of historical precipitation, evapotranspiration, and streamflow information as the baseline condition for estimating future hydrology. The projected hydrology information shall also be applied as the baseline condition used to evaluate future scenarios of hydrologic uncertainty associated with projections of climate change and sea level rise.*

In accordance with GSP Emergency Regulations §354.18 (c)(3)(A), the future water budget must be based on 50 years of historical precipitation, ET, and streamflow information. To satisfy this regulation, the forward version of the numerical model used for the projected water budget includes 77 years of historical precipitation, ET, and streamflow data from the period 1943-2019, which supports a time period from 2022-2096. The streamflow values were modified to incorporate United's best available estimates of future surface water diversions from the Santa Clara River via the Vern Freeman Diversion.

It is believed that the selected historical period is representative and is the best available information for groundwater sustainability planning purposes. This period includes two major drought cycles for the Santa Clara River watershed and was therefore preferred over any single 50-year period (the minimum timeframe required under SGMA regulations) available in DWR's historical dataset, which includes water years 1931-2019 for rainfall (DWR, 2021b) and 1916-2011 for streamflow change factors (DWR, 2018).

Baseline future streamflow in the Santa Clara River and its major contributing tributaries (including Santa Paula Creek, Sespe Creek, Pole Creek, Hopper Creek, Piru Creek, and Castaic Creek, all of which are located east and upstream of Mound Basin) was projected based on historical stream gaging records provided by the USGS and VCWPD. Streamflow in the small subwatersheds present in the foothills north of Mound Basin that contribute to mountain-front recharge, as described in the introduction to Section 3.3, was projected to change in direct proportion to increases or decreases in rainfall in accordance with 2030 and 2070 climate change factors provided by DWR (2018), and is described further below. Projected annual rainfall rates assumed under future baseline, 2030, and 2070 climate change scenarios are shown on Figure 3.3-05. The future baseline scenario assumed no sea level rise, the 2030 climate change scenario assumed 15 centimeters (6 inches) of sea level rise, and the 2070 climate change scenario assumed 45 centimeters (18 inches) of sea level rise, consistent with DWR (2018) guidance. Sea level rise was addressed by increasing the head along the general-head boundary representing the Pacific Ocean in United's (2021c) groundwater model. These changes in model boundary conditions were forecasted to have small impacts on groundwater elevations and groundwater budget components in Mound Basin and are discussed further in Section 3.3.3.2.

For the purpose of projecting future streamflows in the Santa Clara River, the historical stream gage records were modified and supplemented as follows:

- Where data gaps existed in the 1943-2019 records for specific stream gages, correlations with nearby stream gages were developed to fill those gaps. Suitable stream gage records were available to populate all data gaps in gaging data within the Santa Clara River watershed.
- Outflows for Lake Piru and Castaic Lake were simulated using reservoir operations models with historical upstream creek flows as reservoir inputs. Current reservoir operations were applied to the entire future baseline modeling period.
- Historical surface water discharge from the urban and suburban areas of the Santa Clarita Valley to the Santa Clara River was adjusted upwards, with more significant flow increases applied to older data, to reflect current levels of urban impervious area in this drainage area that underwent significant development between 1943 and 2019.
- Historical streamflow in the reach of Santa Clara River in Los Angeles County was adjusted to reflect anticipated future discharges from Water Reclamation Facilities (WRFs).

Uncertainty in future hydrology associated with potential climate change was evaluated by applying DWR (2018) streamflow change factors from their 2030 and 2070 central-tendency scenarios to the historical streamflow records for Castaic Lake (reservoir) inflows, Santa Clara River upstream of Castaic Creek (excluding WRF discharges which were added after applying streamflow change factors), Middle Piru Creek (inflow to Lake Piru), Pole Creek, Hopper Creek, Sespe Creek, and Santa Paula Creek. Daily historical flow records were adjusted to 2030 and 2070 future conditions by applying the annual and monthly streamflow change factors provided for the Santa Clara River watershed (designated HUC8_18070102 by DWR), utilizing the methodology for application of time-series change-factor data described in DWR (2018) guidance. DWR (2018) streamflow change factors are available for water years 1916-2011. Change factors for water years 2012-2019 were modeled by selecting analogous water years in the historical record and applying the streamflow change factors published for these analogous water years. Analogous water years were determined using the monthly precipitation record for VCWPD rain gage 245 (Santa Paula), which has a complete data record from 1915-2019, and is representative of the average annual precipitation observed in much of the Santa Clara River watershed, particularly the Ventura County portion. Analogous water years for 2012-2019 were determined by calculating the root mean square error (RMSE) based on monthly precipitation with each water year from 1915-2011. Generally, the year with the lowest RMSE was selected as the analogous water year.

Compared to historical streamflow between 1943 and 2019, annual average streamflow decreased by 3.8-4.7% for the 2030 climate change scenario, and by 2.6-3.5 % for the 2070 climate change scenario. The calculated change in streamflow for the 2030 and 2070 climate change scenarios is mostly driven by the monthly change factors provided by DWR (as opposed to annual change factors). The Santa Clara River watershed (HUC8_18070102) monthly change factors vary significantly between years, especially during the months of January through March, when much of the precipitation occurs in the Santa Clara River watershed. During these months, projected streamflow may increase or decrease in the 2030 and 2070 climate change scenarios and are more variable for the 2070 climate change scenario. Monthly change factors are mostly less than 1.0—indicating reduced flow compared to the historical period—during the months April, May, June, October, and November. Therefore, streamflow in the Santa Clara River is projected to decrease outside the main wet season under the 2030 and 2070 climate change scenarios.

A more detailed description of the surface water hydrology models utilized to simulate reservoir operations, modifications to streamflow records for future hydrology, application of DWR streamflow change factors, and interaction between the surface water and groundwater models is presented in United's model documentation (United, 2021a, 2021c).

3.3.3.1.2 Projected Water Demand [§354.18(c)(3)(B)]

> **§354.18 Water Budget.**
> ***(c)*** *Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:*
> ***(3)*** *Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:*
> ***(B)*** *Projected water demand shall utilize the most recent land use, evapotranspiration, and crop coefficient information as the baseline condition for estimating future water demand. The projected water demand information shall also be applied as the baseline condition used to evaluate future scenarios of water demand uncertainty associated with projected changes in local land use planning, population growth, and climate.*

GSP Emergency Regulations §354.18(c)(3)(B) require use of the most recent land use, ET, and crop coefficient information as the baseline condition for estimating future water demand and as a baseline condition used to evaluate future scenarios of water demand uncertainty associated with projected changes in local land use planning,

For the purpose of developing a projected water budget for Mound Basin, baseline future water demand in Mound Basin was input to United's (2021c) groundwater flow model using current (most recent) land use information, agricultural and M&I water use trends, and assumptions regarding future climatic conditions (including rainfall and ET).

Projected Agricultural Water Demands

Projected agricultural groundwater demand was provided by MBAWG (Section 2.3). MBAWG was provided historical groundwater extraction data and was asked to provide input on future groundwater demands. MBAWG advised that baseline average year irrigation demands are estimated to be 3,300 AF/yr. Wet year and dry year baseline irrigation demands were assumed to be slightly lower (2,873 AF/yr) and higher (3,548 AF/yr), respectively. Climate change effects on irrigation demand were also considered by accounting for changes in future precipitation and temperature. Future precipitation projections were developed based on historical precipitation records (with baseline conditions taken from 1943-2019) and climate change factors provided by DWR (2018) for SGMA planning purposes. Irrigation demands for future wet, average, and dry conditions (based on total precipitation for the water year) were based on historical irrigation demands for similar wet, average, and dry conditions (based on reported historical groundwater extraction). To account for future increased temperatures due to climate change, the future annual irrigation demands were further scaled by a factor representing the average annual increase (over the projected period of 1943-2019) in future ET (calculated from ET climate change factors provided by DWR). The average ET climate change factor for the 2030s was 1.0359 (increase of 3.6%) and for the 2070s was 1.0825 (increase of 8.25%); hence irrigation demand was increased by the corresponding factors to account for higher ET uptake (demand) of irrigation water. Similar to the ET climate change factors, the net agricultural demand for groundwater extracted from Mound Basin was estimated to increase 3.6%

and 8.5% for the 2030 and 2070 climate change scenarios, respectively, as compared to baseline conditions. The baseline and climate change projections of agricultural water demand also apply to groundwater imported from the Santa Paula and Oxnard Basins for agricultural use, which is reflected in the return flow calculations.

Projected Municipal and Industrial Demands

The City of Ventura provides most of the municipal and industrial water supply in the Basin. The City of Ventura forecasts that it will extract 4,000 AF/yr from the Mound Basin during 2021-2030 on average (Ventura Water, 2020a). As described in Section 3.1.1.3, the City has a diverse water supply portfolio, making it impossible to predict how its Mound Basin groundwater extraction might vary from year to year. Thus, the projected water budget assumes a fixed value of 4,000 AF of groundwater extraction each year. The projected groundwater extraction for the two private industrial wells in the Basin were assumed to continue at historical average rates.

Changes in future application of local and imported water sources in Mound Basin also change future agricultural and M&I return flows in Mound Basin. Changes in return flows each year are simulated in United's (2021c) groundwater flow model as a function of changes in water demand (described above) and adjusted by precipitation (as described in the beginning of Section 3.3). The methodology for calculating the projected changes in return flow and the associated values for the baseline, 2030, and 2070 scenarios are further described in the model documentation (United 2021c).

Land Use and Population Change Effects on Water Demand

As described in Section 2.2.3, changes in land use that could have a significant impact on groundwater demand are not expected in the foreseeable future.

As of December 2019, there are 47 infill development projects within the City of Ventura that are either approved or under construction, which collectively have an estimated 921 AF/yr of water demand (Ventura Water, 2020a). These new demands are accounted for in the City's projected Mound Basin groundwater extraction estimate of 4,000 AF/yr, discussed above.

Any additional future development (and associated population increase) is not expected to impact water demands for groundwater in the Mound Basin because the City's Water Rights Dedication and Water Resource Net Zero Fee Ordinance and Resolution ("Net Zero Policy", adopted June 6, 2016), requires all new and intensified development to offset the demand associated with its impact on the City's potable water system. Offsets can take the form of water rights dedication (i.e. transfer existing rights to extract groundwater from the Mound Basin or the adjacent Oxnard or Santa Clara basins) or payment of a fee that funds development of new City water supplies. Future water supplies include VenturaWaterPure (potable reuse of advanced treated tertiary treated effluent from the VWRF) and an interconnection with Calleguas MWD that will allow the City to access its 10,000 AF/yr Table A entitlement from the California SWP.

Significant development of agricultural land or open space is not expected because agricultural land and open space in the Basin is subject to the City of Ventura and County of Ventura SOAR voter initiatives currently approved through 2050 (County of Ventura, 2020). The SOAR initiatives require a majority vote of the people to rezone unincorporated open space, agricultural, or rural land for development. In addition to the SOAR initiatives, the City of Ventura HVPAA (City of Ventura, 2005), also approved through 2050, requires voter approvals for development or the extension of City urban services into the hillsides. The existence of the SOAR and HVPPA make it very unlikely that a material change in land use will occur during the foreseeable future. Because agricultural land and open space is not expected to convert to other uses, it is assumed that there is little potential for new development that could impact basin recharge or water demands. These assumptions will be revisited during each 5-year GSP assessment.

3.3.3.1.3 Projected Surface Water Supply [§354.18(c)(3)(C)]

§354.18 Water Budget.

(c) *Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:*

(3) *Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:*

(C) *Projected surface water supply shall utilize the most recent water supply information as the baseline condition for estimating future surface water supply. The projected surface water supply shall also be applied as the baseline condition used to evaluate future scenarios of surface water supply availability and reliability as a function of the historical surface water supply identified in Section 354.18(c)(2)(A), and the projected changes in local land use planning, population growth, and climate.*

As explained in Section 3.1.1.3 and summarized at the beginning of Section 3.3, surface water from Casitas MWD is imported to Mound Basin as part of the City's M&I water supply. The City of Ventura's projected future water deliveries from Casitas MWD are calculated for normal years and drought years at approximately 6,000 AF/yr and 3,400 AF/yr, respectively (Ventura Water, 2020b). These values are consistent with actual surface water deliveries for normal to wet years 2010 and 2011, and the average for dry to near-average water years 2012 through 2019 (Table 3.3-05). The City's diverse water supply portfolio must be considered when evaluating the reliability of surface water supplies because the diversity tends to compensate for shortages of one supply. In addition, the City is pursuing new water supplies including VenturaWaterPure (potable reuse of advanced treated tertiary treated effluent from the VWRF) and an interconnection with Calleguas MWD that will allow the City to access its 10,000 AF/yr Table A entitlement from the California SWP. Based on the foregoing, changes in surface water supply availability would not necessarily impact the City's Mound Basin groundwater extraction. Based on the foregoing, MBGSA concludes that the GSP Emergency Regulations §354.18(c)(3)(C) requirement to "evaluate future scenarios of surface water supply availability and reliability as a function of the historical surface water supply…" is not particularly relevant to the Mound Basin GSP. Surface water supply availability and any impacts on the Mound Basin will be evaluated during each 5-year GSP assessment.

3.3.3.2 Projected Water Budget [§354.18(b)(1),(2),(3),(4),(6), and (d)(3)]

§354.18 Water Budget.

(b) *The water budget shall quantify the following, either through direct measurements or estimates based on data:*

- ***(1)*** *Total surface water entering and leaving a basin by water source type.*
- ***(2)*** *Inflow to the groundwater system by water source type, including subsurface groundwater inflow and infiltration of precipitation, applied water, and surface water systems, such as lakes, streams, rivers, canals, springs and conveyance systems.*
- ***(3)*** *Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow.*
- ***(4)*** *The change in the annual volume of groundwater in storage between seasonal high conditions.*
- ***(6)*** *The water year type associated with the annual supply, demand, and change in groundwater stored.*

(d) *The Agency shall utilize the following information provided, as available, by the Department pursuant to Section 353.2, or other data of comparable quality, to develop the water budget:*

- ***(3)*** *Projected water budget information for population, population growth, climate change, and sea level rise.*

The projected baseline surface water and groundwater budgets are presented in the following tables and figures and described below:

- Surface Water Budget: Table 3.3-06 and Figure 3.3-07
- Basin Groundwater Budget: Table 3.3-07 and Figures 3.3-08 and 3.3-09
- Hydrostratigraphic Unit Groundwater Budgets: Table 3.3-08

Projected Surface Water Budget

Average annual volumes for each component of the projected baseline surface water budget in Mound Basin are quantified in Table 3.3-06. The projected surface water budget is subdivided into three periods, including the 20-year implementation period required under SGMA (water years 2022-2041), the 30-year sustaining period under SGMA (water years 2042-2071), and a 25-year post-SGMA period (water years 2072-2096). Baseline projected annual Basin totals for each surface water budget component are shown graphically on Figure 3.3-07. Following are salient results of modeling the baseline projected surface water budget, focusing on notable differences compared to the historical and current water budgets (shown on Table 3.3-02):

- Similar to the historical and current surface water budget periods, the largest source of surface water inflow to and outflow from Mound Basin in the projected water budget is the Santa Clara River, with inflows ranging from zero during drought periods to over 1,000,000 AF/yr during high-rainfall years (Table 3.3-06). Ephemeral streamflows typically comprise the next largest sources of inflows and outflows, although imports of surface water (from Casitas MWD) are greater than ephemeral streamflows during dry years.
- Surface water inflows and outflows in the Santa Clara River and ephemeral streamflows are projected to be substantially smaller during the implementation period than during the sustaining and post-SGMA periods, largely as a result of the smaller average rainfall assumed during the implementation period (Table 3.3-06).

- The long-term average inflow and outflow in the Santa Clara River during the projected water budget period are approximately 4% smaller than long-term average inflow and outflow during the historical and current periods (combined). This difference is partly explained by slightly lower (1% less) rainfall assumed during the projected period compared to rainfall during the combined historical and current periods. The remainder of this difference likely results from changes in hydrologic and groundwater conditions modeled by United (2021c) upstream from Mound Basin in the Santa Clara River watershed (less than 1% of the Santa Clara River's watershed is within Mound Basin).

As was described in Section 3.3.3.1.1 of this GSP, the projected surface water budget was also modeled under two climate change scenarios (2030 and 2070) in accordance with DWR (2018) guidance. Projected surface water budget components under the 2030 climate change scenario are summarized in Table 3.3-09 and graphically illustrated on Figure 3.3-10. Projected surface water budget components under the 2070 climate change scenario are summarized in Table 3.3-10 and graphically illustrated on Figure 3.3-11. The effect of the simulated climate change scenarios on the projected surface water budget components is small; the largest change in long-term average flow projections is less than 3% (larger) compared to baseline surface water budget components.

Projected Groundwater Budget

Average annual volumes of groundwater that comprise each component of the baseline projected water budget for the principal aquifers, Shallow Alluvial Deposits, and fine-grained Pleistocene deposits HSU in Mound Basin are quantified in Table 3.3-08. The projected water budget is subdivided into three periods, including the 20-year implementation period required under SGMA (water years 2022-2041), the 30-year sustaining period under SGMA (water years 2042-2071), and a 25-year post-SGMA period (water years 2072-2096). Baseline projected annual Basin totals for each groundwater budget component are provided in Table 3.3-07 and shown graphically on Figure 3.3-08. Following are salient results of modeling the baseline projected groundwater budget, focusing on notable differences compared to the historical and current water budgets (shown on Tables 3.3-03 and 3.3-04):

- Groundwater underflow (considering all aquifers) between Oxnard Basin and Mound Basin nearly always comprises net inflow to Mound Basin under the future baseline scenario instead of fluctuating between inflow and outflow during the historical period. Exceptions to this net positive inflow to Mound Basin are small amounts of net outflow projected to occur during or immediately after droughts. The overall projected increase in underflow into Mound Basin comprises the largest difference between the baseline projected water budget compared to the historical and current groundwater budgets for Mound Basin. The increase in groundwater inflow from Oxnard Basin to Mound Basin is in large part due to projected increases in groundwater elevations in Oxnard Basin (that increase the hydraulic gradient towards Mound Basin), which in turn are expected to result from implementation of the GSP for the Oxnard Basin (Dudek, 2019). It should be noted that a modest quantity of net outflow from Mound Basin to Oxnard Basin is projected to occur in the Hueneme and Fox Canyon aquifers, albeit at significantly lower rates (Table 3.3-08).
- The net direction and magnitude of groundwater underflow across the coastline (between Mound Basin and areas to the west where the aquifers underlie the seafloor) during the baseline projected water budget period also changed substantially compared to the historical

and current periods. During the projected baseline period, the net direction of groundwater underflow for all aquifers combined is forecasted to be nearly always seaward (toward the ocean), including during drought periods, at a rate of approximately 5,000 AF/yr; during the historical and current periods, influx of water across the coastline occurred during drought periods. However, small to modest quantities of landward flow are projected across the coastline during the GSP implementation period (water years 2022-2041) in the Hueneme and Fox Canyon aquifers. However, seawater intrusion into the aquifers of Mound Basin is not projected to occur as a result of this landward flow, owing to the presence of fresh water in the offshore areas of the Hueneme and Fox Canyon aquifers.

- The projected annual volume of groundwater inflow to Mound Basin from Santa Paula Basin is approximately 800 AF/yr less during the baseline future water budget period (decreasing slightly from the implementation period through the post-SGMA period), compared to the historical and current water budget periods. This decrease in groundwater inflow from Santa Paula Basin is primarily due to projected increases in groundwater elevations in Mound Basin, which would decrease the hydraulic gradient between Santa Paula and Mound Basins.
- The magnitude of groundwater/surface water interaction in the Santa Clara River during the baseline projected water budget period is substantially different compared to the historical and current periods. During the projected baseline period, the net effect of groundwater/surface water interaction is recharge to the Shallow Alluvial Deposits from surface flows in the Santa Clara River, at rates of approximately 1,000 AF/yr, on average, during the implementation period; 1,600 AF/yr during the sustaining period; and 1,300 AF/yr during the post-SGMA period (Table 3.3-08). However, during the historical period, groundwater discharge to the river was approximately equal to infiltration of surface flows into the Shallow Alluvial Deposits (net discharge of approximately 30 AF/yr on average to the river from the shallow aquifer), becoming 270 AF/yr of recharge to the Shallow Alluvial Deposits on average during the current period.
- The net volume of groundwater released from storage in Mound Basin during the entire baseline projected water budget period is approximately -80 AF/yr on average, meaning a small amount of groundwater is projected to be added to storage (associated with rising groundwater levels) on average (Table 3.3-07 and Figure 3.3-09). This is compared with an average of 550 AF/yr of groundwater storage loss during the combined historical and current period.
- Differences in the remaining projected baseline water budget components compared to historical and current water budget components are modest to negligible, as can be seen by comparing Table 3.3-07 and Figure 3.3-08 to Table 3.3-03 and Figure 3.3-02.

As was described in Section 3.3.3.1.1 of this GSP, the projected groundwater budget was also modeled under two climate change scenarios (2030 and 2070) in accordance with DWR (2018) guidance. Projected groundwater budget components under the 2030 climate change scenario are summarized in Tables 3.3-11 and 3.3-12 and Figures 3.3-12 and 3.3-13. Projected groundwater budget components under the 2070 climate change scenario are summarized in Tables 3.3-13 and 3.3-14 and Figures 3.3-14 and 3.3-15. The effect of the simulated climate change scenarios on the projected water budget components is small; the largest change is an 8% decrease in groundwater underflow from the Oxnard Basin to Mound Basin in the 2070 climate change scenario compared to the baseline scenario. The simulated effects of climate change on other water budget components are smaller, ranging from less than 1% to a few percent. It should be noted that existing cyclical climate phenomena, such as the ENSO and PDO, have historically had a greater effect on water budget components in Mound Basin than the projected effects of the 2030 and 2070 climate change scenarios. In other words, the effects of existing climate cycles (ENSO and PDO) likely will have greater impacts on future groundwater conditions in Mound Basin than the longer-term climate change assumptions recommended by DWR (2018) to evaluate potential uncertainty in the projected water budget.

3.3.4 Overdraft Assessment and Sustainable Yield Estimate [§354.18(b)(5) and (b)(7)]

§354.18 Water Budget.

(b) *The water budget shall quantify the following, either through direct measurements or estimates based on data:*

(5) *If overdraft conditions occur, as defined in Bulletin 118, the water budget shall include a quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions.*

(7) *An estimate of sustainable yield for the basin.*

3.3.4.1 Overdraft Assessment

GSP Emergency Regulations § 354.18(b)(5) requires quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions if overdraft conditions exist.

Bulletin 118, Update 2003 (DWR, 2003) describes groundwater overdraft as "[t]he condition of a groundwater basin or subbasin in which the amount of water withdrawn by extraction exceeds the amount of water that recharges the basin over a period of years, during which the water supply conditions approximate average conditions. Overdraft can be characterized by groundwater levels that decline over a period of years and never fully recover, even in wet years. If overdraft continues for a number of years, significant adverse impacts may occur, including increased extraction costs, costs of well deepening or replacement, land subsidence, water quality degradation, and environmental impacts."

Review of the historical, current and projected groundwater budgets indicate small amounts of declining groundwater storage over time (469 and 147 for the historical and current periods, respectively), as shown in Table 3.3-03. These results suggest a minor amount of overdraft may have occurred during the historical and current period of 6.3% and 2.3%, respectively, of the groundwater extraction during that timeframe. However, these values are considered to be within the range of uncertainty of the water budget calculations and no undesirable results have been reported historically. Therefore, it is does not appear that overdraft has occurred historically in the Basin.

The projected water budget suggests that groundwater in storage would increase slightly (68 to 84 AF/yr) between 2022 and 2096, under the assumed future precipitation rates modeled. During the implementation period (2022-2041), declines in storage range from 4 to 38 AF/yr are projected, depending on the climate change assumptions (Tables 3.3-07, 3.3-11, and 3.3-13). These values are considered to be within the range of uncertainty of the water budget calculations. Therefore, MBGSA concludes that overdraft during the 50-year GSP planning horizon is not likely under the assumed conditions.

Although the water budget projections suggest groundwater storage will not decline significantly during the 50-year GSP planning horizon, the model results indicate 318 to 458 AF/yr of groundwater inflow will occur from offshore portions of the Hueneme Aquifer into onshore portions of the aquifer during the implementation period (2022-2041), depending on climate change assumptions (Tables 3.3-08, 3.3-12, and 3.3-14). Modeled flow across the coastline during the next 55 years (sustaining and post-GSP periods, 2042-2096) is projected to reverse (consist of outflow from Mound Basin to the offshore areas), on average. As discussed in Section 3.2.3, available data do not indicate that seawater is or has been present in the onshore portions of the principal aquifers to date. With projected average net outflows of groundwater from Mound Basin to the offshore areas west of the coastline of approximately 5,000 AF/yr (Tables 3.3-08, 3.3-11, and 3.3-14), seawater intrusion into Mound Basin is considered unlikely to occur. Additionally, Section 4.6 presents model results of particle tracking analyses, which suggest that it will take more than 100 years for the seawater front in the Hueneme Aquifer to reach the shoreline of the Mound Basin. This is clearly beyond the 50-year GSP planning horizon and neither SGMA nor the GSP Emergency Regulations explicitly require consideration of potential undesirable results that could manifest after the 50-year GSP planning horizon. Nonetheless, this GSP prudently includes SMC and a monitoring network for seawater intrusion. A contingency plan for unexpected seawater intrusion during the 50-year GSP planning horizon will also be developed and can survive following the 50-year GSP planning horizon and be used to address any future potential landward movement of seawater in the Hueneme Aquifer.

3.3.4.2 Sustainable Yield

GSP Emergency Regulations § 354.18(b)(7) requires an estimate of the sustainable yield for the Basin. Water Code §10721(w) defines "Sustainable yield" as the maximum quantity of water, calculated over a base period representative of long-term conditions in the Basin and including any temporary surplus that can be withdrawn annually from a groundwater supply without causing an undesirable result.

Modeling results for the future projection periods indicate that the projected inflow and outflows will be approximately balanced during the 20-year GSP implementation period (change in storage ranging from 4 to 38 AF/yr; Tables 3.3-07, 3.3-10, and 3.3-13), depending on climate change assumptions. The modeling results also suggest that the minimum thresholds will not be exceeded. Therefore, an estimate of the sustainable yield is approximately equal to the projected extraction (averaging 7,900 to 8,200 AF/yr), depending on climate change assumptions (Tables 3.3-07, 3.3-10, and 3.3-13). It is recognized that increasing extraction rates above these amounts could increase underflow from adjacent basins, thereby increasing the sustainable yield of the Mound Basin; however, this could impact sustainable management of the adjacent Santa Paula and/or Oxnard basins and is not included the sustainable yield estimate at this time.

3.4 Management Areas [§354.20]

No management areas were established for this GSP.

4.0 Sustainable Management Criteria [Article 5, SubArticle 3]

4.1 Introduction to Sustainable Management Criteria [§354.22]

§354.22 Introduction to Sustainable Management Criteria. *This Subarticle describes criteria by which an Agency defines conditions in its Plan that constitute sustainable groundwater management for the basin, including the process by which the Agency shall characterize undesirable results, and establish minimum thresholds and measurable objectives for each applicable sustainability indicator.*

This chapter defines the conditions that direct sustainable groundwater management in the Mound Basin, discusses the process by which MBGSA characterized undesirable results, and established minimum thresholds, measurable objectives, and interim milestones for each applicable sustainability indicator.

Defining the SMC requires a significant level of analysis and scrutiny; this section presents the data and methods used to develop the SMC for the Mound Basin and explains how the SMC affect the interests of beneficial uses and users of groundwater and/or land uses and property interests. The SMC presented in this Section were developed using the best available science and information for the Basin. As noted in this GSP, data gaps exist in the HCM, and uncertainty caused by these data gaps was considered during SMC development. The SMC will be reevaluated during each Plan assessment and potentially modified in the future as new data become available.

The layout for this GSP groups the SMC by each sustainability indicator, and their order is kept consistent with the SGMA regulatory text for minimum thresholds (§354.28). For this GSP, land subsidence is the most limiting sustainability indicator, and it may benefit the reader to understand the SMC for Section 4.8 before reading Sections 4.4 through 4.7. The following sustainability indicators are applicable in the Basin:

- Chronic lowering of groundwater levels (Section 4.4)
- Reduction in groundwater storage (Section 4.5)
- Seawater Intrusion (Section 4.6)
- Degraded water quality (Section 4.7)
- Land subsidence (Section 4.8)

The sixth sustainable management criterion, depletion of interconnected surface water, is not applicable in the Basin because surface water is not materially affected by groundwater extraction for the reasons described in the Basin Setting (see Sections 3.1.4.2, 3.2.6, and 3.3, and Appendix G for further information). There is no direct depletion of interconnected surface water of the Santa Clara River and its estuary because there is no groundwater extraction from the Shallow Alluvial Deposits. Indirect depletion of Santa Clara River flows by groundwater extraction from the deeper, principal aquifers does not occur at material rates because the thick zone of fine-grained materials that lies between the Shallow Alluvial Deposits and the Mugu Aquifer significantly limits the propagation of hydraulic responses between these units. A detailed analysis of the potential for indirect depletion is presented in Appendix G. The results of that analysis indicated that there is no material depletion of surface water.

To retain an organized approach, this chapter follows the same structure for each sustainability indicator. The description of each SMC contains all the information required by §354.22 et seq. of the SGMA regulations and outlined in DWR BMP 6, Sustainable Management Criteria (DWR, 2017), including:

- Description of undesirable results:
  - Potential effects on beneficial uses and users of groundwater, on land uses and property interests, and other potential effects (§354.26(b)(3)).
  - The cause of groundwater conditions that would lead to or has led to undesirable results (§354.26(b)(1)).
  - The criteria used to define when and where the effects of groundwater conditions cause undesirable results (i.e., the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin) (§354.26(b)(2)).
- How minimum thresholds were developed:
  - The information and methodology used to develop minimum thresholds (§354.28 (b)(1)).
  - The relationship between minimum thresholds and the relationship of these minimum thresholds to other sustainability indicators (§354.28 (b)(2)).
  - The effect of minimum thresholds on neighboring basins (§354.28 (b)(3)).
  - The effect of minimum thresholds on beneficial uses and users (§354.28 (b)(4)).
  - How minimum thresholds relate to relevant Federal, State, or local standards (§354.28 (b)(5)).
  - The method for quantitatively measuring minimum thresholds (§354.28 (b)(6)).
- How measurable objectives and interim milestones were developed:
  - The methodology for setting measurable objectives (§354.30).
  - Interim milestones (§354.30 (a), §354.30 (e), §354.34 (g)(3)).

Minimum thresholds, measurable objectives, and interim milestones have been established to evaluate chronic lowering of groundwater levels, reduction in groundwater storage, and land subsidence (Table 4.1-01), water quality (Tables 4.1-02 and 4.1-03), and seawater intrusion (Table 4.1-03). For this GSP and pursuant to GSP Emergency Regulations §354.28(d), a groundwater elevation minimum threshold serves as the metric for chronic lowering of groundwater levels (Section 4.4) and land subsidence (Section 4.8) sustainability indicators. Adequate evidence demonstrating groundwater levels are a reasonable proxy is presented in Sections 4.4.2 and 4.8.2. More information about specific minimum thresholds, measurable objectives, and interim milestones relating to each groundwater condition is available in Sections 4.4 through 4.8.

To facilitate discussion of the land subsidence minimum thresholds the Basin is divided into a “western half,” “eastern half,” and “coastal area” (Figure 4.1-01), and these terms are used throughout the GSP.

4.2 Sustainability Goal [§354.24]

§354.24 Sustainability Goal. *Each Agency shall establish in its Plan a sustainability goal for the basin that culminates in the absence of undesirable results within 20 years of the applicable statutory deadline. The Plan shall include a description of the sustainability goal, including information from the basin setting used to establish the sustainability goal, a discussion of the measures that will be implemented to ensure that the basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation and is likely to be maintained through the planning and implementation horizon.*

The sustainability goal is key to the SMC development process because it provides policy guidance for defining undesirable results and desirable conditions for each applicable sustainability indicator and for the Basin as a whole. Recognizing the importance of the sustainability goal, MBGSA's SMC process began with developing and adopting the sustainability goal. MBGSA used a deliberate process to develop the sustainability goal, which included providing ample opportunity for input on the goal. Sustainability goal outreach included a GSP newsletter article, web-posting, multiple email notices to the interested parties list, discussion at a GSP Workshop, and discussion at four Board of Director meetings. The sustainability goal was adopted by the Board of Directors on September 17, 2020, after three months of outreach. Information from the Basin setting used to establish the sustainability goal is described in the subsections for each individual sustainability indicator.

The sustainability goal for the MBGSA GSP is as follows:

> *The goal of this Groundwater Sustainability Plan (GSP) is to sustainably manage the groundwater resources of the Mound Basin for the benefit of current and anticipated future beneficial users of groundwater and the welfare of the general public who rely directly or indirectly on groundwater. Sustainable groundwater management will ensure the long-term reliability of the Mound Basin groundwater resources by avoiding undesirable results pursuant to the Sustainable Groundwater Management Act (SGMA) no later than 20 years from GSP adoption through implementation of a data-driven and performance-based adaptive management framework. It is the express goal of this GSP to develop sustainable management criteria and plan implementation measures to avoid undesirable results for the applicable SGMA sustainability indicators by:*
>
> 1. *Using best available science and information, including consideration of uncertainty in the basin setting and groundwater conditions;*
> 2. *Conducting active and meaningful stakeholder engagement;*
> 3. *Considering potential impacts on the management of adjacent basins and, where necessary coordinating with adjacent basins; and*
> 4. *Balancing economic, social, and environmental impacts and benefits associated with current and anticipated future beneficial users of groundwater, by considering:*
>   a. *Water supply reliability for agriculture and municipal and industrial users;*
>   b. *Availability of alternative water sources for domestic groundwater beneficial users;*
>   c. *Identifying and considering potential impacts to groundwater-dependent ecosystems;*

d. State, federal, or local standards relevant to applicable sustainability indicators;

e. Feasibility of projects and management actions necessary to achieve proposed measurable objectives; and

f. Economic impact of projects and management actions necessary to achieve proposed measurable objectives on all beneficial users, with special consideration of disadvantage communities and agricultural landowners lacking alternative land use options.

The measures that will be implemented to ensure that the Basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation (and is likely to be maintained through the planning and implementation horizon) is presented in Section 6 (Projects and Management Actions) and Section 7 (Plan Implementation).

4.3 Process for Establishing Sustainable Management Criteria [§354.26(a), §354.34(g)(3)]

§354.26 Undesirable Results.

(a) *Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.*

§354.34 Monitoring Network

(g) *Each Plan shall describe the following information about the monitoring network:*

(3) *For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.*

On June 18, 2020, the MBGSA Board of Directors adopted a deliberate process for developing SMC for this GSP (depicted in Figure 4.3-01 below).

As shown in Figure 4.3-01, a key part of the SMC development process is defining undesirable results (GSP Emergency Regulations §354.26(a)). The process for defining undesirable results was modified as the work was completed and consisted of multiple steps:

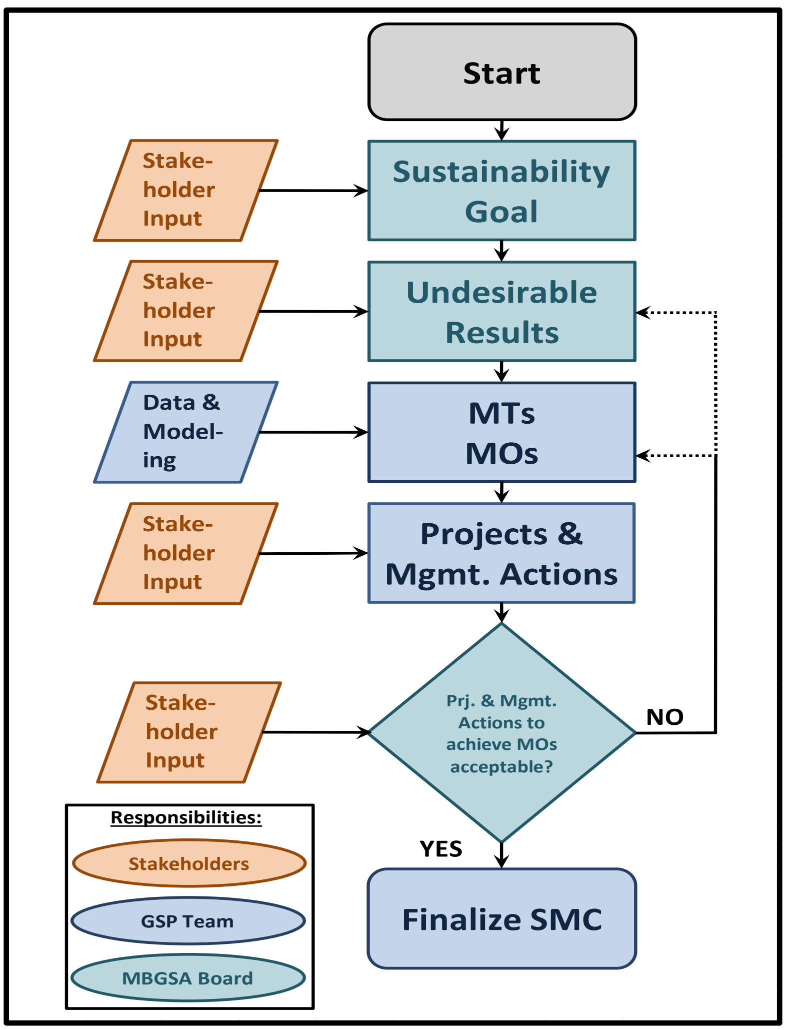
1. First, potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other effects were evaluated and described qualitatively.
2. This qualitative undesirable results statement was then translated and quantified into minimum thresholds at specific monitoring network sites (existing and proposed).
3. Lastly, a combination of minimum threshold exceedances representing undesirable results (when significant and unreasonable effects occur on any of the sustainability indicators) in the Basin was established.

The Board of Directors and stakeholders reviewed SMC proposals prepared by staff. Written proposals were provided in the form of staff reports and presentations at numerous Board of Directors meetings, which included information on SGMA requirements, relevant information from the Basin Setting section, and results of additional analyses completed to support SMC development. Meeting summaries (minutes) were posted on the MBGSA website to reflect the discussions that took place for each sustainability indicator.

SMC were also presented at two GSP workshops. The first GSP workshop was held on September 3, 2020, and focused on providing foundational information for SMC development, including the Basin setting, groundwater model, SMC development process, and sustainability goal. The second GSP workshop was held on March 4, 2021, and focused on detailed SMC proposals. The Board approved the SMC for inclusion in the draft GSP on March 18, 2021.

The proposed SMC were also subject to review and comment during the Draft GSP comment period. Outreach was performed throughout the SMC development process to encourage input on the proposed SMC, including GSP newsletters, e-mails to the interested parties list, social media posts, telephone communications with stakeholders, updates at the Santa Clara River Watershed Committee, public notices, and a bilingual bill stuffer in the City of Ventura's consumer water bills.

Figure 4.3-01 Sustainable Management Criteria Development Process



4.4 Chronic Lowering of Groundwater Levels

4.4.1 Undesirable Results [§354.26(a),(b)(1),(b)(2),(b)(3)]

§354.26 Undesirable Results.
(a) *Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.*
(b) *The description of undesirable results shall include the following:*
(1) *The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.*
(2) *The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.*
(3) *Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.*

Process and Criteria for Defining Undesirable Results [§354.26(a)]

The overall process relied upon to define undesirable results for this GSP is described in Section 4.3. The specific process and criteria for defining undesirable results applied to the chronic lowering of groundwater levels sustainability indicator are described below.

Evaluation of Potential Effects on Beneficial Uses and Users, Land Uses, and Property Interests [§354.26(b)(3)]

The process for defining undesirable results for chronic lowering of groundwater levels began with considering the potential effects on beneficial uses and users of groundwater, land uses, and property interests.

Potential effects on beneficial uses and users of groundwater include the following:

- Impact on the ability of existing and future wells to produce groundwater at an adequate rate for beneficial uses, and
- Significant financial burden to groundwater beneficial users related to increased extraction costs, well repairs or modifications, and well replacements.

Potential effects on land uses and property interests include decreased property values resulting from decreased well yields and/or increased costs to produce water or purchase supplemental water.

The above-listed potential effects were analyzed by evaluating information about the following:

- Historical groundwater elevation data;
- Depths and locations of existing wells; and

- Numerical modeling results of groundwater level conditions from the 50-year projected water budget.

Chronic lowering of groundwater levels has not historically occurred and is not currently occurring in the Basin. The results of the analysis indicate that groundwater levels could decline by a considerable amount below historical low levels in many areas of the Basin before a significant and unreasonable depletion of supply would occur. The reason for this available groundwater level decline is related to the fact that wells are located in the confined portion of the Basin and the aquifers occur at considerable depths (see Figures 3.1-05 through 3.1-08). In short, there is a high enough water column in most wells to support large groundwater declines before a significant loss of production capacity would occur. The analysis results are supported by the lack of reported pumping problems during historical periods of lowered groundwater levels. While accessing water from depths below historical low groundwater levels may require deeper pump settings than current, the cost for lowering pumps is not considered significant and unreasonable. Significant and unreasonable effects are assumed to occur if wells could no longer be used as designed. Because wells in the Basin are designed to produce from confined aquifers, this means maintaining pumping levels above the top of the aquifers.

Based on the foregoing, the qualitative description of undesirable results is chronic lowering of groundwater levels that causes a significant number of wells in the Basin to no longer be capable of being operated as designed for the confined aquifers of the Mound Basin.

Cause of Groundwater Conditions That Could Lead to Undesirable Results [§354.26(b)(1)]

The cause of groundwater conditions that could lead to undesirable results would be lowering of the groundwater potentiometric surface to depths that cause pumping levels to drop below an operable height above the top of the principal aquifer in a significant number of wells.

The following factors could result in groundwater levels declining to such levels:

1. Mound Basin groundwater extractions rates that significantly exceed those assumed for the projected water budget analysis.
2. Droughts that exceed the duration and severity of droughts included in the hydrologic period used for the projected water budget analysis.
3. If Oxnard Basin does not meet the sustainability goal in its GSP, which would impact underflow between the basins to the detriment of the Mound Basin.
4. Increased groundwater extraction in the adjacent Oxnard Basin near the boundary with the Mound Basin, which would impact underflow between the basins to the detriment of the Mound Basin.
5. Increased groundwater extraction in the adjacent Santa Paula Basin near the boundary with the Mound Basin, which would impact underflow between the basins to the detriment of the Mound Basin.
6. Combinations of items 1 through 5.

Criteria Used to Define Undesirable Results [§354.26(b)(2)]

The combination of minimum threshold exceedances that is deemed to cause significant and unreasonable effects in the Basin for chronic lowering of groundwater levels is minimum threshold exceedances in 50% of the groundwater level monitoring sites in either principal aquifer. Exceedances beyond 50% would indicate widespread significant and unreasonable effects in either principal aquifer leading to undesirable results in the Basin.

4.4.2 Minimum Thresholds [§354.28]

The minimum thresholds for the chronic lowering of groundwater levels are set at the historical low groundwater level for each monitoring well (Appendix I). The basis, description, and definition for the minimum threshold is discussed in the subsequent sections below.

4.4.2.1 Information and Criteria to Define Minimum Thresholds [§354.26(c), §354.28(a),(b)(1),(c)(1)(A),(c)(1)(B),(d), and (e)]

§354.26 Undesirable Results.

(c) *The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*

§354.28 Minimum Thresholds.

(a) *Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.*

(b) *The description of minimum thresholds shall include the following:*

(1) *The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by the uncertainty in the understanding of the basin setting.*

(c) *Minimum thresholds for each sustainability indicator shall be defined as follows:*

(1) *Chronic Lowering of Groundwater Levels. The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results. Minimum thresholds for chronic lowering of groundwater levels shall be supported by the following:*

(A) *The rate of groundwater elevation decline based on historical trend, water year type, and projected water use in the basin.*

(d) *An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.*

(e) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.*

The evaluation of potential effects on beneficial uses and users, land uses, and property interests that would be affected by chronic lowering of groundwater levels was described in the evaluation of undesirable results (Section 4.4.1). Summarizing Section 4.4.1, significant and unreasonable effects from chronic lowering of groundwater levels would be causing wells to no longer be capable of being operated as designed for the confined aquifers of the Mound Basin. Wells are designed to not have the screens desaturate. For the confined aquifers in the Mound Basin, this means the maximum available drawdown is generally limited by the water column above the top of the aquifer (Driscoll, 1986). Drawing groundwater levels into the screen and aquifer causes cascading water in the well, which can cause pump cavitation and can accelerate biofouling, corrosion, and encrustation of the well screen. These effects can rapidly cause a significant loss of well production capacity and can render wells inoperable. Therefore, preventing significant and unreasonable effects requires that static groundwater levels be maintained at levels that provide sufficient water column for pumping levels to remain above the top of the aquifers.

With respect to the undesirable results described above, the groundwater elevations that indicate depletion of supply were calculated for each monitoring location to evaluate potential minimum thresholds for chronic lowering of groundwater levels. The calculations were completed by adding the estimated drawdown for a typical pumping well to 40 ft above the top elevation of the aquifer (see Appendix I for additional details and results of these calculations). Although this calculation was considered for the minimum threshold for the chronic lowering of groundwater levels sustainability indicator, it was noted that some calculated levels are several hundred feet lower in elevation than the measured historical low groundwater elevation (especially for the Hueneme aquifer), while others are similar to the historical low elevations. This is due to the significant folding of the principal aquifers that create a variable depth to the top of aquifer throughout the Basin. Other considerations include the prevention of land subsidence, avoiding potentially unrecoverable reduction of groundwater storage, and impacting underflows to/from the adjacent Oxnard Basin. After considering these factors, the minimum thresholds for the chronic lowering of groundwater levels were set at the historical low groundwater elevations in the monitoring wells. This approach will protect the wells near anticlines (upward folds), prevent land subsidence, prevent the Basin groundwater levels from falling beyond a point from which groundwater storage may not fully recover, and ensure that underflow to/from the Oxnard Basin is not unduly impacted. The resulting minimum thresholds are provided in Table 4.1-01 and are depicted on the time-series plots (hydrographs) included in Appendix I.

Pursuant to GSP Emergency Regulations §354.28(c)(1)(A), the rate of groundwater elevation decline based on historical trend, water year type, and projected water use in the Basin were considered during development of the minimum thresholds for chronic lowering of groundwater levels. Declining groundwater levels have been observed during periods of multiple consecutive dry water years or sequences with alternating dry and normal water years (e.g. Figures 3.2-10 through 3.2-13 and 3.3-02). Projected water use in the Basin is accounted for in the numerical modeling of the 50-year projected period and the modeling results suggest that projected extraction rates will not cause minimum threshold exceedances (Appendix I).

4.4.2.1.1 Evaluation of Multiple Minimum Thresholds [§354.26(c)]

§354.26 Undesirable Results.
(c) *The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*

This requirement is not applicable because only one minimum threshold is established for the chronic lowering of groundwater levels sustainability indicator.

4.4.2.1.2 Evaluation of Representative Minimum Thresholds [§354.28(d)]

§354.28 Minimum Thresholds.
(d) *An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.*

As discussed in Section 4.8, InSAR data is not adequate for monitoring land subsidence in the western half of the Basin. Because of this inadequacy, groundwater level elevations are used as a proxy for land subsidence minimum thresholds in the western half of the Basin. As such, groundwater elevation is used as a representative minimum threshold for multiple sustainability indicators (land subsidence and chronic lowering of groundwater levels in the western half of the Basin). Groundwater levels are a reasonable proxy for multiple minimum thresholds for these sustainability indicators because they are closely correlated. Groundwater levels could decline below historical low levels without causing undesirable results for the chronic lowering of groundwater levels sustainability indicator at some locations in the western half of the Basin based on the drawdown analysis described in Appendix I. However, undesirable results for land subsidence could occur in the "Coastal Area" (see Figure 4.1-01) if groundwater levels decline below historical low levels in the western half of the Basin. Therefore, it is appropriate to use the historical low as minimum thresholds for the land subsidence and chronic lowering of groundwater levels sustainability indicators in the western half of the Basin. Appendix I describes the calculation of the minimum thresholds and measurable objectives for each monitoring well in the Basin.

4.4.2.2 Relationships Between Minimum Thresholds and Sustainability Indicators [§354.28(b)(2)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(2) *The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.*

The relationships between the minimum thresholds for the chronic lowering of groundwater levels sustainability indicator and other sustainability indicators are described in Section 4.4.2.5.

4.4.2.3 Minimum Thresholds in Relation to Adjacent Basins [§354.28(b)(3)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(3) *How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.*

The minimum thresholds for the chronic lowering of groundwater levels sustainability indicator are based on historical low groundwater elevations, which is considered protective of both the Mound Basin and the adjacent Oxnard Basin. Deeper groundwater levels could potentially increase underflow into the Mound Basin from the Oxnard and/or Santa Paula Basins (or decrease underflow to the Oxnard Basin), which could potentially contribute to undesirable results in those Basins. Underflow between the basins will be estimated during Plan implementation using groundwater level data near the basin boundary and numerical modeling to evaluate whether the minimum thresholds are unduly impacting sustainable management of the Oxnard Basin.

4.4.2.4 Impact of Minimum Thresholds on Beneficial Uses and Users [§354.28(b)(4)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(4) *How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.*

The chronic lowering of groundwater levels minimum thresholds may have several effects on beneficial users and land uses in the Basin:

Groundwater Beneficial Users (All Types)

The minimum thresholds will prevent significant and unreasonable depletions of supply and prevent significant financial burdens for well repairs and well replacements. Numerical modeling results suggest that the future groundwater levels will be above the minimum thresholds and achieve the measurable objective without the need for extraction rate reductions or any projects or other management actions. Therefore, the minimum thresholds are not anticipated to limit the beneficial use of groundwater.

Land Uses and Property Interests (All Types)

The minimum thresholds will prevent significant and unreasonable effects on land uses and property interests by preserving water supply for beneficial uses, thereby helping maintain property values. As discussed in Section 2.2.3.1, agricultural land and open space in the Basin is subject to the City of Ventura and County of Ventura SOAR voter initiatives currently approved through 2050 (SOAR, 2015). The SOAR initiatives require a majority vote of the people to rezone unincorporated open space, agricultural, or rural land for development. The existence of SOAR makes it very unlikely that agricultural land could be developed. Therefore, it is important to ensure that agricultural beneficial uses of groundwater are protected by the minimum thresholds because there is no practical alternative land use for most agricultural land in the Basin. Absent groundwater supplies, agricultural property values would likely be significantly impacted. The impact on property values for other land uses and property uses in the Basin is less directly tied to Mound Basin groundwater because the City of Ventura (water supplier for majority of the non-agricultural areas of the Basin) has a diverse water supply portfolio that includes multiple supplies derived from sources located outside of the Basin.

4.4.2.5 Potential Effects on other Sustainability Indicators [§354.28(c)(1)(B)]

§354.28 Minimum Thresholds.
(c) *Minimum thresholds for each sustainability indicator shall be defined as follows:*
(1) *Chronic Lowering of Groundwater Levels. The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results. Minimum thresholds for chronic lowering of groundwater levels shall be supported by the following:*
(B) *Potential effects on other sustainability indicators.*

Pursuant to GSP Emergency Regulations §354.28(c)(1)(B), potential effects on other sustainability indicators were considered. The following effects were identified:

- **Land Subsidence in the Western Half of the Basin**: As discussed in Section 4.8, InSAR data is not adequate for monitoring land subsidence in the western half of the Basin; therefore, groundwater level elevations are used as a proxy for land subsidence minimum thresholds. The minimum thresholds are the same for the chronic lowering of groundwater levels and land subsidence sustainability indicators in the western half of the Basin. The potential effect of the chronic lowering of groundwater levels minimum thresholds is prevention of minimum threshold exceedances for the land subsidence sustainability indicator in the western half of the Basin.

  Land Subsidence in the Eastern Half of the Basin: As discussed in Section 4.8, InSAR data is adequate for monitoring land subsidence in the eastern half of the Basin and the land subsidence minimum thresholds are a rate and extent of subsidence. The chronic lowering of groundwater levels minimum threshold is the historical low groundwater level elevations, which should prevent inelastic subsidence. Thus, the potential effect of the chronic lowering of groundwater levels minimum thresholds is prevention of minimum threshold exceedances for the land subsidence sustainability indicator in the eastern half of the Basin.

- **Reduction of Groundwater Storage**: Managing groundwater levels above historical lows is expected to prevent unrecoverable groundwater storage loss because the Basin has been demonstrated to recover from historical low groundwater elevations historically. Thus, the potential effect of the chronic lowering of groundwater levels minimum thresholds is prevention of unrecoverable reduction of groundwater storage.

- **Seawater Intrusion**: Numerical modeling results suggest that seawater intrusion is not anticipated during the 50-year SGMA planning and implementation period (Section 4.6). In addition, the Mugu and Hueneme aquifers crop out on the continental shelf approximately 10 miles offshore without any submarine canyons (Figure 3.1-10), greatly reducing the likelihood that seawater can find a near-shore path for intrusion. Several investigations have concluded that seawater intrusion is not occurring for Mound Basin. Therefore, the effect of groundwater level minimum thresholds on the seawater intrusion sustainability indicators is not significant. However, it is noted that maintaining groundwater levels above historical low levels will help limit inland gradients in the Hueneme Aquifer that could eventually lead to onshore migration of seawater in the future (beyond the 50-year SGMA planning and implementation period).

- **Degraded Water Quality**: Managing groundwater levels above historical lows is expected to prevent water quality degradation associated with groundwater extraction because the Basin has not experienced degradation of water quality in the principal aquifers during periods of historical low groundwater elevations. Thus, the potential effect of the chronic lowering of groundwater levels minimum thresholds is prevention of degradation of water quality associated with groundwater extraction.

- **Depletion of Interconnected Surface Water**: This sustainability indicator is not applicable to the Mound Basin.

4.4.2.6 Current Standards Relevant to Sustainability Indicator [§354.28(b)(5)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(5) *How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.*

MBGSA is unaware of any federal, state, or local standards for chronic lowering of groundwater levels.

4.4.2.7 Measurement of Minimum Thresholds [§354.28(b)(6)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(6) *How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.*

Groundwater elevations will be directly measured to determine their relation to minimum thresholds. Groundwater level monitoring will be conducted in accordance with the monitoring plan outlined in Section 5. Section 7 Plan Implementation includes an implementation budget to install additional monitoring sites identified in Section 5.

4.4.3 Measurable Objectives and Interim Milestones [§354.30(a),(b),(c),(d),(e),(g)]

§354.30 Measurable Objectives.
(a) *Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.*
(b) *Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.*
(c) *Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.*
(d) *An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.*
(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*
(g) *An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.*

4.4.3.1 Description of Measurable Objectives

The chronic lowering of groundwater levels measurable objectives were developed by applying the concept of providing a reasonable margin of operational flexibility under adverse conditions (GSP Emergency Regulations §354.30(c)). Adverse conditions for the Mound Basin include drought-phases of the long-term and climatic-driven groundwater level cycles, as described in Section 3.2 (Groundwater Conditions). The reasonable margin of operational flexibility was determined to be groundwater levels following wet phases that are sufficiently high to prevent groundwater levels from dropping below the minimum thresholds during a subsequent drought phase (Figures 3.2-10 through 3.2-13). The measurable objectives were developed for each monitoring site using the following approach:

1. Modeled groundwater level data were plotted for the projected period for each monitoring site.
2. The maximum modeled groundwater level decline during the 50-year GSP planning and implementation horizon was determined and, when necessary, adjusted using professional judgment based on model calibration results (see Appendix I for additional details on the methodology);
3. The maximum projected groundwater level decline was added to the minimum threshold to establish the range of operational flexibility.

The measurable objectives are listed along with minimum thresholds for each monitoring site in Table 4.1-01 (§354.30(b)) and apply following wet phases of the climate cycle. Failure to meet the measurable objectives during other times shall not be considered failure to sustainably manage the Basin. Time-series plots (hydrographs) showing the measured and modeled groundwater elevation data and measurable objectives are included in Appendix I.

4.4.3.2 Interim Milestones [§354.30(e)]

§354.30 Measurable Objective.
(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin with 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*

Interim milestones were developed to illustrate a reasonable path to achieve the sustainability goal for the Basin within 20 years of Plan implementation. Development of interim milestones is significantly complicated by the fact that the hydrologic conditions for the next 20 years cannot be predicted. Currently, groundwater levels in the Basin are below the measurable objectives for approximately ⅓ of the wells because the Basin has experienced overall dry conditions for much of the past decade. It is anticipated that groundwater levels will rise during the next wet period and as a result of Oxnard Basin GSP implementation. It is anticipated that the measurable objectives will be met at some point during the 20-year GSP planning period and then may fluctuate above or below the measurable objective thereafter. Because of the uncertainty concerning when the measurable objectives will be met, the interim milestones are shown as a linear path toward the measurable objective over the 20-year sustainability timeframe. This interim milestone path should not be taken literally because it is climate dependent. The interim milestones and path to sustainability will be reviewed during each required 5-year GSP assessment

(GSP Emergency Regulations §354.38(a)). The interim milestones are listed in Table 4.1-01 and are plotted on the time-series plots (hydrographs) included in Appendix I.

Once the measurable objectives are met, numerical modeling results suggests that sustainability will be maintained during the remainder of the 50-year GSP planning and implementation horizon (Appendix I). The causes of groundwater conditions that could lead to undesirable results for the land subsidence sustainability indicator (described in Section 4.8.1) will be carefully reviewed during each required 5-year GSP assessment. The GSP will be updated to include any projects or management actions deemed necessary to maintain sustainable conditions in the Basin.

4.5 Reduction of Groundwater Storage

4.5.1 Undesirable Results [§354.26(a),(b)(1),(b)(2),(b)(3)]

§354.26 Undesirable Results.
(a) *Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.*
(b) *The description of undesirable results shall include the following:*
- ***(1)*** *The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.*
- ***(2)*** *The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.*
- ***(3)*** *Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.*

Process and Criteria for Defining Undesirable Results [§354.26(a)]

The overall process relied upon to define undesirable results for this GSP was described in Section 4.3. The specific process and criteria for defining undesirable results applied to the reduction of groundwater storage sustainability indicator are described below.

Pursuant to Water Code §10721(x)(2) the undesirable result for the reduction of groundwater storage sustainability indicator is a “significant and unreasonable reduction of groundwater storage.” The reduction in groundwater storage sustainability indicator is measured as the “total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results” (GSP Emergency Regulations §354.28(c)(2)).

The HCM for the Mound Basin describes the principal aquifers (Mugu and Hueneme) as extensively deep and confined, except where the Hueneme unit outcrops in the higher elevations to the north (Section 3.1.4.1.3). The principal aquifers are also regional flow-through units, with groundwater underflow from the upgradient Santa Paula Basin contributing to rebound from declines in storage associated with drier periods (Figure 3.3-03). In addition, historical low groundwater levels are consistently well above the top of the principal aquifer units (Figures 3.1-05 – 3.1-07). Storage is not directly measured for the Basin;

therefore there are no storage targets or goals associated with groundwater use. These combinations of factors indicate that groundwater storage is not a directly relevant sustainability indicator for the Basin. Regardless, the potential impacts of the reduction of groundwater storage are evaluated under the guidelines of the GSP Emergency Regulations to maintain compliance.

In many basins, including the Mound Basin, the effects of decreasing groundwater storage would manifest as effects for other sustainability indicators; the reduction of groundwater storage is associated with chronic lowering of groundwater levels and subsidence. For example, a key concern for the Mound Basin would be a reduction in groundwater storage that causes groundwater levels to decline to a point that undesirable results for the land subsidence sustainability indicator occur.

Based on the foregoing, the qualitative description of undesirable results is reduction of groundwater storage that will likely cause other sustainability indicators to have undesirable results.

Evaluation of Potential Effects on Beneficial Uses and Users, Land Uses, and Property Interests [§354.26(b)(3)]

The evaluation of potential effects on beneficial uses and users, land uses, and property interests for the reduction of groundwater storage sustainability indicator is the same as for the other sustainability indicators and is incorporated herein by reference to Sections 4.4.2.4, 4.6.2.4, and 4.7.2.4.

Reduction of groundwater storage has the potential to impact the beneficial uses and users of groundwater in the Mound Basin by limiting the volume of groundwater available that can be economically extracted for agricultural, municipal, and industrial use. These impacts can affect all users of groundwater in the Mound Basin. Groundwater elevations are used to determine whether significant and unreasonable reduction of groundwater in storage is occurring.

Cause of Groundwater Conditions That Could Lead to Undesirable Results [§354.26(b)(1)]

The cause of groundwater conditions that could lead to undesirable results would be reduction of groundwater storage that subsequently causes undesirable results for the other sustainability indicators.

The following factors could result in groundwater storage reductions that could lead to undesirable results for the other sustainability indicators:

1. Mound Basin groundwater extractions rates that significantly exceed those assumed for the projected water budget analysis.
2. Droughts that exceed the duration and severity of droughts included in the hydrologic period used for the projected water budget analysis.
3. If Oxnard Basin does not meet the sustainability goal in its GSP, which would impact underflow between the basins to the detriment of the Mound Basin.
4. Increased groundwater extraction in the adjacent Oxnard Basin near the boundary with the Mound Basin, which would impact underflow between the basins to the detriment of the Mound Basin.

5. Increased groundwater extraction in the adjacent Santa Paula Basin near the boundary with the Mound Basin, which would impact underflow between the basins to the detriment of the Mound Basin.
6. Combinations of items 1 through 5.

Criteria Used to Define Undesirable Results [§354.26(b)(2)]

Because there is a single minimum threshold that applies to the entire Basin, the criteria used to define undesirable results for the reduction of groundwater storage sustainability indicator is the exceedance of the minimum threshold. If the reduction of groundwater storage minimum threshold is exceeded, MBGSA will assess the other sustainability indicators to determine if undesirable results are occurring or are likely to occur.

4.5.2 Minimum Thresholds [§354.28]

The minimum threshold for the reduction of groundwater storage sustainability indicator is the estimated sustainable yield of 8,200 AF/yr of the Basin calculated over a long-term, balanced hydrologic period. Because the minimum threshold applies over an averaging period, groundwater extractions exceeding the minimum threshold in any given year will not automatically be considered to indicate undesirable results are occurring in the Basin (please see Section 4.5.1).

4.5.2.1 Information and Criteria to Define Minimum Thresholds [§354.26(c), §354.28(a),(b)(1),(c)(2), (d), and (e)]

§354.26 Undesirable Results.
(c) *The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*
§354.28 Minimum Thresholds.
(a) *Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.*
(b) *The description of minimum thresholds shall include the following:*
(1) *The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by the uncertainty in the understanding of the basin setting.*
(c) *Minimum thresholds for each sustainability indicator shall be defined as follows:*
(2) *Reduction of Groundwater Storage. The minimum threshold for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the basin without causing conditions that my lead to undesirable results. Minimum thresholds for reduction of groundwater storage shall be supported by the sustainable yield of the basin, calculated based on historical trends, water year type, and projected water use in the basin.*
(d) *An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.*
(e) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.*

Groundwater storage cannot be directly measured; rather it can only be estimated using measured or modeled groundwater levels and knowledge of basin geometry and subsurface hydraulic properties, and there is a calibrated numerical model that is used to relate groundwater levels to storage (United, 2021c). Groundwater extraction values from the Basin's principal aquifers are a more direct and reliable measure as compared to estimated storage changes. For these reasons, groundwater extraction rates will be used for the reduction of groundwater storage sustainability indicator. The information used to define the minimum threshold (sustainable yield) is the water budgets presented in Section 3.3, which are based on the numerical modeling performed for GSP development.

4.5.2.1.1 Evaluation of Multiple Minimum Thresholds [§354.26(c)]

§354.26 Undesirable Results.
(c) *The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*

This requirement is not applicable because only one minimum threshold is established for the reduction of groundwater storage sustainability indicator.

4.5.2.1.2 Evaluation of Representative Minimum Thresholds [§354.28(d)]

§354.28 Minimum Thresholds.
(d) *An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.*

This requirement is not applicable to the reduction of groundwater storage sustainability indicator.

4.5.2.2 Relationships Between Minimum Thresholds and Sustainability Indicators [§354.28(b)(2)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(2) *The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.*

The relationships between the minimum thresholds for the reduction of groundwater storage sustainability indicator and other sustainability indicators are as follows:

- **Chronic Lowering of Groundwater Levels**: Extraction rates directly influence groundwater levels within the principal aquifers, so there is a direct relationship between the reduction of groundwater storage and the chronic lowering of groundwater levels minimum thresholds. Maintaining the long-term average groundwater extraction rates to below the sustainable yield is expected to minimize minimum threshold exceedances for the chronic lowering of groundwater levels sustainability indicator.
- **Land Subsidence:** A lowering of groundwater levels below the historical low levels could cause land subsidence in the Basin. Because extraction rates directly influence groundwater levels within the principal aquifers, the groundwater storage minimum threshold has a direct relationship to land subsidence if groundwater levels fall below the historical low. Maintaining the long-term average groundwater extraction rates to below the sustainable yield should minimize minimum threshold exceedances for the land subsidence sustainability indicator.
- **Seawater Intrusion**: Numerical modeling results suggest that seawater intrusion is not anticipated during the 50-year SGMA planning and implementation period (Section 4.6). In addition, the Mugu and Hueneme aquifers crop out on the continental shelf approximately 10 miles offshore without any submarine canyons (Figure 3.1-10), greatly reducing the likelihood that seawater can find a near-shore path for intrusion. Several investigations have concluded that seawater intrusion is not occurring for Mound Basin. Therefore, the relationship between reduction of groundwater storage minimum thresholds and the seawater intrusion sustainability indicator is not significant. Nevertheless, maintaining the long-term average groundwater extraction rates to below the sustainable yield should further minimize any potential for seawater intrusion.
- **Degraded Water Quality**: A lowering of groundwater levels below the historical low levels could cause degradation of water quality in the principal aquifers. Maintaining the long-term average

groundwater extraction rates to below the sustainable yield will help prevent degradation of water quality associated with groundwater extraction.

- **Depletion of Interconnected Surface Water**: This sustainability indicator is not applicable to the Mound Basin.

4.5.2.3 Minimum Thresholds in Relation to Adjacent Basins [§354.28(b)(3)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(3) *How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.*

The minimum threshold for the reduction of groundwater storage sustainability indicator will ensure groundwater storage does not decrease over long-term, average hydrologic conditions. This is considered protective of both the Mound Basin and the adjacent Oxnard Basin. If storage was allowed to decline over a long-term period of average hydrologic conditions, deeper groundwater levels would result, which could potentially increase underflow into the Mound Basin from the Oxnard and/or Santa Paula basins (or decrease underflow to the Oxnard Basin), which could potentially contribute to undesirable results in those basins. Underflow between the basins will be estimated during Plan implementation using groundwater level data near the basin boundary and numerical modeling to evaluate whether the minimum thresholds are unduly impacting sustainable management of the Oxnard Basin.

4.5.2.4 Impact of Minimum Thresholds on Beneficial Uses and Users [§354.28(b)(4)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(4) *How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.*

The effects on beneficial users and land uses in the Basin are the same as analyzed for the other sustainability indicators and are incorporated herein by reference.

4.5.2.5 Current Standards Relevant to Sustainability Indicator [§354.28(b)(5)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(5) *How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.*

MBGSA is unaware of any federal, state, or local standards for reduction of groundwater storage.

4.5.2.6 Measurement of Minimum Thresholds [§354.28(b)(6)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(6) *How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.*

Groundwater extractions will be directly measured and recorded to determine their relation to minimum thresholds. Extraction rate monitoring will be conducted in accordance with the monitoring plan outlined in Section 5.

4.5.3 Measurable Objectives and Interim Milestones [§354.30(a),(b),(c),(d),(e),(g)]

§354.30 Measurable Objectives.

(a) *Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.*

(b) *Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.*

(c) *Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.*

(d) *An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.*

(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*

(g) *An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.*

4.5.3.1 Description of Measurable Objectives

The reduction of groundwater storage measurable objective is 90% of the sustainable yield (i.e., 7,400 AF/yr), based on professional judgement and to account for uncertainty in the sustainable yield estimate. Like the minimum threshold, the measurable objective applies over a long-term period of average hydrology. It is anticipated that the measurable objective will be met in wet periods, but not met in drier than average periods and perhaps some average years. Failure to meet the measurable objective during average to dry years shall not be considered failure to sustainably manage the Basin. The measurable objective will be tracked over time and updated based on measured and recorded extraction rates for the Basin.

4.5.3.2 Interim Milestones [§354.30(e)]

§354.30 Measurable Objective.
(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin with 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*

Interim milestones were developed to illustrate a reasonable path to achieve the sustainability goal for the Basin within 20 years of Plan implementation. Development of interim milestones is significantly complicated by the fact that the hydrologic conditions for the next 20 years cannot be predicted. The historical and current average groundwater extractions are lower than the minimum threshold value (7,391 and 7,288 AF/yr compared to 8,200 AF/yr). The historical and current average groundwater extractions are also less than the measurable objective (7,400 AF/yr), so the interim milestones are set to be equal to the measurable objective. Numerical modeling results suggest that sustainability will be maintained during the remainder of the 50-year GSP planning and implementation horizon (Appendix I).

4.6 Seawater Intrusion

As described in Section 3.2.3 Seawater Intrusion, available data indicate that seawater has not been present in the onshore portions of the principal aquifers to date. Section 3.2.3 also explains that the Mound Basin principal aquifers may only be exposed to seawater where they crop out on the continental shelf edge, approximately 10 miles offshore, greatly reducing the likelihood that seawater can find a near-shore path for intrusion into the principal aquifers (Figure 3.1-10).

Additional numerical modeling analysis of seawater intrusion potential was conducted to support SMC development. Particle tracking was performed to estimate historical movement of seawater over the last approximate 100-year period to represent groundwater flow conditions since predevelopment. The calibrated MODFLOW model was coupled with MODPATH (Pollock, 2016) for this analysis. Particles were released at the offshore aquifer subcrop locations to simulate seawater movement in the principal aquifers over the 100-year period. The particle tracking results suggests that seawater has moved an average of approximately 0.5 miles from the offshore subcrop toward the shoreline in the Hueneme Aquifer during the past 100 years (Figure 4.6-01). The particle tracking results suggest no migration occurred in the Mugu Aquifer during the same period.

Particle tracking results demonstrate onshore migration of seawater did not occur under historical conditions and is not anticipated during the 50-year SGMA planning and implementation horizon. This is due to the large distance between the shoreline and the edge of the continental shelf where the aquifers are hydraulically connected to seawater. The travel time for seawater to reach the coast is estimated to be multiple centuries or more. This is in contrast with the adjacent Oxnard Plain Basin, where the aquifers are highly vulnerable to lateral seawater intrusion due to the existence of two deep submarine canyons at Port Hueneme and Point Mugu that expose the aquifers to seawater in the walls of the canyons at a very close distance to the shoreline. Although the numerical model results indicate onshore flow in the Hueneme Aquifer, it is believed this water will most likely continue to consist of fresh groundwater from the offshore portion of the aquifer.

While the above-described modeling results are encouraging, it is necessary to consider the possibility that a short-circuit pathway for seawater could exist nearshore (for example along the Oak Ridge Fault). A nearshore short-circuit pathway could allow seawater to enter the aquifer and potentially migrate onshore during the SGMA planning horizon. The impact of potential short-circuit pathways for seawater was evaluated with additional particle tracking simulations. The 50-year baseline numerical model simulation performed for the projected water budget was coupled with MODPATH for this analysis. Particles were released in each principal aquifer at the shoreline to simulate seawater migration from a hypothetical near-shore short-circuit pathway. This simulation provides information for the worst-case scenario of potential seawater intrusion, in the event that seawater is just offshore and migrates onshore due to inland hydraulic gradients. Particles traces were exported after 20 and 50 years of migration to provide results for the 20-year GSP implementation period and the full 50-year SGMA planning period (Figures 4.6-02 and 4.6-03). As shown in Figures 4.6-02 and 4.6-03, the particle traces indicate an approximate average of 500 and 800 ft of potential migration (under the worst-case scenario) over the 20-year implementation and 50-year planning periods, respectively. Even under the worst-case scenario the inland extent of seawater migration is approximately 1 mile from the nearest active production well. It is recognized that migration rates in the more permeable portions of the aquifers could be several times higher than the average rates simulated. Even so, the results of these simulations indicate that it is unlikely that beneficial users of groundwater would be impacted during the 50-year SGMA planning and implementation horizon (see active wells plotted on Figures 4.6-02 and 4.6-03) by onshore migration of seawater via potential short-circuit pathways located near the coast.

Despite the very encouraging model results for seawater intrusion, SMC are included in the GSP to protect current and future beneficial users and users and property interests against potential unexpected seawater intrusion.

4.6.1 Undesirable Results [§354.26(a),(b)(1),(b)(2),(b)(3)]

§354.26 Undesirable Results.
(a) *Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.*
(b) *The description of undesirable results shall include the following:*
- ***(1)*** *The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.*
- ***(2)*** *The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.*
- ***(3)*** *Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.*

Process and Criteria for Defining Undesirable Results [§354.26(a)]

The overall process relied upon to define undesirable results for this GSP is described in Section 4.3. The specific process and criteria for defining undesirable results applied to the seawater intrusion sustainability indicator are described below.

Evaluation of Potential Effects on Beneficial Uses and Users, Land Uses, and Property Interests [§354.26(b)(3)]

The process for defining undesirable results for seawater intrusion began with considering the potential effects on beneficial uses and users of groundwater, land uses, and property interests.

The potential effect on beneficial uses and users of groundwater would be that seawater intrusion would render groundwater unusable for beneficial use. Current and future anticipated beneficial uses of groundwater lie east of Harbor Boulevard. Based on land use designations, there are no current or future anticipated beneficial uses of groundwater in the Coastal Area located west of Harbor Boulevard (Figure 2.1-03).

Given that the beneficial uses immediately east of Harbor Boulevard are agricultural, the potential effect of seawater intrusion on land uses and property interests would be the economic impacts of decreased agricultural activity and decreased property values resulting from the inability to produce water for agricultural activities. As discussed in Section 2.2.3.1, agricultural land and open space in the Basin lies is subject to the City of Ventura and County of Ventura SOAR voter initiatives currently approved through 2050 (SOAR, 2015). The SOAR initiatives require a majority vote of the people to rezone unincorporated open space, agricultural or rural land for development. The existence of the SOAR makes it very unlikely that agricultural land could be developed. Therefore, it is important to ensure that agricultural beneficial uses of groundwater are protected by the minimum thresholds because there is no practical alternative land use for most agricultural land in the Basin.

Based on the foregoing, the qualitative description of undesirable results is seawater intrusion extending east of Harbor Boulevard into areas with current or anticipated future beneficial uses.

Cause of Groundwater Conditions That Could Lead to Undesirable Results [§354.26(b)(1)]

As discussed in the beginning of Section 4.6, undesirable results for seawater intrusion are not anticipated during the 50-year SGMA planning and implementation period even if a near-shore short-circuit pathway for seawater intrusion exists.

The following combination of factors would be required for seawater intrusion to cause undesirable results during the 50-year SGMA planning and implementation period:

1. A near-shore short-circuit pathway for seawater to enter the principal aquifers would need to exist;
2. Onshore groundwater flow rates would need to be significantly greater than simulated (note the model suggest there is offshore flow in the Mugu Aquifer). This could potentially occur in the highest permeability zones of the aquifer, particularly if the onshore groundwater flow gradient increases above that observed historically. The groundwater flow gradient could increase as a result of the following:
    a. Mound Basin groundwater extractions rates that significantly exceed those assumed for the projected water budget analysis.
    b. Droughts that exceed the duration and severity of droughts included in the hydrologic period used for the projected water budget analysis.

c. If Oxnard Basin does not meet the sustainability goal in its GSP, which would impact underflow between the basins to the detriment of the Mound Basin.

d. Increased groundwater extraction in the adjacent Oxnard Basin near the boundary with the Mound Basin, which would impact underflow between the basins to the detriment of the Mound Basin.

e. Increased groundwater extraction in the adjacent Santa Paula Basin near the boundary with the Mound Basin, which would impact underflow between the basins to the detriment of the Mound Basin.

f. Combinations of items a through e.

Criteria Used to Define Undesirable Results [§354.26(b)(2)]

The criteria used to define when and where the effects of the groundwater conditions cause undesirable results is based on the qualitative description of undesirable result, which is seawater intrusion extending east of Harbor Boulevard into areas with current or anticipated future beneficial uses. Preventing undesirable results for seawater intrusion means that the chloride concentrations should be maintained below concentration indicative of seawater intrusion impacts at monitoring sites along Harbor Boulevard. Therefore, the combination of minimum threshold exceedances that is deemed to cause significant and unreasonable effects would be an isocontour line that exceeds the minimum threshold at or east of Harbor Boulevard (Table 4.1-01).

4.6.2 Minimum Thresholds [§354.28]

4.6.2.1 Information and Criteria to Define Minimum Thresholds [§354.26(c), §354.28(a),(b)(1),(c)(3)(A),(c)(3)(B),(d), and (e)]

§354.26 Undesirable Results.

(c) *The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*

§354.28 Minimum Thresholds.

(a) *Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.*

(b) *The description of minimum thresholds shall include the following:*

(1) *The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by the uncertainty in the understanding of the basin setting.*

(c) *Minimum thresholds for each sustainability indicator shall be defined as follows:*

(3) *Seawater Intrusion. The minimum threshold for seawater intrusion shall be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results. Minimum thresholds for seawater intrusion shall be supported by the following: .*

(A) *Maps and cross-sections of the chloride concentration isocontour that defines the minimum threshold and measurable objective for each principal aquifer.*

(B) *A description of how the seawater intrusion minimum threshold considers the effects of current and projected sea levels.*

(d) *An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.*

(e) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.*

Contrary to the general rule for setting minimum thresholds for other sustainability indicators, seawater intrusion minimum thresholds do not have to be set at individual monitoring sites. Rather, the minimum threshold is set along an isocontour (GSP Emergency Regulations §354.28(c)(3). However, for practical purposes of monitoring the isocontour, minimum thresholds are set at the monitoring and production wells used to define the isocontour.

Information used for establishing the chloride isocontour seawater intrusion minimum thresholds and measurable objectives include:

- Description of undesirable results (Section 4.6.1);
- Depths, locations, and logged lithology of existing wells used to monitor groundwater quality;
- Historical and current chloride concentrations in monitoring and production wells near the coast; and

- Minimum thresholds for chloride for the degraded water quality sustainability indictor.

Based on analysis of the above-listed factors, the seawater intrusion minimum threshold was established as a 150 mg/L chloride concentration isocontour along Harbor Boulevard. The minimum threshold is the same for both principal aquifers.

Figures 4.6-04 and 4.6-05 show the minimum threshold isocontour in map view and cross-section view for both principal aquifers, as required by GSP Emergency Regulations §354.28(c)(3)(A). Table 4.1-03 summarizes the seawater intrusion minimum threshold and measurable objective for the Mugu and Hueneme aquifers for the planned monitoring wells discussed in Section 4.6.2.6 below.

GSP Emergency Regulations §354.28(c)(3)(B) requires a description of how the seawater intrusion minimum threshold considers the effects of current and projected sea levels. As described in Sections 3.3 and 3.3.3, modeling for the 50-year projected water budget includes scenarios the considered 2030 and 2070 climate change conditions. The future baseline scenario assumed no sea level rise, the 2030 climate change scenario assumed 15 centimeters (6 inches) of sea level rise, and the 2070 climate change scenario assumed 45 centimeters (18 inches) of sea level rise, consistent with DWR (2018) guidance. The projected sea level rise amounts were incorporated into the general head boundary used to simulate the offshore seawater interface with the aquifer. The results of the 2030 and 2070 climate change model simulations are not significantly different from the baseline (no climate change) model simulation (Appendix I).

4.6.2.1.1 Evaluation of Multiple Minimum Thresholds [§354.26(c)]

> **§354.26 Undesirable Results.**
> ***(c)*** *The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*

This requirement is not applicable because only one minimum threshold is established for the seawater intrusion sustainability indicator.

4.6.2.1.2 Evaluation of Representative Minimum Thresholds [§354.28(d)]

> **§354.28 Minimum Thresholds.**
> ***(d)*** *An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.*

This requirement is not applicable to the seawater intrusion sustainability indicator because groundwater levels are not used as proxy.

4.6.2.2 Relationships Between Minimum Thresholds and Sustainability Indicators [§354.28(b)(2)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(2) *The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.*

The relationships between the minimum thresholds for the sweater intrusion sustainability indicator and other sustainability indicators are as follows:

- **Chronic Lowering of Groundwater Levels**: Numerical modeling results suggest that seawater intrusion is not anticipated during the SGMA planning and implementation periods. Therefore, the relationship between the seawater intrusion and chronic lowering of groundwater levels sustainability indicator is not significant. However, it is noted that maintaining groundwater levels above historical low levels will help limit inland gradients in the Hueneme Aquifer that could eventually lead to onshore migration of seawater in the future (beyond the 50-year SGMA planning and implementation period).
- **Reduction of Groundwater Storage:** Numerical modeling results suggest that seawater intrusion is not anticipated during the SGMA planning and implementation periods. Therefore, the relationship between the seawater intrusion and reduction of groundwater storage sustainability indicator is not significant. However, it is noted that maintaining groundwater extraction totals will help limit the onshore movement of fresh groundwater in the Hueneme Aquifer that could eventually lead to onshore migration of seawater.
- **Land Subsidence**: Numerical modeling results suggest that seawater intrusion is not anticipated during the SGMA planning and implementation periods. Therefore, the relationship between the land subsidence sustainability and seawater intrusion indicators is not significant. However, it is noted that maintaining groundwater levels above historical low levels for the land subsidence sustainability indicator in the western half of the Basin will help limit the onshore movement of fresh groundwater in the Hueneme Aquifer that could eventually lead to onshore migration of seawater.
- **Degraded Water Quality**: The minimum threshold for seawater intrusion is consistent with the chloride minimum threshold for the degraded water quality sustainability indicator.
- **Depletion of Interconnected Surface Water**: This sustainability indicator is not applicable to the Mound Basin.

4.6.2.3 Minimum Thresholds in Relation to Adjacent Basins [§354.28(b)(3)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(3) *How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.*

The seawater intrusion minimum thresholds do not affect management of the adjacent Oxnard and Santa Paula basins.

4.6.2.4 Impact of Minimum Thresholds on Beneficial Uses and Users [§354.28(b)(4)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(4) *How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.*

Seawater intrusion minimum thresholds affect beneficial users and land uses in the Basin in the following ways:

Groundwater Beneficial Users (All Types)

The minimum thresholds will prevent significant and unreasonable degradation of groundwater quality by seawater intrusion, thereby avoiding loss of groundwater supply. Numerical modeling results suggest that the minimum thresholds will be met without the need for extraction rate reductions or any projects or management actions. Therefore, the minimum thresholds are not anticipated to limit the beneficial use of groundwater.

Land Uses and Property Interests (All Types)

The minimum thresholds will prevent significant and unreasonable effects on land uses and property interests by preserving water supply for beneficial uses, thereby helping maintain property values. As discussed in Section 4.6.1, the existence of SOAR makes it very unlikely that agricultural land could be developed. Therefore, it is important to ensure that agricultural beneficial uses of groundwater are protected by the minimum thresholds because there is no practical alternative land use for most agricultural land in the Basin. Absent useable groundwater supplies, agricultural property values would likely be significantly impacted. The impact on property values for other land uses and property uses in the Basin is not applicable because M&I wells are located inland, away from area that could be impacted by seawater intrusion.

4.6.2.5 Current Standards Relevant to Sustainability Indicator [§354.28(b)(5)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(5) *How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.*

MBGSA is unaware of any federal, state, or local standards for seawater intrusion other than the WQOs included in the RWQCB-LA Basin Plan (RWQCB-LA, 2019). The minimum threshold for seawater intrusion is equal to the RWQCB Basin Plan WQO for chloride.

4.6.2.6 Measurement of Minimum Thresholds [§354.28(b)(6)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(6) *How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.*

Chloride concentrations will be directly measured to determine their relation to the minimum threshold. Groundwater quality monitoring will be conducted in accordance with the monitoring plan outlined in Section 5.

A minimum of two monitoring sites are needed along Harbor Boulevard to monitor chloride concentrations relative to the minimum threshold chloride isocontour. As described in Section 5, two monitoring sites are planned to satisfy this requirement. In addition, a potential shoreline "early warning" well may eventually augment cluster well 02N23W15J0X. This well will be evaluated following the 5-year GSP review. The shoreline wells will provide early detection of seawater intrusion, thereby providing time to react to any unexpected landward migration of seawater before the minimum thresholds are exceeded. Section 7 on Plan Implementation includes an implementation budget to install additional monitoring sites identified in Section 5.

4.6.3 Measurable Objectives and Interim Milestones [§354.30(a),(b),(c),(d),(e),(g)]

§354.30 Measurable Objectives.
(a) *Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.*
(b) *Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.*
(c) *Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.*
(d) *An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.*
(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*
(g) *An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.*

The seawater intrusion sustainability indicator measurable objectives and interim milestones are based on the chloride measurable objectives and interim milestones developed for the degraded water quality sustainability indicator. As such, the measurable objective is a 75-mg/L chloride isocontour for the Mugu Aquifer and a 100-mg/L chloride isocontour for the Hueneme Aquifer, both along Harbor Boulevard

(Figures 4.6-04 and 4.6-05). Based on available water quality data, it is anticipated that the measurable objective will already be met. However, this cannot be confirmed until the planned monitoring wells are drilled and sampled. Therefore, interim milestones are assumed to be equal to the measurable objective, but this needs to be confirmed in the first GSP update.

Please see Section 4.7.3 for more information concerning basis for the measurable objectives and interim milestones.

4.7 Degraded Water Quality

GSP Emergency Regulations 354.28(c)(4) requires GSAs to address migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the Agency that may lead to undesirable results. As discussed in Section 3.2.4, Groundwater Quality Impacts, there are no known contaminant plumes in the Basin. Potential impacts related to elevated concentrations of common ions and nitrate are there the focus for the degraded water quality sustainability indicator. It is noted that DWR has been consistent in its responses when asked about this sustainability indicator that GSAs are only responsible for managing water quality degradation that is caused by groundwater extraction or GSP projects or management actions. The SMC for the water quality degradation sustainability indicator were developed with this construct in mind.

As described in Section 3.1.4.3, Groundwater Quality, and Section 3.2.4, Groundwater Quality Impacts, the common ion chemistry of the groundwater in the Mugu and Hueneme principal aquifers is not ideal, but is beneficially used by municipal and agricultural users across the Basin. Common ions with RWQCB WQOs include sulfate, boron, and chloride. TDS also has a WQO. In general, TDS, sulfate, boron, and chloride concentrations are lower in the Mugu Aquifer and meet the WQOs with few exceptions. In general, TDS, sulfate, boron, and chloride concentrations are higher in the Hueneme Aquifer and meet the WQOs at most of the locations. The dissolved constituents are derived from natural sources, and groundwater extraction does not appear to be correlated with common ion chemistry concentrations.

It is noted that the City of Ventura has experienced elevated TDS and sulfate concentrations relative to secondary MCLs and detectable nitrate in extracted water from its wells. Based on comparison with monitoring data from other wells in the Basin, the elevated concentrations of sulfate and TDS in the City's wells appear to be related to well seal or casing integrity issues that facilitate intrusion of very poor-quality water from the shallow groundwater system into the well. This is considered a well construction/condition issue and not an indicator of regional degradation of water quality in the principal aquifer that can or should be managed by the GSA. This same pattern is also observed in some agricultural wells.

Nitrate can impact drinking water beneficial uses. The nitrate MCL is 45 mg/L (as NO_3; equivalent to 10 mg/L as N). Nitrate concentrations in excess of the drinking water MCL have been detected in groundwater samples from three agricultural wells that are screened in principal aquifers in Mound Basin (Mugu and Hueneme aquifers). Nitrate is also detected frequently in one of the two City of Ventura wells at concentrations above background but below the MCL. The other City of Ventura well has periodic low-level detections of nitrate. All of these wells exhibit anomalously high concentrations of TDS, sulfate, and chloride, suggesting influence of shallow groundwater through a possibly compromised well seal or well casing rather than presence of nitrate "plumes" in the Mugu and Hueneme aquifers in Mound Basin. It is further noted that other wells in the Basin do not exhibit elevated nitrate concentrations, further reinforcing the conclusion that nitrate is not a widespread issue in the Mound Basin principal aquifers.

In summary, groundwater quality in the Mound Basin is marginal due to natural geochemical processes, and groundwater extraction does not appear to exacerbate these natural processes. Occurrences of elevated sulfate, TDS, and nitrate concentrations appear to be related to well construction/condition issues that facilitate intrusion of very poor-quality water from the shallow groundwater system into these wells, as opposed to being an indicator of regional water quality degradation in the principal aquifers. In conclusion, it does not appear that significant or unreasonable groundwater quality degradation has occurred in the Mound Basin. However, it is recognized that potential future increases in Mugu Aquifer groundwater extraction could induce downward movement of very poor-quality water from the shallow groundwater system into the Mugu Aquifer, which could potentially lead to undesirable results. Additionally, improperly constructed wells that remain in use and abandoned wells that have not been properly destroyed (backfilled) can provide conduits for downward movement of very poor-quality water from the shallow groundwater system into the Mugu and/or Hueneme aquifers. Therefore, MBGSA must establish water quality sustainability criteria and monitor groundwater quality relative to those criteria.

4.7.1 Undesirable Results [§354.26(a),(b)(1),(b)(2),(b)(3)]

§354.26 Undesirable Results.

(a) *Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.*

(b) *The description of undesirable results shall include the following:*

- ***(1)*** *The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.*
- ***(2)*** *The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.*
- ***(3)*** *Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.*

Process and Criteria for Defining Undesirable Results [§354.26(a)]

The overall process relied upon to define undesirable results for this GSP is described in Section 4.3. The specific process and criteria for defining undesirable results applied to the degraded water quality sustainability indicator are described below.

Evaluation of Potential Effects on Beneficial Uses and Users, Land Uses, and Property Interests [§354.26(b)(3)]

The process for defining undesirable results for degraded water quality began with considering the potential effects on beneficial uses and users of groundwater, land uses, and property interests.

Potential effects on municipal beneficial uses would be increased costs for treatment or blending to meet drinking water standards. Potential effects on agricultural beneficial uses could include lower quality crops, increased water use to meet leaching requirements, and implementation of treatment or blending to reduce salinity. The potential effects on agricultural beneficial uses would result in increased costs and potential impacts on lease rates and land values.

The above-listed potential effects were analyzed by evaluating information about the following:

- Historical groundwater quality data;
- Relevant local, state, and federal water quality standards applicable to the Basin; and
- The 50-year projected water budget.

The analysis revealed that the common ion chemistry of the groundwater in the Mugu and Hueneme principal aquifers is not ideal but has been and continues to be beneficially used by municipal and agricultural users across the Basin. Based on the foregoing, the qualitative description of undesirable results is groundwater quality that exceed historical concentrations and significantly impacts beneficial uses.

Cause of Groundwater Conditions That Could Lead to Undesirable Results [§354.26(b)(1)]

Potential future increases in Mugu Aquifer extraction could potentially induce downward movement of very poor-quality water from the shallow groundwater system into the Mugu Aquifer, which could potentially lead to undesirable results. Additionally, improperly constructed wells that remain in use and abandoned wells that have not been properly destroyed (backfilled) can provide conduits for downward movement of very poor-quality water from the shallow groundwater system into the Mugu and/or Hueneme aquifers.

Criteria Used to Define Undesirable Results [§354.26(b)(2)]

The effects of groundwater conditions deemed to cause undesirable results is considered to occur when all representative monitoring wells in a principal aquifer exceed the minimum threshold concentration for a constituent for two consecutive years.

4.7.2 Minimum Thresholds [§354.28]

4.7.2.1 Information and Criteria to Define Minimum Thresholds [§354.26(c), §354.28(a),(b)(1),(c)(4), (d), and (e)]

§354.26 Undesirable Results.

(c) *The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*

§354.28 Minimum Thresholds.

(a) *Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.*

(b) *The description of minimum thresholds shall include the following:*

(1) *The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by the uncertainty in the understanding of the basin setting.*

(c) *Minimum thresholds for each sustainability indicator shall be defined as follows:*

(4) *Degraded Water Quality. The minimum threshold for degraded water quality shall be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the Agency that may lead to undesirable results. The minimum threshold shall be based on the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined by the Agency to be of concern for the basin. In setting minimum thresholds for degraded water quality, the Agency shall consider local, state, and federal water quality standards applicable to the basin.*

(d) *An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.*

(e) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.*

Minimum thresholds were developed to address the qualitative description of undesirable results provided in Section 4.7.1: "groundwater quality that exceed historical concentrations and significantly impacts beneficial uses." The potential effects on beneficial uses and users were considered together with applicable local, state, and federal water quality standards applicable to the Basin.

These criteria were considered when developing the minimum thresholds:

- **Primary MCLs**: Applicable to nitrate only. It is desirable to maintain existing water quality at levels suitable potable water for human consumption for current and future beneficial uses. Widespread occurrence of nitrate in excess of the MCL is considered a significant and unreasonable effect.
- **Secondary MCLs**: Applicable to TDS, sulfate, and chloride. It is desirable to maintain water quality at levels acceptable to consumers. Widespread occurrence of TDS, sulfate, or chloride concentrations in excess of the short-term consumer acceptance level established by the DDW would be considered a significant and unreasonable effect.

- **RWQCB WQOs**: These standards are designed to protect beneficial uses and preserve existing water quality at the time of RWQCB Basin Plan (RWQCB-LA, 2019) development from degradation, consistent with the Porter-Cologne Act and SWRCB Antidegradation Policy (Resolution No. 68-16).
- **Agricultural Thresholds**: Certain crops grown in the Basin are sensitive to chloride and boron in irrigation water. The RWQCB WQOs were developed, in part to protect agricultural beneficial uses of water. Therefore, widespread chloride or boron concentrations in excess of WQOs for these constituents would be considered a significant and unreasonable effect.
- **Existing Water Quality**: Current groundwater quality is known to support beneficial uses in the Basin and there is an absence of significant and unreasonable effects due to water quality. Therefore, minimum thresholds should be set equal to or greater than existing water quality to recognize the absence of significant and unreasonable effects at present.
- **MBGSA's Ability to Improve Water Quality**: TDS, sulfate, chloride, and boron are naturally occurring constituents that are derived from groundwater interaction with subsurface sediments. The GSA has no feasible means of reducing the existing in situ concentrations of these constituents in the Basin. The GSA can take measures to minimize the downward migration of these constituents and nitrate from the shallow groundwater into the principal aquifers.

In general, the minimum thresholds were selected be consistent with the RWQCB WQOs. The one exception is TDS in the Hueneme Aquifer, which has historically exceeded the RWQCB WQO. The TDS minimum threshold was set higher than the RWQCB WQO based on the upper range of concentrations observed in representative monitoring wells during the previous 10 years. Setting the minimum threshold above the RWQCB WQO is not considered an issue because there are no direct potable uses of groundwater and the City of Ventura manages water quality through blending within its system. It is also noted that the minimum threshold is less than the short-term consumer acceptance level established by the DDW. The minimum thresholds and specific rationale for each water quality constituent minimum threshold are provided in Table 4.1-02. The minimum thresholds and measurable objectives with respect to each aquifer are shown on Table 4.1-03. The minimum thresholds are also shown on the water quality plots provided in Appendix J.

4.7.2.1.1 Evaluation of Multiple Minimum Thresholds [§354.26(c)]

§354.26 Undesirable Results.
(c) *The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*

This requirement is not applicable because only one minimum threshold is established for the degraded water quality sustainability indicator.

4.7.2.1.2 Evaluation of Representative Minimum Thresholds [§354.28(d)]

§354.28 Minimum Thresholds.
(d) *An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.*

The requirement is not applicable to the degraded water quality sustainability indicator because groundwater elevations are not used as a proxy for the minimum thresholds.

4.7.2.2 Relationships Between Minimum Thresholds and Sustainability Indicators [§354.28(b)(2)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(2) *The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.*

The relationships between the minimum thresholds for the degraded water quality and other sustainability indicators are as follows:

- **Chronic Lowering of Groundwater Levels**: Managing groundwater levels above historical lows is expected to prevent water quality degradation associated with groundwater extraction because the Basin has not experienced degradation of water quality in the principal aquifers during periods of historical low groundwater elevations. Thus, the potential effect of the chronic lowering of groundwater levels minimum thresholds is prevention of degradation of water quality associated with groundwater extraction.
- **Reduction of Groundwater Storage**: A lowering of groundwater levels below the historical low levels could cause degradation of water quality in the principal aquifers. Maintaining the long-term average groundwater extraction rates below the sustainable yield will help prevent degradation of water quality associated with groundwater extraction.
- **Land Subsidence**: The land subsidence minimum thresholds are designed to minimize future potential inelastic land subsidence. Because poor-quality water is expelled from clays when inelastic subsidence occurs, minimizing inelastic land subsidence helps prevent significant and unreasonable effects for the degraded water quality sustainability indicator.
- **Seawater Intrusion**: The seawater intrusion minimum threshold is consistent with the degraded water quality minimum threshold for chloride.
- **Depletion of Interconnected Surface Water**: This sustainability indicator is not applicable to the Mound Basin.

4.7.2.3 Minimum Thresholds in Relation to Adjacent Basins [§354.28(b)(3)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(3) *How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.*

The degraded water quality minimum thresholds help protect that quality of groundwater that underflows into the adjacent Oxnard Basin.

4.7.2.4 Impact of Minimum Thresholds on Beneficial Uses and Users [§354.28(b)(4)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(4) *How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.*

Groundwater Beneficial Users (All Types)

The minimum thresholds will prevent significant and unreasonable degradation of groundwater quality that would limit the beneficial use of groundwater. Potential effects on municipal beneficial uses would be increased costs for treatment or blending to meet drinking water standards. Potential effects on agricultural beneficial uses could include lower quality crops, increased water use to meet leaching requirements, and implementation of treatment or blending to reduce salinity. The potential effects on agricultural beneficial uses would result in increased costs and potential impacts on lease rates and land values.

Land Uses and Property Interests (All Types)

The minimum thresholds will prevent significant and unreasonable effects on land uses and property interests by preserving water supply for beneficial uses, thereby helping maintain property values. As discussed in Section 2.2.3.1, agricultural land and open space in the Basin lies is subject to the City of Ventura and County of Ventura SOAR voter initiatives currently approved through 2050 (SOAR, 2015). The SOAR initiatives require a majority vote of the people to rezone unincorporated open space, agricultural or rural land for development. The existence of the SOAR makes it very unlikely that agricultural land could be developed. Therefore, it is important to ensure that agricultural beneficial uses of groundwater are protected by the minimum thresholds because there is no practical alternative land use for most agricultural land in the Basin. Absent useable groundwater supplies, agricultural property values would likely be significantly impacted. The impact on property values for other land uses and property uses in the Basin is less directly tied to Mound Basin groundwater because the City of Ventura (water supplier for majority of the non-agricultural areas of the Basin) has a diverse water supply portfolio that includes multiple supplies derived from sources located outside of the Basin.

4.7.2.5 Current Standards Relevant to Sustainability Indicator [§354.28(b)(5)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
  (5) *How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.*

The state, federal, and local standards applicable to the degraded water quality sustainability indicator are discussed in Section 4.7.2.1.

4.7.2.6 Measurement of Minimum Thresholds [§354.28(b)(6)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
  (6) *How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.*

Groundwater quality will be directly measured to determine where dissolved constituent concentrations are in relation to minimum thresholds. Groundwater quality monitoring will be conducted in accordance with the monitoring plan outlined in Section 5.

4.7.3 Measurable Objectives and Interim Milestones [§354.30(a),(b),(c),(d),(e),(g)]

§354.30 Measurable Objectives.
(a) *Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.*
(b) *Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.*
(c) *Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.*
(d) *An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.*
(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*
(g) *An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.*

The measurable objectives were developed using the same information and criteria used to develop the minimum thresholds, which are described in Section 4.7.2.1. In general, the measurable objectives were selected to preserve existing water quality for beneficial uses in the Basin. The measurable objectives and specific rationale for each water quality constituent measurable objective are provided in Table 4.1-02. The measurable objectives provide a reasonable range of operational flexibility above the minimum thresholds and historical concentrations observed in the Basin, as shown in the water quality plots provided in (Appendix J).

4.7.3.1 Interim Milestones [§354.30(e)]

§354.30 Measurable Objective.
(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin with 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*

Based on available water quality data, the measurable objectives are already being met. Therefore, interim milestones are equal to the measurable objective.

4.8 Land Subsidence

As described in Section 3.2.5 Land Subsidence, no land subsidence due to groundwater extraction has been documented historically in the Mound Basin. Section 3.2.5 also explains that the Mound Basin is considered to have a low estimated potential for inelastic land subsidence. Numerical modeling for the water budget suggests that future groundwater levels will remain above historical low levels, which would prevent inelastic subsidence due to groundwater extraction (Appendix I). Despite these factors, sustainable management is prudent because groundwater levels could decline below historical levels and trigger inelastic land subsidence if actual future conditions differ significantly from those assumed in the projected water budget analysis.

4.8.1 Undesirable Results [§354.26(a),(b)(1),(b)(2),(b)(3), and (c)]

§354.26 Undesirable Results.
(a) *Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.*
(b) *The description of undesirable results shall include the following:*
- ***(1)*** *The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.*
- ***(2)*** *The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.*
- ***(3)*** *Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.*

(c) *The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*

Process and Criteria for Defining Undesirable Results [§354.26(a)]

The overall process relied upon to define undesirable results for this GSP was described in Section 4.3. The specific process and criteria for defining undesirable results applied to the land subsidence sustainability indicator are described below.

Evaluation of Potential Effects on Beneficial Uses and Users, Land Uses, and Property Interests [§354.26(b)(3)]

The process for defining undesirable results for land subsidence began with considering the potential effects on beneficial uses and users of groundwater, land uses, and property interests. Beneficial uses and users of groundwater are not anticipated to be affected by the low amounts of land subsidence that could potentially occur in this basin (i.e. potential subsidence does not appear sufficient to damage wells). Therefore, the process for defining undesirable results focused on assessing potential effects on land uses and property interests in the Basin. This was accomplished by reviewing best available information concerning land uses (existing and planned), 100-year floodplain extents, infrastructure, sea level rise and related coastal hazards. The City of Ventura, which overlies most of the Basin, was consulted in this process.

Evaluation of the above-listed factors revealed that the Coastal Area located west of Harbor Boulevard is particularly susceptible to impacts of land subsidence (Figure 4.1-01). Primary sewer lines to the City's wastewater treatment plant run along Harbor Boulevard and have a low slope that could be impacted by relatively small amounts of land subsidence. Available studies indicate that the developed areas located west of Harbor Boulevard, including the Pierpont community and Ventura Harbor, will be impacted by sea level rise (Figure 4.8-01a and 4.8-01b) (VCWPD, 2018). Inelastic land subsidence in this area would unreasonably exacerbate the already significant impacts associated with sea level rise. For these reasons it was determined that any measurable (0.1 ft or greater) inelastic land subsidence in the Coastal Area could potentially result in undesirable results, particularly as the effects of sea level rise act to increase coastal hazards in the Coastal Area during the planning and implementation horizons. The potential impact of land subsidence on the remainder of the Basin is less clear.

Based on the foregoing, the qualitative description of undesirable results is:

> *Land subsidence in the Coastal Area that exacerbates coastal hazards associated sea level rise or that impacts the City of Ventura's sewer mains along Harbor Boulevard and/or that substantially interferes with surface land uses in elsewhere in the Basin.*

Cause of Groundwater Conditions That Could Lead to Undesirable Results [§354.26(b)(1)]

The cause of groundwater conditions that could lead to undesirable results would be groundwater levels that decline below historical low levels resulting in inelastic land subsidence in the Coastal Area.

The following factors could result in groundwater levels declining below historical low levels:

1. Mound Basin groundwater extractions rates that significantly exceed those assumed for the projected water budget analysis.
2. Droughts that exceed the duration and severity of droughts included in the hydrologic period used for the projected water budget analysis.

3. If Oxnard Basin does not meet the sustainability goal in its GSP, which would impact underflow between the basins to the detriment of the Mound Basin.
4. Increased groundwater extraction in the adjacent Oxnard Basin near the boundary with the Mound Basin, which would impact underflow between the basins to the detriment of the Mound Basin.
5. Increased groundwater extraction in the adjacent Santa Paula Basin near the boundary with the Mound Basin, which would impact underflow between the basins to the detriment of the Mound Basin.
6. Combinations of items 1 through 5.

Criteria Used to Define Undesirable Results [§354.26(b)(2), (c)]

The criteria used to define when and where the effects of the groundwater conditions cause undesirable results is based on the qualitative description of undesirable result, which is land subsidence in the Coastal Area (Figure 4.1-01) that exacerbates coastal hazards associated with sea level rise or that impacts the City of Ventura's sewer mains along Harbor Boulevard and/or that substantially interferes with surface land uses elsewhere in the Basin.

InSAR is the best available method for measuring the rate and extent of land subsidence over large areas, such as a groundwater basin. As described in Section 4.8.2, InSAR data utility is impacted by a significant lack of coverage in the western half of the Mound Basin as well as other factors (Figure 3.2-19) and is inadequate to be relied upon for developing the land subsidence sustainability indicators. As a result, the minimum thresholds described in Section 4.8.2 were developed using groundwater levels as a proxy for the western half of the Basin. Subsidence rates that will be monitored using InSAR are used for the minimum threshold for the eastern half of the Basin because there is adequate InSAR coverage in that area. Therefore, multiple minimum thresholds are evaluated to determine whether an undesirable result is occurring for the land subsidence sustainability indicator.

Western Half of Mound Basin

For the Coastal Area, preventing undesirable results for land subsidence would mean that the groundwater levels are maintained above historical low levels, which avoids inelastic land subsidence. Because land subsidence can propagate radially away from an area of depressed groundwater levels, it is also necessary to maintain groundwater levels above historical lows in the remainder of the western half of the Basin to prevent inelastic land subsidence that could propagate into the Coastal Area. Based on the foregoing, the combination of minimum threshold exceedances that is deemed to cause significant and unreasonable effects in the western half of the Basin for land subsidence is minimum threshold exceedances in 50% of monitoring sites (Table 4.1-01). This combination is intended to indicate significant and unreasonable effects are widespread in the western half of the Basin. If InSAR coverage and other data issues are resolved in the future, MBGSA will update the GSP to use a rate and extent of land subsidence for the minimum threshold in the western half of the Basin.

Eastern Half of Mound Basin

By regulation, the land subsidence undesirable result is a quantitative combination of subsidence minimum threshold exceedances. For the eastern half of the Mound Basin, no land subsidence that substantially interferes with surface land uses is acceptable. Therefore, the combination of minimum threshold exceedances that may cause undesirable results in the eastern half of the Basin for land subsidence is as follows: in any one year, there will be zero exceedances of the minimum thresholds for subsidence *caused by groundwater conditions*, as indicated by InSAR. To determine whether InSAR-indicated land surface elevation changes were caused by groundwater conditions, InSAR data will only be considered when groundwater levels are below historical low levels. The InSAR data will be adjusted to account for rates of subsidence related to tectonic activity using continuous GPS data historical trends to determine if the minimum threshold has been exceeded.

4.8.2 Minimum Thresholds [§354.28]

4.8.2.1 Information and Criteria to Define Minimum Thresholds [§354.26(c), §354.28(a),(b)(1),(c)(5)(A),(c)(5)(B),(d), and (e)]

§354.26 Undesirable Results.

(c) *The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.*

§354.28 Minimum Thresholds.

(a) *Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.*

(b) *The description of minimum thresholds shall include the following:*

(1) *The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by the uncertainty in the understanding of the basin setting.*

(c) *Minimum thresholds for each sustainability indicator shall be defined as follows:*

(5) *Land Subsidence. The minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. Minimum thresholds for land subsidence shall be supported by the following:*

(A) *Identification of land uses and property interests that have been affected or are likely to be affected by land subsidence in the basin, including an explanation of how the Agency has determined and considered those uses and interests, and the Agency's rationale for establishing minimum thresholds in light of those effects.*

(B) *Maps and graphs showing the extent and rate of land subsidence in the basin that defines the minimum threshold and measurable objectives.*

(d) *An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.*

(e) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.*

Land uses and property interests that would be affected by land subsidence in the Basin were described in the evaluation of undesirable results (Section 4.8.1). Summarizing Section 4.8.1, the Coastal Area of the Basin is particularly vulnerable to land subsidence impacts because land subsidence in this area would exacerbate coastal hazards associated with sea level rise in the Pierpont community and Ventura Harbor and could impact the City of Ventura's sewer mains that feed the City's WWTP. Section 4.8.1 concluded that any measurable inelastic land subsidence in the Coastal Area could potentially result in undesirable results, particularly as the effects of sea level rise act to increase coastal hazards in the Coastal Area during the planning and implementation horizons. However, because land subsidence can propagate radially away from an area of depressed groundwater levels, it is also important to prevent land subsidence in proximal areas adjacent to the Coastal Area in order to prevent inelastic land subsidence from propagating into the Coastal Area. It was further concluded that the potential impact of land subsidence on the remainder of the Basin is less clear.

Western Half of Mound Basin

Pursuant to GSP Emergency Regulations §354.28(c)(5), the minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. InSAR is the best available method for measuring the rate and extend of land subsidence over large areas, such as a groundwater basin. However, the interpolated InSAR data for the Mound Basin are impacted by multiple factors:

1. There is a significant lack of coverage in the western half of the Mound Basin (Figure 3.2-19), which causes the interpolated InSAR subsidence rates to be unreliable.
2. InSAR data provided by DWR are interpolated across the basin boundary between Mound and Oxnard basins. This is not appropriate because of the faults and folds that comprise the basin boundary. These structures likely impact the propagation of any subsidence between the basins (Figures 3.1-02, 3.1-06, and 3.2-19).
3. There is a subsidence "hotspot" that corresponds with a landfill located just south of the Mound Basin in the adjacent Oxnard Basin, which would be representing natural land compaction at the landfill. Careful inspection of the InSAR interpolation reveals that the hotpot greatly influences the subsidence values in the western portion of the Mound Basin, which lacks InSAR data (Figure 3.2-19).

For these reasons, InSAR is not considered a reliable method for measuring land subsidence in the western half of the Mound Basin and groundwater levels will be used as a proxy minimum threshold, as provided for in GSP Emergency Regulations §354.28(d). This regulation section allows the use of groundwater levels as a proxy for other sustainability indicators if a significant correlation between groundwater elevations and the other sustainability indicators can be demonstrated. The preconsolidation stress, the effective stress threshold at which inelastic compaction begins, generally is exceeded when groundwater levels decline past historical low levels (California Water Foundation, 2014). Therefore, groundwater levels are an appropriate proxy for monitoring inelastic land subsidence due to groundwater extraction. Based on the discussion of undesirable results in Section 4.8.1, minimum thresholds must be established to prevent inelastic land subsidence caused by groundwater conditions in the Coastal Area of the Basin. This means that the GSP should prevent groundwater levels from declining below historical low levels within the Coastal Area. Because land subsidence propagates radially away from an area of depressed groundwater levels, it is also necessary to maintain groundwater levels above historical lows in the remainder of the western half of the Basin to prevent inelastic land subsidence that could propagate into the Coastal Area. Therefore, the minimum thresholds for land subsidence in the western half of the Basin are defined as the historical low groundwater levels (Table 4.1-01).

The historical low groundwater elevations which define the minimum thresholds in the western half of the Basin were established using the following approach:

1. Review of available historical data presented in the Basin Setting (Section 3; Figures 3.2-10 through 3.2-13), suggests that historical low groundwater levels occurred in late 1990 to early 1991.
2. Measured and modeled groundwater level data were plotted for the historical period for each monitoring site.
3. If measured data are available during late 1990 to early 1991, the historical low groundwater elevation was established using the lowest measured groundwater levels during this period.
4. If measured data were not available during late 1990 to early 1991, the historical low groundwater elevations were estimated based on numerically modeled groundwater levels, accounting for bias in simulated low water levels compared to observed groundwater levels (where available) from the recent drought (Appendix I).

Time-series plots (hydrographs) showing the measured and modeled groundwater elevation data and minimum thresholds are included in Appendix I.

Eastern Half of Mound Basin

For the eastern half of the Basin, InSAR provides adequate coverage and there are no apparent interpolation issues. As such, the minimum threshold for land subsidence for the eastern half of the Basin is the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. Section 3.2.5 explains that available reports do not indicate any documented groundwater-related subsidence in the Mound Basin, and the DWR (2014) screening of the Mound Basin indicated a "low" overall estimated potential for future subsidence. Thus, significant and unreasonable effects from inelastic land subsidence caused by groundwater conditions are considered unlikely in the eastern half of the Basin. No basin-specific data exist to determine rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results (GSP Emergency Regulations §354.28(c)(5)). MBGSA staff consulted with land subsidence expert Michelle Sneed of the USGS concerning methods for predicting rates of subsidence that could substantially interfere with surface land uses. Ms. Sneed was unaware of any studies or proven methodologies for predicting rates of subsidence that could substantially interfere with surface land uses (M. Sneed of USGS, personal communication, July 24, 2020). Given the apparent lack of a published methodology for predicting rates of subsidence that could substantially interfere with surface land uses in the eastern half of the Basin, MBGSA estimated these rates of subsidence based on a literature review of subsidence case studies. The case studies provide insight into subsidence amounts that have led to significant and unreasonable impacts in other groundwater basins. A summary of case studies from the 10 basins identified in the literature review is presented in Table 4.8-01. As indicated in Table 4.8-01, the rates of subsidence that led to undesirable results ranged from approximately 1.2 to 4.5 inches per year (0.1 to 0.38 feet per year [ft/yr]). Reported cumulative subsidence ranged from 0.6 to 10 ft. MBGSA concluded that it may be reasonable to assume a threshold for potential significant and unreasonable effects based on the low end of the values reported from the case studies (i.e., 0.1 ft/yr, 0.6 ft cumulative). These values were selected as the basis for minimum thresholds for the eastern half of the Basin and will be revised later if basin-specific information becomes available. To determine whether InSAR-indicated land surface elevation changes were caused by groundwater conditions, InSAR data will only be considered when groundwater levels are at or below historical low levels. The InSAR data will be adjusted to account for subsidence related to tectonic activity using continuous GPS data and historical trends to determine if the minimum threshold has been exceeded.

Figure 4.8-02 shows the minimum thresholds and measurable objectives in map view, as required pursuant to GSP Emergency Regulations §354.28(c)(5)(B).

4.8.2.1.1 Evaluation of Representative Minimum Thresholds [§354.28 (d)]

§354.28 Minimum Thresholds.
(d) *An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.*

As discussed in Section 4.8.2.1, InSAR data is not adequate for monitoring land subsidence in the western half of the Basin. Because of this, groundwater level elevations are used as a proxy for land subsidence minimum thresholds. As such, groundwater elevation is used as a representative minimum threshold for multiple sustainability indicators (land subsidence and chronic lowering of groundwater levels) in the Basin. Numerical modeling results (Appendix I) indicate that groundwater levels could decline below historical low levels without causing undesirable results for the chronic lowering of groundwater levels sustainability indicator for some locations in the western half of the Basin. However, undesirable results for land subsidence could occur in the Coastal Area if groundwater levels decline below historical low levels in the western half of the Basin. Therefore, it is appropriate to use groundwater level elevations as representative minimum thresholds for the land subsidence sustainability indicator.

4.8.2.2 Relationships Between Minimum Thresholds and Sustainability Indicators [§354.28(b)(2)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(2) *The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.*

The relationships between the minimum thresholds for the land subsidence sustainability indicator and other sustainability indicators are as follows:

- **Chronic Lowering of Groundwater Levels in the Western Half of the Basin:** The minimum thresholds are the same for the land subsidence and chronic lowering of groundwater levels sustainability indicators in the western half of the Basin. The potential effect of the chronic lowering of groundwater levels minimum thresholds is prevention of minimum threshold exceedances for the land subsidence sustainability indicator in the western half of the Basin.
- **Chronic Lowering of Groundwater Levels in the Eastern Half of the Basin:** The chronic lowering of groundwater levels minimum threshold is the historical low groundwater level elevations, which should prevent inelastic subsidence. Thus, the potential effect of the chronic lowering of groundwater levels minimum thresholds is prevention of minimum threshold exceedances for the land subsidence sustainability indicator in the eastern half of the Basin.

- **Reduction of Groundwater Storage:** A lowering of groundwater levels below the historical low levels could cause land subsidence in the Basin, and because extraction rates directly influence groundwater levels within the principal aquifers, the groundwater storage minimum threshold has a direct relationship to land subsidence if groundwater levels fall below the historical low. Maintaining the long-term average groundwater extraction rates below the sustainable yield should prevent minimum threshold exceedances for the land subsidence sustainability indicator.
- **Seawater Intrusion**: Numerical modeling results suggest that seawater intrusion is not anticipated during the SGMA planning and implementation periods. Therefore, the relationship between the land subsidence sustainability and seawater intrusion indicators is not significant. However, it is noted that maintaining groundwater levels above historical low levels for the land subsidence sustainability indicator in the western half of the Basin will help limit inland gradients in the Hueneme Aquifer that could eventually lead to onshore migration of seawater in the future (beyond the 50-year SGMA planning and implementation period).
- **Degraded Water Quality**: The land subsidence sustainability indicator minimum thresholds will limit future groundwater level declines, which will help prevent downward movement of very poor-quality water from the shallow groundwater system into the Mugu Aquifer, which could potentially lead to undesirable results.
- **Depletion of Interconnected Surface Water**: This sustainability indicator is not applicable to the Mound Basin.

4.8.2.3 Minimum Thresholds in Relation to Adjacent Basins [§354.28(b)(3)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(3) *How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.*

The land subsidence sustainability indicator minimum thresholds will limit future groundwater level declines, thereby minimizing impacts to underflow, which will help prevent undesirable results in the adjacent Oxnard and Santa Paula basins.

4.8.2.4 Impact of Minimum Thresholds on Beneficial Uses and Users [§354.28(b)(4)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(4) *How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.*

Land subsidence minimum thresholds may have several effects on beneficial users and land uses in the Basin:

Groundwater Beneficial Users (All Types

Beneficial uses and users of groundwater are not anticipated to be affected by the low amounts of land subsidence that could potentially occur in this basin (i.e. potential subsidence does not appear sufficient to damage wells); therefore, the minimum thresholds do not effect groundwater beneficial uses and users. Numerical modeling results suggest that the minimum thresholds will be met without the need for groundwater extraction reductions or any projects or management actions. Therefore, the minimum thresholds are not anticipated to limit the beneficial use of groundwater.

Land Uses and Property Interests (All Types)

The minimum thresholds will protect land uses and property interests against significant and unreasonable inelastic land subsidence.

4.8.2.5 Current Standards Relevant to Sustainability Indicator [§354.28(b)(5)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(5) *How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.*

MBGSA is unaware of any federal, state, or local standards for land subsidence.

4.8.2.6 Measurement of Minimum Thresholds [§354.28(b)(6)]

§354.28 Minimum Thresholds.
(b) *The description of minimum thresholds shall include the following:*
(6) *How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.*

For the western half of the Basin, groundwater elevations will be directly measured to determine their relation to minimum thresholds. Groundwater level monitoring will be conducted in accordance with the monitoring plan outlined in Section 5. Section 7, Plan Implementation, includes an implementation budget to install additional monitoring sites identified in Section 5.

For the eastern half of the Basin, InSAR data will be used to measure inelastic subsidence in relation to the minimum thresholds. To determine whether InSAR data indicated land surface elevation changes were caused by groundwater conditions, InSAR data will only be considered when groundwater levels are below historical low levels. The InSAR data will be adjusted to account for subsidence related to tectonic activity using continuous GPS data and historical trends to determine if the minimum threshold has been exceeded.

4.8.3 Measurable Objectives and Interim Milestones [§354.30(a),(b),(c),(d),(e),(g)]

§354.30 Measurable Objectives.

(a) *Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.*

(b) *Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.*

(c) *Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.*

(d) *An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.*

(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*

(g) *An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.*

4.8.3.1 Description of Measurable Objectives

Western Half of Mound Basin

The measurable objectives for land subsidence in the western half of the Basin were developed by applying the concept of providing a reasonable margin of operational flexibility under adverse conditions (GSP Emergency Regulations §354.30(c)). Adverse conditions for the Mound Basin include long-term drought phases and climatic-driven groundwater level cycles, as described in Section 3.2 (Groundwater Conditions). The reasonable margin of operational flexibility was determined to be groundwater levels following wet phases that are sufficiently high to prevent groundwater levels from dropping below the minimum thresholds during a subsequent drought phase (Figures 3.2-10 through 3.2-13). The measurable objectives were developed for each monitoring site using the following approach:

1. Modeled groundwater level data were plotted for the projected period for each monitoring site.
2. The maximum modeled groundwater level decline during the 50-year GSP planning and implementation horizon was determined and, when necessary, adjusted using professional judgment based on model calibration results (see Appendix I for additional details on the methodology).
3. The maximum projected groundwater level decline was added to the minimum threshold.

The measurable objectives along with minimum thresholds for each monitoring site are listed in Table 4.1-01 (354.30 (b)) and apply following wet phases of the climate cycle. Failure to meet the measurable objectives during other times shall not be considered failure to sustainably manage the Basin. Time-series plots (hydrographs) showing the measured and modeled groundwater elevation data and measurable objectives are included in Appendix I.

Eastern Half of Mound Basin

The measurable objective for land subsidence for the eastern half of the Basin is no measurable inelastic land subsidence due to groundwater level declines. Measurable inelastic land subsidence is the minimum amount of subsidence that can be detected using the InSAR method when water levels are at or below historical lows. The InSAR data provided by DWR are subject to measurement error. DWR has stated that on a statewide level for the total vertical displacement measurements between June 2015 and June 2018, the errors are as follows (Paso Robles GSA, 2020):

1. The error between InSAR data and continuous GPS data is 16 mm (0.052 ft) with a 95% confidence level, and
2. The measurement accuracy when converting from the raw InSAR data to the maps provided by DWR is 0.048 ft with 95% confidence level.

The total estimated error, therefore, is 0.1 ft. A land surface change of less than 0.1 ft, therefore, is within the noise of the data collection and processing and is considered equivalent to no measurable subsidence in this GSP. The measurable objective is, therefore, equal to the minimum threshold for the eastern half of the Basin. To determine whether InSAR-indicated land surface elevation changes are caused by groundwater conditions, InSAR data will only be considered when groundwater levels are below historical low levels. The InSAR data will be adjusted to account for subsidence related to tectonic activity using continuous GPS data and historical trends to determine if the minimum threshold has been exceeded.

4.8.3.2 Interim Milestones [§354.30(e)]

§354.30 Measurable Objective.
(e) *Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin with 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.*

Western Half of Mound Basin

Interim milestones were developed to illustrate a reasonable path to achieve the sustainability goal for the Basin within 20 years of Plan implementation for the western half of the Basin. Development of interim milestones is significantly complicated by the fact that there is significant uncertainty in predicting hydrologic conditions for the next 20 years. Currently, groundwater levels in the Basin are below the measurable objectives for approximately ⅓ of the wells because the Basin has experienced overall dry conditions for the better part of the last decade. It is anticipated that groundwater levels will rise during the next wet period and as a result of Oxnard Basin GSP implementation. It is anticipated that the measurable objectives will be met at some point during the 20-year GSP implementation period and then may fluctuate above or below the measurable objective thereafter. Because of the uncertainty concerning when the measurable objectives will be met, the interim milestones are shown as a linear path toward the measurable objective over the 20-year sustainability timeframe. This interim milestone path should not be taken literally because it is climate dependent. The interim milestones and path to sustainability will be reviewed during each required 5-year GSP assessment (GSP Emergency Regulations §354.38(a)). The interim milestones are listed in Table 4.1-01 and are plotted on the time-series plots (hydrographs) included in Appendix I.

Once the measurable objectives are met, numerical modeling results suggest that sustainability will be maintained during the remainder of the 50-year GSP planning and implementation horizon (Appendix I). The causes of groundwater conditions that could lead to undesirable results described in Section 4.8.1 will be carefully reviewed during each required 5-year GSP assessment. The GSP will be updated to include any projects or management actions deemed necessary to maintain sustainable conditions in the Basin.

Eastern Half of Mound Basin

The InSAR data available for GSP development indicate that the measurable objective for the eastern half of the Basin is already met. Therefore, the land subsidence interim milestones for the eastern half of the Basin are equal to the measurable objective.

4.9 Depletions of Interconnected Surface Water [§354.26(d)]

§354.26 Measurable Objectives.
(d) *An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.*

Depletions of interconnected surface water is not an applicable indicator of groundwater sustainability in the Mound Basin and, therefore, no SMC are set. Section 3.2.6, Interconnected Surface Water Systems, and Appendix G provides the evidence for the inapplicability of this sustainability indicator.

4.10 Measurable Objectives and Interim Milestones for Additional Plan Elements [§354.30(f)]

§354.30 Measurable Objectives.
(f) *Each Plan may include measurable objectives and interim milestones for additional Plan elements described in Water Code Section 10727.4 where the Agency determines such measures are appropriate for sustainable groundwater management in the basin.*

No measurable objectives were developed for the additional plan elements included in the GSP.

5.0 Monitoring Networks [Article 5, SubArticle 4]

5.1 Introduction to Monitoring Networks [§354.32]

§354.32 Introduction to Monitoring Networks. *This Subarticle describes the monitoring network that shall be developed for each basin, including monitoring objectives, monitoring protocols, and data reporting requirements. The monitoring network shall promote the collection of data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions that occur through implementation of the Plan.*

Section 5 describes existing monitoring networks and improvements to those monitoring networks that will be developed as part of GSP implementation. Section 5 is prepared in accordance with the GSP Emergency Regulations §354.32 - §354.40 and includes monitoring objectives, monitoring protocols, data reporting requirements, assessment of the monitoring network, and DMS.

Consistent with GSP Emergency Regulations §354.34(e), the monitoring networks presented in this chapter are based primarily on existing monitoring sites. The existing monitoring networks in the Basin have been used for several decades to collect information to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface water conditions. The monitoring networks include features for the collection of data to monitor the groundwater sustainability indicators applicable to the Basin. Additional monitoring sites will be added to enhance the existing monitoring network based on the assessment herein, pursuant to GSP Emergency Regulations §354.38. The additional monitoring sites are necessary to fully demonstrate sustainability and will also help refine the HCM and improve the numerical model.

Monitoring networks are described for each applicable sustainability indicator, and data gaps are identified for each, as appropriate in the following sections. As discussed in Sections 3.2.6 and 4.9, depletion of interconnected surface water is not an applicable sustainability indicator in the Basin and therefore monitoring of surface water flow is not included in the monitoring network. Section 3.3 and Table 3.3-01 do, however, include the sources of publicly available surface water monitoring data.

5.2 Monitoring Network Objectives and Design Criteria [§354.34(a),(b)(1),(b)(2),(b)(3),(b)(4),(d),(f)(1),(f)(2),(f)(3), and (f)(4)]

§354.34 Monitoring Network.

(a) *Each Agency shall develop a monitoring network capable of collecting sufficient data to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface conditions, and yield representative information about groundwater conditions as necessary to evaluate Plan implementation.*

(b) *Each Plan shall include a description of the monitoring network objectives for the basin, including an explanation of how the network will be developed and implemented to monitor groundwater and related surface conditions, and the interconnection of surface water and groundwater, with sufficient temporal frequency and spatial density to evaluate the affects and effectiveness of Plan implementation. The monitoring network objectives shall be implemented to accomplish the following:*

(1) *Demonstrate progress toward achieving measurable objectives described in the Plan.*

(2) *Monitor impacts to the beneficial uses or users of groundwater.*

(3) *Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds.*

(4) *Quantify annual changes in water budget components.*

(d) *The monitoring network shall be designed to ensure adequate coverage of sustainability indicators. If management areas are established, the quantity and density of monitoring sites in those areas shall be sufficient to evaluate conditions of the basin setting and sustainable management criteria specific to that area.*

(f) *The Agency shall determine the density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends based upon the following factors:*

(1) *Amount of current and projected groundwater use.*

(2) *Aquifer characteristics, including confined or unconfined aquifer conditions, or other physical characteristics that affect groundwater flow.*

(3) *Impacts to beneficial uses and users of groundwater and land uses and property interests affected by groundwater production, and adjacent basins that could affect the ability of that basin to meet the sustainability goal.*

(4) *Whether the Agency has adequate long-term existing monitoring results or other technical information to demonstrate an understanding of aquifer response.*

5.2.1 Monitoring Network Objectives

The GSP Emergency Regulations require monitoring networks be developed to collect data of sufficient quality, frequency, and spatial distribution to characterize groundwater and related surface water conditions (if applicable) in the Basin, and to evaluate changing conditions that occur during implementation of the GSP. Monitoring networks should accomplish the following (§354.34(b)):

- Demonstrate progress toward achieving measurable objectives described in the GSP.
- Monitor impacts to the beneficial uses and users of groundwater.
- Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds.
- Quantify annual changes in water budget components.

Each of these objectives is described further below with specific discussion relevant to the planned Mound Basin GSP monitoring network:

1. **Demonstrate progress toward achieving measurable objectives described in Section 4 of this GSP:** As described in Section 4.9 of this GSP, the depletion of interconnected surface water indicator is not applicable to this basin. The remaining five sustainability indicators are applicable but have already met the corresponding measurable objectives historically and are expected to meet them going forward. Therefore, the focus of this objective for the Mound Basin is to demonstrate continued compliance with the measurable objectives as opposed to progress toward meeting the measurable objectives.

2. **Monitor impacts to the beneficial uses or users of groundwater:** The beneficial uses of groundwater in the primary aquifers (i.e., Mugu and Hueneme aquifers) of Mound Basin include municipal, industrial, and agricultural water supply. The beneficial users include the City of Ventura, owners of wells that are pumped for industrial water supply (two as of 2021), and owners of 22 wells used for agricultural water supply. These uses and users could be impacted by degradation of water quality, seawater intrusion, and declining groundwater levels and storage (which are an important causative factor in land subsidence). Key design criteria considered in developing a network to monitor these potential impacts on uses and users of groundwater include the following:

    - <u>Monitoring Parameters</u>: Monitoring groundwater levels, extraction rates, and groundwater quality can indicate trends that could precede land subsidence or seawater intrusion, as well as trends that could affect operation and associated costs of production wells (e.g., declining groundwater elevations may require setting a pump deeper in a well, combined with greater energy requirements to pump each AF of water). Monitoring common dissolved constituents in groundwater at or near active water supply wells can detect changes in groundwater quality that might affect groundwater users. Groundwater levels can be directly measured at monitoring wells using a manual sounder (where monthly, quarterly, or semiannual measurement is appropriate) or an installed pressure transducer with datalogger (where high-frequency measurement is needed). Groundwater extraction rates and amounts are reported to United by the well owners pursuant to Water Code §75611. Monitoring for seawater intrusion is commonly performed by analyzing groundwater samples for chloride, although analysis for other dissolved ions can be helpful for distinguishing chloride resulting from seawater intrusion versus other potential sources. In addition, rates of inland movement of fresh groundwater from offshore portions of the aquifer can be provided by monitoring groundwater elevations inland from the coast.

    - <u>Monitoring Locations</u>: As noted in DWR's best management practices for monitoring networks (DWR, 2016c), "Areas that are subject to greater groundwater pumping, greater fluctuations in conditions, significant recharge areas, or specific projects may require more monitoring (temporal and/or spatial) than areas that experience less activity or are more static." Under this guidance, appropriate monitoring sites in Mound Basin are in the southern portion of Mound Basin where all the Basin's active water supply wells are located (Figure 3.1-26) and groundwater levels are known to fluctuate. Monitoring in the northern portion of the Basin is low priority due to the lack of beneficial uses. In the event that seawater is detected in shoreline monitoring wells, additional monitoring wells may be warranted to ensure protection of beneficial users of groundwater in the western portion of the Basin. DWR's BMPs for monitoring networks also notes that "[u]nderstanding conditions at or across basin boundaries is important." Variable groundwater underflow occurs along the southern boundary of Mound Basin adjacent to Oxnard Basin; therefore, coverage of this area by the Mound Basin monitoring network can help confirm underflow estimated in the water budget. Finally, monitoring groundwater quality and elevations along the coastline and just inland from the coast can provide early warning of any unexpected seawater intrusion during the SGMA implementation period, as well as rates of movement of fresh groundwater to or from offshore portions of the aquifer.

- Screened Intervals (depths) of Monitoring Wells: In basins with multiple aquifers, such as Mound Basin, the depth of monitoring is an important consideration. For Mound Basin, this means ensuring monitoring takes place in both principal aquifers in the Basin (i.e., the Mugu and Hueneme aquifers). However, the emphasis should be on monitoring the Hueneme Aquifer because most of the groundwater extracted from the Basin is from wells screened in this aquifer.
- Monitoring Frequency: In Mound Basin, where groundwater elevations are subject to both seasonal fluctuations (due to changes in groundwater extraction and recharge rates) and longer-term cyclical fluctuations (due to climatic variability), the frequency of groundwater level measurements, extraction rate reporting, and groundwater quality sampling is an important design consideration. Therefore, this objective for Mound Basin includes a frequency of groundwater level measurements and extraction rates sufficient to capture the range (seasonal highs and lows) of groundwater elevations occurring within the Basin over the course of each year. For monitoring seawater intrusion, the frequency of sampling should be sufficient to detect unexpected inland advancement of seawater in time to institute mitigation measures that can prevent undesirable results (e.g., before chloride concentrations at agricultural water supply wells increase to the point that they become harmful to crops). Due to the relatively slow rate of groundwater movement, annual monitoring for seawater intrusion should suffice with the caveat that the sampling frequency should be increased if indications of seawater are detected. The frequency of groundwater level measurement and groundwater quality sampling at or near active water supply wells should be sufficient to detect any long-term trends in water quality that could result from vertical migration of poor-quality water into the principal aquifers. Due to the relatively slow rate of potential vertical migration, annual water quality monitoring should suffice.

3. **Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds:** Similar to #1 above, the focus of this objective for the Mound Basin is to demonstrate continued compliance with the measurable objectives. As discussed in Section 4.4.2.1.2, groundwater levels are used as a proxy for the land subsidence minimum threshold in the western half of the Basin. The reduction of groundwater storage sustainability indicator is monitored by reported extraction rates. Thus, monitoring of changes in groundwater conditions relative to minimum thresholds and measurable objectives will be accomplished using groundwater level, extraction rate, and groundwater quality monitoring. Monitoring in the Mound Basin should focus on whether the trend of these parameters is deviating from a pattern that is consistent with continued maintenance of groundwater conditions relative to the measurable objectives. If a significant change from historical extraction rate patterns or groundwater quality were to occur in the future (e.g., groundwater extraction from an aquifer

that was largely unused historically, or new reports of discharge of contaminants to groundwater in an area of the Basin with few monitoring wells), then modifications to the monitoring network could be required.

4. **Quantify annual changes in water budget components:** As described in Section 3.3 of this GSP, United's (2021a) groundwater flow model is the best tool currently available for estimating the quantities of most of the water budget components involving groundwater flow in the Mound Basin. Exceptions include:
   - Groundwater extractions, which are measured by well owners and reported to the MBGSA and United semiannually.
   - Groundwater imports from adjacent basins, which are recorded by the City of Ventura, FICO, and Alta MWC. Quantities of imported water are available to the MBGSA upon request. Imports from the California SWP, when Ventura's SWP Interconnection Project is completed, will also be recorded by the City of Ventura and made available to the MBGSA upon request.
   - Areal recharge, which can be quantified based on rainfall data and land use information. Rainfall data are collected by the VCWPD, and land use data are updated annually to biennially by several county and state agencies and can be downloaded from their websites.

The above data will be input to United's flow model for calculating future annual changes in subsurface water budget components and change in storage. Surface flows in the Santa Clara River are measured daily by the VCWPD at flow-gaging station "723 - Santa Clara River at Victoria Ave" located outside of the Basin. Data from this station are available online and can be downloaded annually to update this surface water component of the Mound Basin water budget (VCWPD, 2021). MBGSA intends to continue using data from these existing sources as input to United's model, which will in turn be used periodically to quantify changes in water budget components. At present, this GSP does not contemplate development of a new monitoring network or modification of existing monitoring networks to obtain data regarding groundwater extraction, imported water, or recharge quantities because it is MBGSA's opinion that these water budget components are currently adequate for sustainable management of the Basin.

5.2.2 Monitoring Network Design Criteria

Design criteria are discussed for each sustainability indicator regarding GSP Emergency Regulations §354.34(c)(1) through (6) and are addressed in the subsections that discuss the monitoring networks specific to each sustainability indicator.

GSP Emergency Regulations §354.34(d) adds the overarching design criteria, which echo the third monitoring network objective described in GSP Emergency Regulations §354.34(b)(3) (see #3 in Section 5.2.1 above), to "[e]nsure adequate coverage of sustainability indicators." No management areas have been established for the Basin, so the sufficient quantity and density of monitoring sites is addressed for each sustainability indicator for the entire Basin.

GSP Emergency Regulations §354.34(f) provide additional design considerations for the density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends based upon the following factors:

- Amount of current and projected groundwater use.
- Aquifer characteristics, including confined or unconfined aquifer conditions, or other physical characteristics that affect groundwater flow.
- Impacts to beneficial uses and users of groundwater and land uses and property interests affected by groundwater production, and adjacent basins that could affect the ability of that basin to meet the sustainability goal.
- Whether the Agency has adequate long-term existing monitoring results or other technical information to demonstrate an understanding of aquifer response.

Other criteria from DWR BMP 2, Monitoring Networks and Identification of Data Gaps (DWR, 2016c), were also considered in developing the monitoring network. These include:

- **Access issues**: Most of the land within Mound Basin has been developed for urban/suburban uses or consists of privately owned farmland. The majority of open land occurs on the steep hillsides in the northern portion of the Basin, where access by drilling rigs would be difficult. Due to the large depth to the principal aquifers in most parts of the Basin, drilling and construction of new groundwater monitoring wells will likely require a large construction "footprint." Therefore, construction of new monitoring wells will be difficult in much of the Basin and may not be feasible in some areas. Although some new monitoring wells are proposed in this GSP (in Sections 5.3 and 5.5), existing wells should be used for monitoring to the extent practicable.
- **Consider all sustainability indicators**: DWR (2016c) recognizes that "GSAs should look for ways to efficiently use monitoring sites to collect data for more than one or all of the sustainability indicators," including those indicators that are not currently known to affect (or be affected by) uses and users of groundwater from the principal aquifers. In keeping with DWR (2016c) guidance, to the extent practicable, the proposed Mound Basin GSP monitoring network is designed to collect the most data possible with a minimum of monitoring points/resources. Potential opportunities for modifying the existing monitoring network to provide additional data regarding groundwater quality, land subsidence, and interconnected surface water in Mound Basin are provided in the following subsections of this GSP.
- **Cost**: Cost is a critical factor for MBGSA because of the small amount of groundwater extraction in this basin, compared to most medium- and high-priority basins. This means there is a significantly greater cost burden on each groundwater user to fund additional monitoring sites as compared to groundwater users in most other basins.

5.2.3 Monitoring Network Design Analysis

The objectives and design criteria set forth in the GSP Emergency Regulations were analyzed in a Basin-specific context. The analysis resulted in the following key monitoring network design factors:

1. The applicable sustainability indicator measurable objectives have been met historically and are expected to be met going forward. Therefore, the focus of this objective for the Mound Basin is to demonstrate continued compliance with the measurable objectives as opposed to progress toward meeting the measurable objectives.
2. The depletion of interconnected surface water indicator is not applicable to this basin and percolation of surface water is not a significant water budget element. Therefore, surface water monitoring is not a priority for the Mound Basin.
3. Because groundwater levels are used as a proxy for the land subsidence in the western half of the Basin (see Figure 4.1-01), the reduction of groundwater storage is monitored using extraction rates, and surface water is not an important factor in the Mound Basin, monitoring should focus on groundwater levels, extraction rates, and groundwater quality monitoring.
4. No management areas have been established in the Mound Basin under this GSP. Therefore, adequate coverage of the sustainability indicators applies at the basin level.
5. The area of greatest risk for undesirable results is in the western half of the Basin due to the sensitivity of land uses and critical infrastructure to land subsidence in the Coastal Area, and proximity of agricultural beneficial users to the shoreline for any unexpected seawater intrusion. Thus, MBGSA's highest priority for its limited fiscal resources is to ensure adequate monitoring near the coast to protect land uses and beneficial uses relative to the land subsidence and seawater intrusion sustainability indicators.
6. Current and projected groundwater beneficial uses and users are limited to the southern portion of the Basin. Monitoring sites should be prioritized in the southern portion of the Basin, and MBGSA's limited fiscal resources should be prioritized to address monitoring needs in this area, as opposed to the northern portion of the Basin which has no groundwater extraction.
7. Data limitations in the northern portion of the Basin are not believed to limit MBGSA's ability to sustainably manage the Basin as there are no beneficial uses in that area and because the numerical model can be used to estimate the potentiometric surface and storage change in that area.
8. Current and projected groundwater extractions for beneficial uses are heavily skewed toward the Hueneme Aquifer. Therefore, the monitoring sites should be prioritized in the Hueneme Aquifer. All other factors being equal, MBGSA's limited fiscal resources should be prioritized to address monitoring needs in Hueneme Aquifer, as opposed to the Mugu and non-principal aquifers in the Basin.
9. Groundwater underflow from Oxnard Basin is more variable than underflow from the Santa Paula Basin, as described in Section 3.3 of this GSP. Additionally, sustainable groundwater management of the Mound Basin will be affected by the implementation of the Oxnard Basin GSP by the FCGMA, whereas Santa Paula Basin is adjudicated. Therefore, monitoring that supports the assessment of underflow should be prioritized along the Oxnard Basin boundary as compared to the Santa Paula Basin boundary.
10. Monitoring Frequencies: The following circumstances were considered when evaluating monitoring frequencies:

a. Measurable objectives have consistently been met historically;

b. MBGSA has long-term existing monitoring results;

c. The Basin has a relatively small amount of groundwater extraction; and

d. The aquifers are deep and confined and, therefore, do not exhibit large seasonal changes (in response to climate variations) in groundwater levels and storage and are not susceptible to rapid changes in groundwater quality from surface activities.

Based on the foregoing, high-frequency monitoring is not necessary to characterize short-term, seasonal, and long-term trends in groundwater levels, quality, and water budget components. Quarterly groundwater level monitoring, semiannual extraction rate reporting, and annual groundwater quality sampling frequencies are considered adequate. More frequent monitoring may be desirable, but not considered necessary for sustainable management of the Basin, unless conditions change. The monitoring frequencies, among other aspects, should be evaluated during the periodic Plan assessments.

How the monitoring objectives and design criteria were specifically applied to each SMC to develop the GSP monitoring network is described in the following subsections.

5.3 Groundwater Levels Monitoring Network [§354.34(e),(g)(3),(h), and (j)]

§354.34 Monitoring Network.
(e) *A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.*
(g) *Each Plan shall describe the following information about the monitoring network:*
(3) *For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.*
(h) *The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.*
(j) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.*

Table 5.3-01 summarizes construction and other information for the 23 existing wells in Mound Basin that have regularly been used for groundwater level monitoring historically. These wells are referred to as the "existing groundwater level monitoring network." Locations of groundwater level monitoring wells screened in the Mugu and Hueneme aquifers are shown on Figures 5.3-01 and 5.3-02, respectively. Inspection of Table 5.3-01 indicates that most (15) existing groundwater level monitoring wells are screened exclusively or almost exclusively in the Hueneme Aquifer, which is one of the two principal aquifers in the Basin and supplies most of the groundwater extracted from Mound Basin (Table 3.1-02). Five wells are screened solely in the Mugu Aquifer, which is the other principal aquifer. One well is screened in portions of both the Hueneme and Fox Canyon aquifers, and one well is screened across significant intervals of both the Mugu and Hueneme aquifers. Two wells in the existing monitoring well network are screened in the fine-grained Pleistocene Deposits overlying the Mugu Aquifer. Wells screened in the fine-grained Pleistocene Deposits, the Fox Canyon Aquifer, or across multiple aquifers are shown on Figure 5.3-03.

Wells 02N22W07M01S/02S/03S and 02N23W07J01S/02S/03S are clustered wells that were jointly installed by United and the City of Ventura in the 1990s and provide data concerning vertical hydraulic gradients between the principal aquifers and the fine-grained Pleistocene deposits.

Two additional monitoring well clusters are planned in the Coastal Area to provide monitoring sites for implementation of the seawater intrusion sustainability indicator (Sites A and B on Table 5.3-02 and Figures 5.3-01 and 5.3-02). These monitoring well clusters will include discrete screen intervals in each principal aquifer, which will provide additional definition of the potentiometric surface in both principal aquifers and additional vertical gradient data. Site C is a potential “early warning” well and the plans to install this well will be evaluated following the 5-year review.

Ventura Water monitors several shallow wells located along the Santa Clara River, which are not part of the Mound Basin GSP monitoring network. Shallow groundwater levels from these wells will be collected and analyzed as part of the interim shallow groundwater data collection and analysis described in Section 6.6.

5.3.1 Attainment of Monitoring Objectives and Other Requirements [§354.34(c)(1)(A),(c)(1)(B), and (g)(1)]

§354.34 Monitoring Network.
(c) *Each monitoring network shall be designed to accomplish the following for each sustainability indicator:*
(1) *Chronic Lowering of Groundwater Levels. Demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features by the following methods:*
(A) *A sufficient density of monitoring wells to collect representative measurements through depth-discrete perforated intervals to characterize the groundwater table or potentiometric surface for each principal aquifer.*
(B) *Static groundwater elevation measurements shall be collected at least two times per year, to represent seasonal low and seasonal high groundwater conditions.*
(g) *Each Plan shall describe the following information about the monitoring network:*
(1) *Scientific rationale for the monitoring site selection process.*

In accordance with GSP Emergency Regulations §354.34(b) and (d), the groundwater level monitoring network sites have been selected using MBGSA’s scientific judgment to (1) demonstrate progress toward achieving measurable objectives described in the GSP, (2) monitor impacts to the beneficial uses and users of groundwater, (3) monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds, (4) quantify annual changes in water budget components, and (5) to provide adequate coverage of sustainability indicators. Importantly, there is no groundwater extraction in the northern portion of the Basin; thus, the sustainability indicators that rely on groundwater levels directly (or as a proxy) and the groundwater monitoring network are necessarily focused on the southern portion of the Basin. The monitoring network has a special focus in areas of greatest risk for undesirable results: the western half of the Basin where land uses and critical infrastructure are sensitive to land subsidence effects, and agricultural beneficial users proximal to the coastline would be at risk if unexpected seawater intrusion occurs. Additional monitoring well clusters are proposed in the western half of the Basin to address these concerns.

Pursuant to GSP Emergency Regulations §354.34(c)(1)(A), the groundwater level monitoring network sites have been selected to provide a sufficient density of monitoring wells to collect representative measurements through depth-discrete intervals to characterize the potentiometric surface for each principal aquifer. The existing and planned groundwater level monitoring wells screened in the Hueneme Aquifer and the Mugu Aquifer provide sufficient density for the following scientific and practical reasons consistent with the key Basin-specific monitoring network design factors discussed in Section 5.2:

- The groundwater level monitoring sites (existing and proposed) were selected to provide focused monitoring of groundwater gradients and flow directions over time in the western half of the Basin where the greatest risk for undesirable results exists.
- The groundwater level monitoring sites (existing and proposed) were selected to provide coverage across the southern portion of the Basin to monitor the regional groundwater gradient and flow direction over time in the area where current and projected groundwater beneficial uses exist.
- Groundwater level monitoring sites are located along the southern Basin boundary to monitor gradients and flow to/from the Oxnard Basin.
- The lack of monitoring sites in the northern portion of the Basin is not believed to limit MBGSA’s ability to sustainably manage the Basin because there are no beneficial uses in that area and the numerical model can be used as needed to estimate the potentiometric surface and storage changes in this area.
- A higher density of groundwater level monitoring sites has been selected in the Hueneme Aquifer commensurate with the fact that this aquifer supplies most of the water extracted from the Basin.
- The relatively limited number of groundwater level monitoring sites in the Mugu Aquifer is not believed to limit MBGSA’s ability to sustainably manage the Basin because there is limited groundwater extraction from this aquifer and the existing and proposed monitoring sites provide sufficient coverage to map the regional potentiometric surface in the Mugu Aquifer.

Consistent with to GSP Emergency Regulations §354.34(c)(1)(B), static groundwater levels will be measured quarterly (or more frequently, as feasible) at wells in the groundwater level monitoring network to represent seasonal-low and seasonal-high groundwater conditions. Groundwater elevations have been measured manually on a monthly, bi-monthly, or quarterly basis at wells in the groundwater level monitoring network, exceeding the SGMA requirement for semiannual (fall and spring) measurements. In addition, United collects automated groundwater elevation measurements at 4-hour intervals in four Mound Basin monitoring wells screened in principal aquifers (Figures 5.3-01 and 5.3-02) to provide high-frequency data useful for understanding daily to seasonal variability in groundwater elevations. This is helpful for more accurately determining the precise timing of spring-high and fall-low groundwater elevations each year and for evaluating the interference effects of nearby groundwater extraction on static groundwater levels.

Additional factors considered during selection of the groundwater level monitoring sites include:

1. From a scientific perspective, monitoring sites were selected to provide data in areas where groundwater elevations and hydraulic gradients are known to fluctuate over time. In Mound Basin, such fluctuations occur chiefly in the vicinity of water supply wells, which are limited

to the southern portion of the Basin, and along the boundary with the Oxnard Basin to evaluate interbasin underflow.

2. To the extent practicable, existing wells have been used as monitoring sites to avoid the cost and public nuisance associated with drilling new wells in a largely urban setting. However, in areas where groundwater level monitoring would provide crucial information, but no existing wells are present (or are unsuitable for some reason, such as being screened at a depth that would not provide useful data), new wells have been installed in parks and other public spaces in Mound Basin in the past.

3. DWR's BMP for developing monitoring networks (2016c) cites guidance stating that the density of monitoring wells should be 6.3 wells per 100 square miles (mi^2) to 4.0 wells per 100 mi^2 (Hopkins, 2016; applies to basins with groundwater extractions of more than 10,000 AF per 100 mi^2). In the principal aquifers of the Mound Basin (which has an area of approximately 23 mi^2), there are five existing groundwater level monitoring wells (density of 22 wells per 100 mi^2) screened solely in the Mugu Aquifer and 13 existing groundwater level monitoring wells (density of 57 wells per 100 mi^2) screened solely in the Hueneme Aquifer. Therefore, the density of monitoring sites in the existing groundwater level monitoring network exceeds the metrics recommended by DWR.

5.3.2 Data and Reporting Standards [§354.34(g)(2)]

§354.34 Monitoring Network.

(g) *Each Plan shall describe the following information about the monitoring network:*

> ***(2)*** *Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.*

The groundwater level monitoring sites are generally consistent with applicable data and reporting standards set forth in GSP Emergency Regulations §352.4. Exceptions to the standards are described below:

- Two existing monitoring sites—wells 02N22W09K05S and 02N22W08G01S—are screened across two aquifers, as shown on Table 5.3-01. DWR (2016b) notes that groundwater levels measured at wells screened across multiple aquifers should be considered composite groundwater levels rather than being representative of specific aquifers, and that these data must be used with caution. Fortunately, wells 02N22W09K05S and 02N22W08G01S are located near other wells that are screened in individual aquifers and are monitored by United (Figures 5.3-01 and 5.3-02). Therefore, the composite groundwater levels measured at wells 02N22W09K05S and 02N22W08G01S are not necessary for evaluating groundwater elevations in the principal aquifers or for preparing groundwater elevation contour maps, but are included in the GSP groundwater level monitoring network for completeness because they are part of the existing monitoring program in the Basin.

- The depth of the screened interval for well 02N22W16H01S is not reported (Table 5.3-01); therefore, the aquifer that this well is screened in is unknown. The well is part of the existing groundwater level monitoring network and is included as such but is not relied upon for meeting SGMA and GSP regulatory requirements.

5.3.3 Monitoring Protocols [§354.34(i)]

§354.34 Monitoring Network.
(i) *The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.*

United, VCWPD, and the City of Ventura collect and report groundwater elevation data from the groundwater level monitoring network in general conformance with the CASGEM program's "Procedures for Monitoring Entity Reporting" (DWR, 2010) and DWR BMP 1 for monitoring protocols, standards, and sites (DWR, 2016b). Some key elements of DWR guidance include (but are not limited to) the following:

- Depth to groundwater must be measured relative to an established reference point on the well casing;
- Depth to groundwater must be measured to an accuracy of 0.1 ft below the reference point (it is preferable to measure depth to groundwater to an accuracy of 0.01 ft);
- Transducers must be able to record groundwater levels with an accuracy of 0.1 ft;
- Transducer data should periodically be checked against hand-measured groundwater levels to monitor electronic drift or cable movement.

More details are provided in the referenced guidance documents (DWR, 2010, 2016b), and are not repeated in this GSP. It is presently anticipated that United, VCWPD, and the City of Ventura will continue collecting groundwater level data from the existing monitoring network, including any improvements or modifications made in the future, and report those data to CASGEM and the MBGSA.

5.3.4 Assessment and Improvement of Monitoring Network [§354.38(a),(b),(c)(1),(c)(2),(d),(e)(1),(e)(2),(e)(3), and (e)(4)]

§354.38 Assessment and Improvement of Monitoring Network.
(a) *Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.*
(b) *Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.*
(c) *If the monitoring network contains data gaps, the Plan shall include a description of the following:*
(1) *The location and reason for data gaps in the monitoring network.*
(2) *Local issues and circumstances that limit or prevent monitoring.*
(d) *Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.*
(e) *Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:*
(1) *Minimum threshold exceedances.*
(2) *Highly variable spatial or temporal conditions.*
(3) *Adverse impacts to beneficial uses and users of groundwater.*
(4) *The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.*

The existing groundwater level monitoring network is considered generally suitable for groundwater sustainability planning relative to the criteria provided in DWR's GSP and CASGEM guidance (DWR, 2016c, 2010), and has met the needs of United, the City of Ventura, and VCWPD for the past three decades relative to their objectives for monitoring groundwater conditions.

Pursuant to GSP Emergency Regulations §354.38, MBGSA has assessed the existing groundwater level monitoring network and determined that certain data gaps exist. These data gaps and, where applicable, planned actions to address the data gaps before the next 5-year assessment are discussed below.

Western Half of Mound Basin

The western half of the Basin has the greatest risk for undesirable results due to the vulnerability of land uses and critical infrastructure to land subsidence in the Coastal Area and the proximity of agricultural beneficial users to the shoreline for any unexpected seawater intrusion. This area is MBGSA's highest priority for expending its limited fiscal resources, to ensure adequate monitoring near the coast to protect land uses and beneficial uses relative to the land subsidence and seawater intrusion sustainability indicators. Two additional monitoring well clusters are planned in the Coastal Area to provide additional monitoring sites for implementation of the seawater intrusion sustainability indicator (Sites A and B on Figures 5.3-01, 5.3-02, 5.3-04, and 5.3-05). These monitoring well clusters will include discrete intervals in each principal aquifer, which will provide additional definition of the potentiometric surface in both principal aquifers and additional vertical gradient data. Site C is an additional potential "early warning" shoreline well and the plans to install the well will be evaluated following the 5-year review.

- Site A is planned for construction in 2021 (supported by a SGMA Technical Support Services [TSS] grant from DWR). The wells in this cluster will be screened in the Mugu and Hueneme aquifers. The primary purpose of this monitoring site is to provide a location for application of minimum thresholds and measurable objectives for the seawater intrusion sustainability indicator. This monitoring site will also be used for the land subsidence sustainability indicator and, more generally, to better define the potentiometric surface near the coast and provide additional vertical gradient data.

- Site B is planned for construction prior to the first 5-year GSP assessment. Site B is located along Harbor Boulevard and its primary purpose is to monitor groundwater in relation to the minimum thresholds and measurable objectives for the seawater intrusion sustainability indicator. This site will also be used for the land subsidence sustainability indicator and, more generally, to better define the potentiometric surface near the coast and provide additional vertical gradient data.
- Site C is a potential "early warning" monitoring well cluster planned for construction following review of the first 5-year GSP assessment. Site C is located near the coastline and its primary purpose would be to provide early warning for unexpected seawater intrusion. This site would also be used to better define the potentiometric surface near the coast and provide additional vertical gradient data.

Northern Portion of Mound Basin

The northern portion of the Basin lacks groundwater level monitoring sites screened in the principal aquifers. The lack of groundwater level monitoring sites is due to the lack of water supply wells. Future groundwater beneficial uses are not anticipated in the northern portion of the Basin due to the dominance of residential tract housing, which is supplied with potable water from the City of Ventura. Because there are no current or anticipated future beneficial uses and because the calibrated numerical model can be used to estimate the potentiometric surface in areas without data (the model can integrate existing monitoring data with modeled results to provide estimates to the northern area), this data gap is not considered a limiting factor for sustainable management of the Basin and will not be addressed unless changing conditions in the Basin warrant monitoring sites.

In addition to the efforts to address the above-described data gaps, MBGSA will consider expanding the monitoring network as opportunities arise. For example, when new or replacement wells are drilled, MBGSA will consider working with the owner to obtain access for monitoring.

5.4 Groundwater Storage Monitoring Network [§354.34(e),(g)(3),(h), and (j)]

23 Cal. Code Regs. §354.34 Monitoring Network.
(e) *A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.*
(g) *Each Plan shall describe the following information about the monitoring network:*
(3) *For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.*
(h) *The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.*
(j) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.*

As noted in DWR's (2016c) BMP for monitoring networks, changes in groundwater storage are not a directly measurable condition. Rather, estimation of changes in groundwater storage relies on collection of accurate groundwater levels. Measured groundwater level changes can then be used to calculate changes in storage based on understanding of aquifer thickness, porosity, and connectivity (DWR, 2016c), or can be calculated using a groundwater model. Therefore, the "groundwater storage monitoring network" consists of the groundwater level monitoring network, which is described above in Section 5.3.

An additional component of monitoring for the reduction of groundwater storage sustainability indicator involves tracking the groundwater extraction rates against the measurable objectives and minimum thresholds. The network consists of the pumping well owners and the extraction rates are reported semiannually to United by the well owners pursuant to Water Code §75611.

5.4.1 Attainment of Monitoring Objectives and Other Requirements [§354.34(c)(2) and (g)(1)]

§354.34 Monitoring Network.
(c) *Each monitoring network shall be designed to accomplish the following for each sustainability indicator:*
(2) *Reduction of Groundwater Storage. Provide an estimate of the change in annual groundwater in storage.*
(g) *Each Plan shall describe the following information about the monitoring network:*
(1) *Scientific rationale for the monitoring site selection process.*

The reduction of groundwater storage monitoring network design criterion provided in GSP Emergency Regulations §354.34(c)(2) is to provide an estimate of the change in annual storage.

As noted in Section 5.3, static groundwater levels and groundwater extraction rates will be measured and reported twice (or more) per year at wells in the groundwater level monitoring network and active extraction wells, respectively to achieve the overall monitoring objectives described in Section 5.2, and additionally to estimate annual change in groundwater in storage in the two principal aquifers used for water supply in Mound Basin—the Mugu and Hueneme aquifers. Spring is the time of year when aquifers in the region typically are in a positive water-balance condition (inflows exceed outflows) and potentiometric surfaces are at their highest; therefore, the spring-high groundwater levels will be used for annual estimates of changes in storage. Fall-low groundwater levels in Mound and adjacent basins can be strongly influenced by short-term, local factors such as timing of the first winter rainfall event and the presence or absence of Santa Ana winds in fall (which can result in a significant increase in demand for irrigation). Therefore, fall groundwater elevations provide a less reliable indicator of annual changes in groundwater in storage compared to spring groundwater elevations.

The data limitation in the northern portion of the Basin is acknowledged but is not believed to limit MBGSA's ability to attain the monitoring objective because the numerical model can be used to estimate the potentiometric surface and storage change in areas without measured groundwater levels (Appendix I).

5.4.2 Data and Reporting Standards [§354.34(g)(2)]

§354.34 Monitoring Network.
(g) *Each Plan shall describe the following information about the monitoring network:*
(2) *Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.*

The data and reporting standards for groundwater storage monitoring are identical to those for groundwater level monitoring because groundwater levels are used to estimate groundwater in storage.

5.4.3 Monitoring Protocols [§354.34(i)]

23 Cal. Code Regs. §354.34 Monitoring Network.
(i) *The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.*

The monitoring protocols for groundwater storage monitoring are identical to those for groundwater levels monitoring (Section 5.3.3), because groundwater levels will be used to estimate aquifer storage.

5.4.4 Assessment and Improvement of Monitoring Network [§354.38(a),(b),(c)(1),(c)(2),(d),(e)(1),(e)(2),(e)(3), and (e)(4)]

§354.38 Assessment and Improvement of Monitoring Network.
(a) *Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.*
(b) *Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.*
(c) *If the monitoring network contains data gaps, the Plan shall include a description of the following:*
(1) *The location and reason for data gaps in the monitoring network.*
(2) *Local issues and circumstances that limit or prevent monitoring.*
(d) *Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.*
(e) *Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:*
(1) *Minimum threshold exceedances.*
(2) *Highly variable spatial or temporal conditions.*
(3) *Adverse impacts to beneficial uses and users of groundwater.*
(4) *The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.*

Assessment and potential improvements of the monitoring network for groundwater storage are identical to those for groundwater level monitoring (Section 5.3.4), because groundwater levels are used to estimate aquifer storage.

As noted above in Section 5.4.1, storage changes in the northern portion of the Basin will be addressed by using the numerical model.

A relationship between measured groundwater levels and storage (a.k.a. a “storage curve” approach) has been developed using the numerical model that addresses this data gap. This relationship will be used to calculate the annual storage change. More information about the storage curve approach to estimating annual change in storage is provide in Appendix K.

Groundwater extraction is reported to Untied for each active well on a semiannual basis per Water Code §75611. Thus, there are no spatial reporting gaps to address. It is noted that reporting is made for the periods January-June and July-December. MBGSA will use this reporting to estimate water year extractions.

5.5 Seawater Intrusion Monitoring Network [§354.34(e),(g)(3),(h), and (j)]

§354.34 Monitoring Network.
(e) *A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.*
(g) *Each Plan shall describe the following information about the monitoring network:*
(3) *For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.*
(h) *The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.*
(j) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.*

A subset of the degraded water quality monitoring network consisting of cluster wells 02N23W15J01S/02S and planned monitoring well clusters at Sites A and B will be used to monitor for seawater intrusion (Figures 5.3-04 and 5.3-05). Cluster wells 02N23W15J01S/02S and the potential for planned cluster "early warning" wells at Site C will provide shoreline monitoring for early detection of any unexpected seawater intrusion. Planned cluster wells at Sites A and B will be used to monitor relative to the measurable objectives and minimum thresholds that are designed to protect beneficial uses of groundwater which exist at each of these locations (there are no groundwater beneficial uses in the Coastal Area west of planned cluster well Sites A & B). The aforementioned monitoring sites will be sampled and analyzed for chloride and other dissolved constituents and parameters no less frequently than annually as part of the degraded water quality monitoring network.

5.5.1 Attainment of Monitoring Objectives and Other Requirements [§354.34(c)(3) and (g)(1)]

§354.34 Monitoring Network.
(c) *Each monitoring network shall be designed to accomplish the following for each sustainability indicator:*
(3) *Seawater Intrusion. Monitor seawater intrusion using chloride concentrations, or other measurements convertible to chloride concentrations, so that the current and projected rate and extent of seawater intrusion for each applicable principal aquifer may be calculated.*
(g) *Each Plan shall describe the following information about the monitoring network:*
(1) *Scientific rationale for the monitoring site selection process.*

In accordance with GSP Emergency Regulations §354.34(b) and (d), the seawater intrusion monitoring network sites have been selected using MBGSA's scientific judgment to demonstrate progress toward (1) achieving measurable objectives described in the GSP, (2) monitor impacts to the beneficial uses and users of groundwater, (3) monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds, and (4) provide adequate coverage of sustainability indicators. The seawater intrusion monitoring network focuses on the Coastal Area of the Basin where agricultural beneficial users are proximal to the Coast and would be at risk if unexpected seawater intrusion occurs (Figure 5.3-04 and 5.3-05).

Pursuant to GSP Emergency Regulations §354.34(c)(3), the seawater intrusion monitoring network sites have been selected to provide chloride concentrations to assess the projected rate and extent of seawater intrusion for each principal aquifer. The existing and planned groundwater quality monitoring wells screened in the Hueneme Aquifer and the Mugu Aquifer are considered to provide sufficient density for the following scientific and practical reasons, consistent with the key Basin-specific monitoring network design factors discussed in Section 5.2:

- The groundwater quality monitoring sites (existing and proposed) were selected to provide coverage across the Coastal Area where seawater intrusion could occur.
- The seawater intrusion monitoring sites (existing and proposed) were sited to provide both early warning of seawater intrusion and measurements relative to minimum thresholds and measurable objectives to protect groundwater beneficial uses.
- An annual sampling frequency is considered adequate because numerical modeling suggests that the average travel time between the shoreline wells and planned cluster wells A & B is more than the 50-year SGMA implementation timeframe, although it is possible that travel times could be shorter in the more permeable zones of an aquifer. If monitoring results suggest seawater may be present in any of the monitoring sites, the well will be resampled and, if confirmed, the sampling frequency will be increased to quarterly.

5.5.2 Data and Reporting Standards [§354.34(g)(2)]

§354.34 Monitoring Network.
(g) *Each Plan shall describe the following information about the monitoring network:*
(2) *Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.*

The data and reporting standards for seawater intrusion monitoring are identical to those for the degraded water quality monitoring network, described in Section 5.6.2.

5.5.3 Monitoring Protocols [§354.34(i)]

23 Cal. Code Regs. §354.34 Monitoring Network.
(i) *The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.*

The monitoring protocols for seawater intrusion monitoring are identical to those for the degraded water quality monitoring network (Section 5.6.2).

5.5.4 Assessment and Improvement of Monitoring Network [§354.38(a),(b),(c)(1),(c)(2),(d),(e)(1),(e)(2),(e)(3), and (e)(4)]

§354.38 Assessment and Improvement of Monitoring Network.

(a) *Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.*

(b) *Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.*

(c) *If the monitoring network contains data gaps, the Plan shall include a description of the following:*

- ***(1)*** *The location and reason for data gaps in the monitoring network.*
- ***(2)*** *Local issues and circumstances that limit or prevent monitoring.*

(d) *Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.*

(e) *Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:*

- ***(1)*** *Minimum threshold exceedances.*
- ***(2)*** *Highly variable spatial or temporal conditions.*
- ***(3)*** *Adverse impacts to beneficial uses and users of groundwater.*
- ***(4)*** *The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.*

Pursuant to GSP Emergency Regulations §354.38, MBGSA has assessed the existing seawater intrusion monitoring network and determined that certain data gaps exist. MBGSA concluded that additional wells are needed for measurements relative to minimum thresholds and measurable objectives. Planned monitoring well cluster Sites A and B were identified to address these gaps (Figure 5.3-04 and 5.3-05). An additional cluster wells at Site C will be considered to augment existing cluster well 02N23W15J01S/02S for early warning of seawater intrusion along the shoreline. Construction of Site C will be considered following the 5-year GSP evaluation, based on monitoring results and funding availability.

5.6 Degraded Water Quality Monitoring Network [§354.34(e),(g)(3),(h), and (j)]

23 Cal. Code Regs. §354.34 Monitoring Network.
(e) *A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.*
(g) *Each Plan shall describe the following information about the monitoring network:*
(3) *For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.*
(h) *The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.*
(j) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.*

Table 5.3-01 summarizes information regarding depth, sampling frequency, and purpose of the ten existing wells in Mound Basin that have been regularly sampled for water quality analysis. These wells are referred to as the "existing groundwater quality monitoring network." Locations of wells previously used to monitor groundwater quality in the Mugu and Hueneme aquifers are shown on Figures 5.3-04 and 5.3-05, respectively. Inspection of Table 5.3-01 indicates that most (six) existing groundwater quality monitoring sites are screened solely in the Hueneme Aquifer (one additional well is screened chiefly in the Hueneme Aquifer, but its screen may extend into the Mugu Aquifer), which is one of the two principal aquifers where most of the groundwater is extracted from Mound Basin (Table 3.1-02). Three groundwater quality monitoring sites are screened solely in the Mugu Aquifer, which is the other principal aquifer. In addition to these 10 groundwater quality monitoring sites, the existing monitoring wells screened in the fine-grained Pleistocene deposits overlying the Mugu Aquifer (02N22W07M03S and 02N23W07J03S) will be sampled occasionally to characterize the quality of the water that could leak into the Mugu Aquifer (Figure 5.3-03).

Two additional monitoring well clusters are planned in the Coastal Area to provide additional water quality monitoring sites for the seawater intrusion sustainability indicator (Sites A and B on Table 5.3-02 and Figures 5.3-04 and 5.3-05). These planned monitoring well clusters will include discrete screen intervals in each principal aquifer and will be incorporated into the groundwater quality monitoring network once constructed. Site C is a potential "early warning" shoreline well and the plans to install the well will be evaluated following the 5-year review.

The aforementioned monitoring sites (existing and planned) will be sampled and analyzed annually for inorganic constituents (general mineral analysis) and common water quality parameters (Table 5.6-01). In addition to this annual sampling (in fall), United currently is conducting supplemental sampling at many of the monitoring wells for an abbreviated analyte list every spring; this spring sampling by United is expected to continue in the future as part of the GSP.

5.6.1 Attainment of Monitoring Objectives and Other Requirements [§354.34(c)(4) and (g)(1)]

§354.34 Monitoring Network.
(c) *Each monitoring network shall be designed to accomplish the following for each sustainability indicator:*
(4) *Degraded Water Quality. Collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues.*
(g) *Each Plan shall describe the following information about the monitoring network:*
(1) *Scientific rationale for the monitoring site selection process.*

In accordance with GSP Emergency Regulations §354.34(b) and (d), the groundwater quality monitoring network sites have been selected using MBGSA's scientific judgment to demonstrate progress toward (1) achieving measurable objectives described in the GSP, (2) monitor impacts to the beneficial uses and users of groundwater, (3) monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds, and (4) provide adequate coverage of sustainability indicators. Importantly, there is no groundwater extraction in the northern portion of the Basin; thus, the sustainability indicators that rely on groundwater quality are necessarily focused on the southern portion of the Basin. The groundwater quality monitoring network has a special focus in areas of greatest risk for undesirable results: the western half of the Basin where agricultural beneficial users are proximal to the coast and would be at risk if unexpected seawater intrusion occurs. Additional monitoring well clusters are proposed in the western half of the Basin to address these concerns.

Pursuant to GSP Emergency Regulations §354.34(c)(4), the groundwater quality monitoring network sites have been selected to provide sufficient spatial and temporal data from each principal aquifer to determine groundwater quality trends. The existing and planned groundwater quality monitoring wells screened in the Hueneme and Mugu aquifers are considered to provide sufficient density for the following scientific and practical reasons consistent with the key Basin-specific monitoring network design factors discussed in Section 5.2:

- The groundwater quality monitoring sites (existing and proposed) were selected to provide focused monitoring of the western half of the Basin, where the greatest risk for undesirable results exists (i.e., seawater intrusion leading to increased chloride concentrations).
- The groundwater quality monitoring sites (existing and proposed) were selected to provide coverage across the southern portion of the Basin where current and projected groundwater beneficial uses exist.
- The lack of monitoring sites in the northern portion of the Basin is not believed to limit MBGSA's ability to sustainably manage the Basin because there are no groundwater beneficial uses in that area.
- A higher density of groundwater level monitoring sites has been selected in the Hueneme Aquifer commensurate with the fact that this aquifer supplies most of the water extracted from the Basin.
- The relatively limited number of groundwater level monitoring sites in the Mugu Aquifer is not believed to limit MBGSA's ability to sustainably manage the Basin; additional groundwater

quality monitoring sites would be helpful in the Mugu Aquifer, but the proposed network is considered adequate given the small amount of groundwater extraction from the aquifer.

- The annual sampling frequency is considered adequate. More frequent monitoring, when feasible, is desirable but not considered necessary for sustainable management of the Basin unless conditions change. The monitoring frequency will be increased if unexpected changes in water quality are observed. This will happen based on the Plan Manager's professional judgment and the changes will be reflected as described in the Annual Report and incorporated in the next GSP update.

Additional factors considered during selection of the groundwater quality monitoring sites include:

1. To the extent practicable, existing wells have been used as monitoring sites to avoid the cost and public nuisance associated with drilling new wells in a largely urban setting. However, in areas where groundwater quality monitoring would provide crucial information, but no existing wells are present (or are unsuitable for some reason, such as being screened at a depth that would not provide useful data), new wells have been installed in parks and other public spaces in Mound Basin in the past.
2. DWR's BMPs for developing monitoring networks (2016c) cites guidance stating that the density of monitoring wells should be 6.3 wells per 100 mi^2 to 4.0 wells per 100 mi^2 (Hopkins, 2016; applies to basins with groundwater extractions of more than 10,000 AF per 100 mi^2). In the principal aquifers of the Mound Basin (which has an area of approximately 23 mi^2), there are two existing groundwater quality monitoring wells (density of nine wells per 100 mi^2) screened solely in the Mugu Aquifer and six existing groundwater quality monitoring wells (density of 27 wells per 100 mi^2) screened solely in the Hueneme Aquifer. Therefore, the density of monitoring sites in the existing groundwater quality monitoring network exceeds the metrics recommended by DWR.

5.6.2 Data and Reporting Standards [§354.34(g)(2)]

§354.34 Monitoring Network.
(g) *Each Plan shall describe the following information about the monitoring network:*
(2) *Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.*

The groundwater quality monitoring sites are generally consistent with applicable data and reporting standards set forth in GSP Emergency Regulations §352.4. Exceptions to the standards are described below:

- Well 02N23W13F02S is screened primarily in the Hueneme Aquifer, with a small length of screened interval in the Mugu Aquifer, as noted on Table 5.3-01. Results of water quality analyses for samples obtained from this well historically have been consistent with water quality at other wells screened in the Hueneme Aquifer in Mound Basin, suggesting it extracts groundwater primarily from the Hueneme Aquifer. Therefore, this well will remain in the GSP groundwater level monitoring network.

- Well 02N22W08G01S is believed to be screened in both the Mugu Aquifer and the upper part of the Hueneme Aquifer, as noted on Table 5.3-01. Additionally, water quality samples obtained from this well have been anomalous in the past, as described in Section 3.1.4.3, suggesting influence of shallow groundwater, possibly through a compromised well seal or well casing. This well is included in the GSP groundwater level monitoring network for completeness because it has been part of the existing monitoring program in the Basin; however, results of water quality analysis for samples from this well may not be consistent with groundwater chemistry in either the Mugu or Hueneme aquifers in the vicinity of this well and will not be a determining factor when analyzing concentrations relative to the minimum threshold and measurable objectives.

5.6.3 Monitoring Protocols [§354.34(i)]

23 Cal. Code Regs. §354.34 Monitoring Network.
(i) *The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.*

United and VCWPD collect groundwater quality data from wells in Mound Basin (Table 5.3-01) in general conformance with the DWR's BMPs for monitoring protocols, standards, and sites (DWR, 2016b). The City of Ventura must additionally meet United States Environmental Protection Agency and California DDW standards for municipal water supply. Data and reporting standards for groundwater quality sampling at their municipal water supply wells typically exceed the recommended standards described in DWR's BMPs (2016b). The key DWR "standardized protocols" for groundwater quality sampling as described in Section 5.5.2 are followed by United, VCWPD, and the City of Ventura. More details are provided in the referenced guidance document (DWR, 2016b), and are not repeated in this GSP. It is presently anticipated that United, VCWPD, and the City of Ventura will continue collecting groundwater quality data from the existing monitoring network, including any improvements or modifications made in the future, and report those data to the MBGSA.

5.6.4 Assessment and Improvement of Monitoring Network [§354.38(a),(b),(c)(1),(c)(2),(d),(e)(1),(e)(2),(e)(3), and (e)(4)]

§354.38 Assessment and Improvement of Monitoring Network.

(a) *Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.*

(b) *Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.*

(c) *If the monitoring network contains data gaps, the Plan shall include a description of the following:*

- ***(1)*** *The location and reason for data gaps in the monitoring network.*
- ***(2)*** *Local issues and circumstances that limit or prevent monitoring.*

(d) *Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.*

(e) *Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:*

- ***(1)*** *Minimum threshold exceedances.*
- ***(2)*** *Highly variable spatial or temporal conditions.*
- ***(3)*** *Adverse impacts to beneficial uses and users of groundwater.*
- ***(4)*** *The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.*

The existing groundwater quality monitoring network, as introduced in Section 5.6, is considered generally suitable for groundwater sustainability planning relative to the criteria provided in DWR's GSP and CASGEM guidance (DWR, 2016a, 2010), and has met the needs of United and the City of Ventura in past decades.

Pursuant to GSP Emergency Regulations §354.38, MBGSA has assessed the existing groundwater quality monitoring network and determined that certain data gaps exist. Planned actions to address the data gaps before the next 5-year assessment are discussed below.

Northern Portion of Mound Basin

As discussed in Section 5.6.1, the northern portion of the Basin lacks groundwater quality monitoring sites. The lack of groundwater quality monitoring sites is due to the lack of groundwater extraction wells in the northern half of the Basin. Future groundwater beneficial uses are not anticipated in the northern part of the Basin due to the dominance of residential tract housing. Because there are no current or anticipated future beneficial uses, this data gap is not considered to a limiting factor for sustainable management of the Basin and will not be addressed unless changing conditions in the Basin warrant monitoring sites.

Mugu Aquifer

As discussed in Section 5.6.1, there are a relatively limited number of groundwater quality monitoring sites in the Mugu Aquifer. This data gap is not believed to limit MBGSA's ability to sustainably manage the Basin because there is limited groundwater extraction from this aquifer. Additional groundwater quality monitoring sites would be helpful in the Mugu Aquifer, but the existing network is considered adequate given the small amount of groundwater extraction from the aquifer. However, it is noted that the planned monitoring sites to address seawater intrusion (planned cluster sites A-C; Section 5.3.4) will provide additional water quality data in the Mugu Aquifer.

5.7 Land Subsidence Monitoring Network [§354.34(e),(g)(3),(h), and (j)]

23 Cal. Code Regs. §354.34 Monitoring Network.
(e) *A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.*
(g) *Each Plan shall describe the following information about the monitoring network:*
(3) *For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.*
(h) *The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.*
(j) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.*

As described in Section 4.8.2 of this GSP, InSAR is not considered a reliable method for measuring land subsidence in the western half of the Mound Basin due to multiple factors:

1. There is a significant lack of coverage in the western half of the Mound Basin (Figure 3.2-19), which causes the interpolated InSAR subsidence rates to be unreliable.
2. InSAR data provided by DWR are interpolated across the basin boundary between Mound and Oxnard basins. This is not appropriate because of the faults and folds that comprise the basin boundary. These structures likely impact the propagation of any subsidence between the basins (Figures 3.1-02, 3.1-06, and 3.2-19).
3. There is a subsidence "hotspot" that corresponds with a landfill located just south of the Mound Basin in the adjacent Oxnard Basin, which would be representing natural land compaction at the landfill. Careful inspection of the InSAR interpolation reveals that the hotpot greatly influences the subsidence values in the western portion of the Mound Basin, which lacks InSAR data (Figure 3.2-19).

For these reasons, groundwater elevations will be used as a proxy to detect and monitor the potential onset of inelastic land subsidence that may result from future groundwater extractions in Mound Basin (i.e., if groundwater elevations decline below historical low levels). Therefore, the land subsidence monitoring network utilizes the groundwater level monitoring network for the western half of the Basin, which is described above in Section 5.3. To ensure the best available data is used for monitoring, the eastern half of the Basin utilizes InSAR data to measure land surface elevation changes when groundwater levels are below historical lows (Section 4.8).

5.7.1 Attainment of Monitoring Objectives and Other Requirements [§354.34(c)(5) and (g)(1)]

§354.34 Monitoring Network.
(c) *Each monitoring network shall be designed to accomplish the following for each sustainability indicator:*
(5) *Land Subsidence. Identify the rate and extent of land subsidence, which may be measured by extensometers, surveying, remote sensing technology, or other appropriate method.*
(g) *Each Plan shall describe the following information about the monitoring network:*
(1) *Scientific rationale for the monitoring site selection process.*

The land subsidence monitoring network design criterion provided in GSP Emergency Regulations §354.34(c)(5) is to identify the rate and extent of land subsidence, which may be measured by extensometers, surveying, remote sensing technology, or other appropriate methods. Using groundwater levels as a proxy for inelastic land subsidence is an appropriate method because it is mentioned in the GSP Emergency Regulations (§354.36(b)) and because the sustainability goal of no measurable inelastic land subsidence due to groundwater extractions is directly correlated with maintaining groundwater levels above historical low levels. Declining groundwater levels (typically resulting from groundwater extractions) are one potential cause for land subsidence in California, especially when groundwater levels decline below historical lows (Sneed et al., 2013). However, after fine-grained sediments have been compacted during an episode of historically low groundwater levels, there is low probability of additional subsidence unless groundwater elevations decline further—specifically, below the previous historical lows (DWR, 2014). For these reasons, the groundwater level monitoring network will be used to attain the monitoring objectives for the land subsidence monitoring network.

5.7.2 Data and Reporting Standards [§354.34(g)(2)]

§354.34 Monitoring Network.
(g) *Each Plan shall describe the following information about the monitoring network:*
(2) *Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.*

The data and reporting standards for land subsidence monitoring are identical to those for groundwater level monitoring since groundwater levels will be used as a proxy for indicating potential onset of land subsidence.

For the eastern half of the Basin, InSAR data acquired from DWR along with available GPS data will be reported in feet to an accuracy of at least 0.1 feet relative to North American Vertical Datum of 1988 (NAVD88). The InSAR and GPS data will be compared with groundwater level data to analyze the rate of ground position decline with variation in groundwater levels to determine subsidence in relation to groundwater levels or extraction rates. Results will be mapped, graphed, and reported consistent with standards described in GSP Emergency Regulations (§352.4 (d)), and provided with the GSP updates.

5.7.3 Monitoring Protocols [§354.34(i)]

23 Cal. Code Regs. §354.34 Monitoring Network.
(i) *The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.*

The monitoring protocols for land subsidence monitoring are identical to those for groundwater level monitoring, as groundwater levels will be used as a proxy for indicating potential onset of land subsidence.

Subsidence data for the eastern half of the Basin will be acquired from DWR from their SGMA Data Viewer web-based GIS viewer (DWR, 2020b), and reviewed. In addition to the InSAR results, data from a continuous GPS, VNCO, which is maintained by a non-profit university consortium, will be downloaded and reviewed (UNAVCO, 2020). GPS data will be compared with groundwater level data to analyze the rate of ground position decline with variation in groundwater levels to determine subsidence in relation to groundwater levels or extraction rates.

5.7.4 Assessment and Improvement of Monitoring Network [§354.38(a),(b),(c)(1),(c)(2),(d),(e)(1),(e)(2),(e)(3), and (e)(4)]

§354.38 Assessment and Improvement of Monitoring Network.
(a) *Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.*
(b) *Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.*
(c) *If the monitoring network contains data gaps, the Plan shall include a description of the following:*
(1) *The location and reason for data gaps in the monitoring network.*
(2) *Local issues and circumstances that limit or prevent monitoring.*
(d) *Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.*
(e) *Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:*
(1) *Minimum threshold exceedances.*
(2) *Highly variable spatial or temporal conditions.*
(3) *Adverse impacts to beneficial uses and users of groundwater.*
(4) *The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.*

Assessment and potential improvements of the monitoring network for land subsidence are identical to those for groundwater level monitoring since groundwater levels are used as a proxy for indicating potential onset of land subsidence.

MBGSA has assessed the available InSAR and GPS data for the eastern half of the Basin and has considered it generally suitable for estimating land subsidence in the case that groundwater levels are below the historical low. There are some minor gaps in InSAR raster coverage in the eastern half of the Basin (see Figure 3.2-19) but will not significantly impact the interpolation of the InSAR land displacement.

5.8 Depletions of Interconnected Surface Water Monitoring Network [§354.34(e),(g)(3),(h), and (j)]

23 Cal. Code Regs. §354.34 Monitoring Network.

(e) *A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.*

(g) *Each Plan shall describe the following information about the monitoring network:*

(3) *For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.*

(h) *The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.*

(j) *An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.*

As was described in Section 3.2.6 and 4.9 of this GSP, the depletions of interconnected surface water sustainability criterion was determined not to be applicable to Mound Basin. Therefore, a monitoring network for depletions of interconnected surface water is not required.

5.9 Representative Monitoring Sites [§354.36(a),(b)(1),(b)(2), and (c)]

§354.36 Representative Monitoring. *Each Agency may designate a subset of monitoring sites as representative of conditions in the basin or an area of the basin, as follows:*

(a) *Representative monitoring sites may be designated by the Agency as the point at which sustainability indicators are monitored, and for which quantitative values for minimum thresholds, measurable objectives, and interim milestones are defined.*

(b) *Groundwater elevations may be used as a proxy for monitoring other sustainability indicators if the Agency demonstrates the following:*

(1) *Significant correlation exists between groundwater elevations and the sustainability indicators for which groundwater elevation measurements serve as a proxy.*

(2) *Measurable objectives established for groundwater elevation shall include a reasonable margin of operational flexibility taking into consideration the basin setting to avoid undesirable results for the sustainability indicators for which groundwater elevation measurements serve as a proxy.*

(c) *The designation of a representative monitoring site shall be supported by adequate evidence demonstrating that the site reflects general conditions in the area.*

At present, the MBGSA plans to use data collected from all of the monitoring sites described in Sections 5.3 and 5.6 to monitor relevant groundwater sustainability indicators in Mound Basin and is not currently designating a subset of monitoring sites as representative of conditions in the Basin.

5.10 Reporting Monitoring Data to the Department (Data Management System) [§354.40]

§354.40 Reporting Monitoring Data to the Department. *Monitoring data shall be stored in the data management system developed pursuant to Section 352.6. A copy of the monitoring data shall be included in the Annual Report and submitted electronically on forms provided by the Department.*

Pursuant to Section §352.6, monitoring data will be stored in MBGSA's DMS. Data will be transmitted to DWR with the GSP, annual reports, and GSP updates electronically on the forms provided by DWR. Information concerning the MBGSA DMS is provided in Appendix L.

6.0 Projects and Management Actions [Article 5, SubArticle 5]

6.1 Introduction [§354.42, 354.44(a),(b)(2),(b)(9),(c), and (d)]

§354.42 Introduction to Projects and Management Actions. *This Subarticle describes the criteria for projects and management actions to be included in a Plan to meet the sustainability goal for the basin in a manner that can be maintained over the planning and implementation horizon.*

§354.44 Projects and Management Actions

(a) *Each Plan shall include a description of the projects and management actions the Agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.*

(b) *Each Plan shall include a description of the projects and management actions that include the following:*

(2) *If overdraft conditions are identified through the analysis required by Section 354.18, the Plan shall describe projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft.*

(9) *A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.*

(c) *Projects and management actions shall be supported by best available information and best available science.*

(d) *An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.*

This section describes the projects and management actions included in the plan to ensure the sustainability goal is met and to address additional plan elements. Determination of the projects and management actions is based on the best available information and best available science and accounts for the level of uncertainty associated with the Basin setting.

The GSP Emergency Regulations specifically require the inclusion of projects or management actions to address the following:

- **Overdraft (§354.44(b)(2))**: A description of the projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft, if and overdraft condition is identified through the analysis required by §354.18.
- **Drought Offset Measures §354.44(b)(9)**: A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.

As described in earlier sections, the 50-year modeling projections developed for the water budget suggest that the measurable objectives for the applicable sustainability indicators will be met without the need for overdraft mitigation or drought offset measures. However, several management actions are included to respond to potential changing conditions in the Basin and to help protect groundwater quality.

6.2 Seawater Intrusion Monitoring Wells for Sustainable Management Criteria Implementation [§354.44(b)(1) and (d)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*
(d) *An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.*

As described in Sections 4.6.2.6 and 5.5.4, MBGSA has assessed the existing seawater intrusion monitoring network and determined that additional monitoring wells are needed between the shoreline and locations of water wells to implement minimum thresholds and measurable objectives designed to protect beneficial uses (monitoring well clusters at Sites A and B (Figure 5.3-04 and 5.3-05)). These wells are needed to meet the SGMA requirement for using a chloride concentration isocontour to delineate the seawater intrusion minimum thresholds and measurable objectives. At least two wells are needed along Harbor Boulevard to establish an isocontour between the coast and the beneficial users of groundwater located to the east. The Site A monitoring well is planned for construction in 2021 and will be funded by the DWR TSS program. The Site B monitoring well would be funded by MBGSA, unless a grant is obtained. Because monitoring wells are required for SMC implementation, they must be constructed before the first 5-year GSP assessment (GSP Emergency Regulations §354.38(d)).

6.2.1 Relevant Measurable Objective(s) [§354.44(b)(1)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*

The relevant measurable objective for the seawater intrusion monitoring wells project is the measurable objective for the seawater intrusion sustainability indicator. The planned Site A and B wells would also provide groundwater level and quality data that would be relevant to the measurable objectives for the other sustainability indicators.

6.2.2 Implementation Triggers [§354.44(b)(1)(A)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(A) *A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.*

The implementation trigger for the seawater intrusion monitoring wells project is GSP Emergency Regulations §354.38(d), which requires GSAs to address data gaps before the first 5-year GSP assessment. This project is already underway, with the Site A monitoring well scheduled for construction in 2021 with funding from the DWR TSS program. No known criteria would trigger the termination of this Project, and the conditions requiring the implementation of this project are discussed in Sections 4.6.2.6 and 5.5.4.

6.2.3 Public Notice Process [§354.44(b)(1)(B)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(B) *The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.*

MBGSA will continue to follow its adopted SEP to inform the public about progress implementing the seawater intrusion monitoring wells project.

6.2.4 Permitting and Regulatory Process [§354.44(b)(3)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(3) *A summary of the permitting and regulatory process required for each project and management action.*

The seawater intrusion monitoring wells project will require the following permits:

- CEQA compliance (most likely a categorical exemption).
- Administrative Coastal Development Permit (City of Ventura).
- Ventura County Well Permit.

6.2.5 Implementation Timeline [§354.44(b)(4)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(4) *The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.*

This project is already underway and will be completed prior to the first 5-year GSP assessment. The Site A monitoring well is scheduled for construction in 2021 with funding from the DWR TSS program. Site B monitoring wells are budgeted for construction in 2026 but would be completed sooner if grant funding is available.

6.2.6 Anticipated Benefits [§354.44(b)(5)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(5) *An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.*

The primary benefit of the seawater intrusion monitoring wells project is to provide monitoring sites to implement SMC for the seawater intrusion sustainability indicator.

6.2.7 Implementation Approach [§354.44(b)(6)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(6) *An explanation of how the project or management action will be accomplished. If the project or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.*

The Site A monitoring well is scheduled for construction in 2021 with funding from the DWR TSS program.

The Site B monitoring well will be completed by MBGSA. The project will be implemented as a typical design-bid-build project. MBGSA staff will obtain right-of-way, design, bid, and issue a construction contract with the assistance of legal counsel and consultants.

6.2.8 Legal Authority [§354.44(b)(7)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(7) *A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.*

MBGSA will rely on the authority provided for under SGMA to contract for the construction of monitoring wells.

6.2.9 Cost & Funding [§354.44(b)(8)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(8) *A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.*

The Site A monitoring well cluster is funded by the DWR TSS program. Unreimbursed costs paid by MBGSA include Coastal Development permit application development and permit fees, well permit fees, and labor to obtain right-of-way and coordinate with DWR. MBGSA' estimated costs for the Site A monitoring wells are $50,000.

Site B monitoring well cluster is budgeted for construction in 2026. The total project costs (all-in) is estimated to be $884,000 (escalated from 2021 dollars assuming 3% per year inflation). The Site B monitoring wells will be funded using groundwater extraction fees, unless grant funding is available.

6.3 Seawater Intrusion Contingency Plan and Additional Shoreline Monitoring Well [§354.44(b)(1) and (d)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*
(d) *An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.*

As described in Section 3.2.3 Seawater Intrusion, available data indicate that seawater has not been present in the onshore portions of the principal aquifers to date. Section 3.2.3 also explains that the Mound Basin principal aquifers may only be exposed to seawater where they crop out on the continental shelf edge, approximately 10 miles offshore, greatly reducing the likelihood that seawater can find a near-shore path for intrusion into the principal aquifers (Figure 3.1-10). As discussed in Section 4.6, particle tracking simulations indicated that GSP indicate that onshore migration of seawater is not anticipated during the 50-year SGMA planning and implementation horizon from the offshore aquifer subcrops. The possibility of nearshore short-circuit pathways that could allow seawater to enter the aquifer (for example along the Oak Ridge Fault) and migrate onshore during the SGMA planning horizon were also considered in the particle tracking analysis. The particle tracking results indicate that it is unlikely that beneficial users of groundwater would be impacted during the 50-year SGMA planning and implementation horizon by onshore migration of seawater via potential short-circuit pathways located near the coast.

Despite the very encouraging model results for seawater intrusion, MBGSA believes it would be prudent to develop a contingency plan to address any unexpected seawater intrusion. The contingency plan will be developed to identify measures that would be taken to address unexpected seawater intrusion. The contingency plan will be developed prior the first 5-year GSP assessment. A related aspect of the contingency plan would be the construction of an additional shoreline monitoring well cluster (Site C on Figures 5.3-04 and 5.3-05) to provide early warning of any onshore flow of seawater. The Site C monitoring wells would complement the existing shoreline monitoring wells located at Marina Park (02N23W15J01/2). Because the Site C monitoring wells are not required for SMC implementation, they can be constructed after the first 5-year GSP assessment. Therefore, the GSP budget projections assume this well cluster would be constructed in 2032, just before the second 5-year GSP assessment.

6.3.1 Relevant Measurable Objective(s) [§354.44(b)(1)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*

The relevant measurable objective for the seawater intrusion contingency plan and additional shoreline monitoring well project is the measurable objective for the seawater intrusion sustainability indicator.

The Site C monitoring well cluster would help ensure the measurable objective is met by providing early warning of unexpected seawater intrusion. The Site C wells would also provide groundwater level and quality data that would be relevant to the measurable objectives for the other sustainability indicators.

6.3.2 Implementation Triggers [§354.44(b)(1)(A)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(A) *A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.*

The seawater intrusion contingency plan and additional shoreline monitoring well project is a voluntary measure that will be undertaken by the MBGSA at its discretion. As such, there is no definitive implementation trigger for developing the contingency plan or constructing the Site C wells.

6.3.3 Public Notice Process [§354.44(b)(1)(B)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(B) *The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.*

MBGSA will continue to follow its adopted SEP to inform the public about progress implementing the seawater intrusion contingency plan and additional shoreline monitoring well project.

6.3.4 Permitting and Regulatory Process [§354.44(b)(3)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(3) *A summary of the permitting and regulatory process required for each project and management action.*

No permits or regulatory approvals are required to develop the seawater intrusion contingency plan.

The additional shoreline monitoring well project will require the following permits:

- CEQA compliance (most likely a categorical exemption).
- Administrative Coastal Development Permit (City of Ventura).
- Ventura County Well Permit.

6.3.5 Implementation Timeline [§354.44(b)(4)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(4) *The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.*

The seawater intrusion contingency plan and additional shoreline monitoring well project is a voluntary measure that will be undertaken by the MBGSA at its discretion. Contingency plan development is anticipated to be completed during the first 5-year GSP assessment period (i.e., before 2027). Due to funding constraints, the additional shoreline monitoring well project is scheduled for construction in 2032 but would be completed sooner if grant funding is available.

6.3.6 Anticipated Benefits [§354.44(b)(5)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(5) *An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.*

The seawater intrusion contingency plan and additional shoreline monitoring well project will benefit beneficial users and property interests in the Basin by providing early warning of unexpected seawater intrusion and ensuring pre-planned measures are in place to address it before undesirable results could occur.

6.3.7 Implementation Approach [§354.44(b)(6)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(6) *An explanation of how the project or management action will be accomplished. If the project or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.*

The seawater intrusion contingency plan will be developed through a collaborative stakeholder driven process that identifies triggers, actions, and funding mechanisms to address unexpected seawater intrusion. Engineering assistance will be obtained from consultants as needed during the seawater intrusion contingency plan development process.

The Site C additional shoreline monitoring well will be completed by MBGSA. The project will be implemented as a typical design-bid-build project. MBGSA staff will obtain right-of-way, design, and bid, and issue a construction contract with the assistance of legal counsel and consultants.

6.3.8 Legal Authority [§354.44(b)(7)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(7) *A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.*

MBGSA will rely on the authority provided for under SGMA to develop the seawater intrusion contingency plan or to contract for the construction of monitoring well.

6.3.9 Cost & Funding [§354.44(b)(8)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(8) *A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.*

The estimated cost for seawater intrusion contingency plan development is $85,000 (shared with the land subsidence contingency plan development). The estimated all-in cost for the new shoreline monitoring well is $1,052,000 (escalated form 2021 dollars assuming 3% per year inflation). The seawater intrusion contingency plan and monitoring wells will be funded using groundwater extraction fees, unless grant funding is available.

6.4 Land Subsidence Contingency Plan [§354.44(b)(1) and (d)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*
(d) *An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.*

As described in Section 3.2.5 Land Subsidence, no land subsidence due to groundwater extraction has been documented historically in the Mound Basin. Section 3.2.5 also explains that the Mound Basin is considered to have a low estimated potential for inelastic land subsidence. Numerical modeling for the water budget suggests that future groundwater levels will remain above historical low levels, which would prevent inelastic subsidence due to groundwater extraction (Appendix I). Despite these factors, sustainable management is prudent because groundwater levels could decline below historical levels and trigger inelastic land subsidence if actual future conditions differ significantly from those assumed in the projected water budget analysis.

As described in Section 4.8.1, the Coastal Area (Figure 4.1-01) located west of Harbor Boulevard would be particularly susceptible to impacts of land subsidence. Primary sewer lines to the City's WWTP run along Harbor Boulevard and have a low slope that could be impacted by relatively small amounts of land subsidence. Available studies indicate that the developed areas located west of Harbor Boulevard, including the Pierpont community and Ventura Harbor, will be impacted by sea level rise (Figure 4.8-01a) (VCWPD, 2018). Inelastic land subsidence in this area would unreasonably exacerbate the already significant impacts associated with sea level rise. For these reasons it was determined that any measurable inelastic land subsidence in the Coastal Area could potentially result in undesirable results, particularly as the effects of sea level rise act to increase coastal hazards in the Coastal Area during the planning and implementation horizons.

Despite the very encouraging model results that suggest that land subsidence is not expected during the 50-year GSP implementation period, MBGSA believes it would be prudent to develop a contingency plan to address unexpected conditions that could cause groundwater levels to decline below historical low levels in the western half of the Basin and potentially trigger inelastic land subsidence in the Coastal Area. The contingency plan will be developed to identify triggers and measures that would be taken to halt groundwater level declines before historical low levels are exceeded in the western half of the Basin.

6.4.1 Relevant Measurable Objective(s) [§354.44(b)(1)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*

The relevant measurable objective for the land subsidence contingency plan is the measurable objective for the land subsidence sustainability indicator.

6.4.2 Implementation Triggers [§354.44(b)(1)(A)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(A) *A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.*

The land subsidence contingency plan is a voluntary measure that will be undertaken by the MBGSA at its discretion. As such, there is no definitive implementation trigger for developing the contingency plan.

6.4.3 Public Notice Process [§354.44(b)(1)(B)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(B) *The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.*

MBGSA will continue to follow its adopted SEP to inform the public about progress developing the land subsidence contingency plan.

6.4.4 Permitting and Regulatory Process [§354.44(b)(3)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(3) *A summary of the permitting and regulatory process required for each project and management action.*

No permits or regulatory approvals are required to develop the land subsidence contingency plan.

6.4.5 Implementation Timeline [§354.44(b)(4)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(4) *The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.*

The land subsidence contingency plan is a voluntary measure that will be undertaken by the MBGSA at its discretion. The land subsidence contingency plan development is anticipated to be completed during the first 5-year GSP assessment period (i.e., before 2027).

6.4.6 Anticipated Benefits [§354.44(b)(5)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(5) *An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.*

the land subsidence contingency plan will benefit beneficial users and property interests in the Basin by providing early warning of groundwater levels declines that could lead to potential land subsidence in the Coastal Area and by ensuring pre-planned measures are to address it before undesirable results could occur.

6.4.7 Implementation Approach [§354.44(b)(6)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(6) *An explanation of how the project or management action will be accomplished. If the project or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.*

The land subsidence contingency plan will be developed through a collaborative stakeholder-driven process that identifies triggers, actions, and funding mechanisms to address unexpected groundwater level declines that could lead to potential land subsidence in the Coastal Area. Engineering assistance will be obtained from consultants as needed during the land subsidence contingency plan development process.

6.4.8 Legal Authority [§354.44(b)(7)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(7) *A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.*

MBGSA will rely on the authority provided for under SGMA to develop the land subsidence contingency plan.

6.4.9 Cost & Funding [§354.44(b)(8)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(8) *A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.*

The estimated cost for land subsidence contingency plan development is $88,4000 (shared with the seawater intrusion contingency plan development).

6.5 Groundwater Quality Protection Measures [§354.44(b)(1) and (d)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*
(d) *An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.*

MBGSA will coordinate with the County of Ventura to identify and address improperly constructed or abandoned wells that create conduits for migration of poor-quality water from the Shallow Alluvial Deposits into the principal aquifers. MBGSA will also coordinate with County of Ventura to review the County well permit ordinance and modify, if necessary, to ensure the future wells are properly sealed to prevent migration of poor-quality water from the Shallow Alluvial Deposits into the principal aquifers.

6.5.1 Relevant Measurable Objective(s) [§354.44(b)(1)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*

The relevant measurable objective for the groundwater quality protection measures management action is the measurable objective for the degraded water quality sustainability indicator.

6.5.2 Implementation Triggers [§354.44(b)(1)(A)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(A) *A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.*

The groundwater quality protection measures management action is a voluntary measure that will be undertaken by the MBGSA at its discretion. As such, there is no definitive implementation trigger for developing the contingency plan.

6.5.3 Public Notice Process [§354.44(b)(1)(B)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(B) *The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.*

MBGSA will continue to follow its adopted SEP to inform the public about progress implementing the groundwater quality protection measures management action.

6.5.4 Permitting and Regulatory Process [§354.44(b)(3)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(3) *A summary of the permitting and regulatory process required for each project and management action.*

No permits or regulatory approvals are required to implement groundwater quality protection measures management action.

6.5.5 Implementation Timeline [§354.44(b)(4)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(4) *The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.*

The groundwater quality protection measures management action is a voluntary measure that will be undertaken by the MBGSA at its discretion. However, it is anticipated that the Groundwater Quality

Protection Measures management action will be initiated during the first 5-year GSP assessment period (i.e., before 2027).

6.5.6 Anticipated Benefits [§354.44(b)(5)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
> ***(5)*** *An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.*

The groundwater quality protection measures management action will benefit beneficial users and property interests in the Basin by protecting groundwater quality from degradation.

6.5.7 Implementation Approach [§354.44(b)(6)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
> ***(6)*** *An explanation of how the project or management action will be accomplished. If the project or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.*

The groundwater quality protection measures management action will be developed through collaboration with the County of Ventura, the well permitting agency for the Basin.

6.5.8 Legal Authority [§354.44(b)(7)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
> ***(7)*** *A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.*

MBGSA will rely on the County of Ventura's legal authority as the well permitting agency for the Basin.

6.5.9 Cost & Funding [§354.44(b)(8)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
> ***(8)*** *A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.*

The estimated costs for the groundwater quality protection measures management action are included in the groundwater management, coordination, and outreach budget. Grant funding will be pursued to address any improperly constructed or abandoned wells that are identified.

6.6 Interim Shallow Groundwater Data Collection and Analysis [§354.44(b)(1) and (d)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*
(d) *An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.*

As described in Section 3.1.4.1.3, Section 3.2.6, and Appendix G, the current HCM, data, and modeling indicate that there is virtually no impact of principal aquifer groundwater extractions on groundwater levels in the Shallow Alluvial Deposits or surface flows in the Santa Clara River. In response to concerns communicated by several commenters on the draft GSP, MBGSA will partner with the City of Ventura and United to collect interim shallow groundwater levels and water quality data from existing shallow wells located near the Santa Clara River leading up to the first 5-year GSP assessment to confirm the above-described conclusions. MBGSA is currently coordinating with the City of Ventura and United to perform the interim monitoring of shallow groundwater levels in several shallow wells located along the Santa Clara River (see Figure 6.6-01, Table 6.6-01). Note, these wells are not part of the Mound Basin GSP monitoring network, but data from these wells will be collected and analyzed on an interim basis. If data from the interim study confirm the existing conclusions, then no further monitoring will be necessary. If the data suggest a significant relationship exists between the Shallow Alluvial Deposits and Santa Clara River flows with the deeper, principal aquifers, the GSP will be updated to reflect those findings and an appropriate amount of monitoring will be continued.

Consistent with to GSP Emergency Regulations §354.34(c)(1)(B), static groundwater levels will be measured monthly (or more frequently, as feasible) at the shallow wells to represent seasonal-low and seasonal-high groundwater conditions. Groundwater elevations have been measured continuously by the City of Ventura with transducers, or manually on a monthly or bi-monthly basis at the shallow wells, exceeding the SGMA requirement for semiannual (fall and spring) measurements. The continuous data from the transducers is helpful for more accurately determining the precise timing of spring-high and fall-low groundwater elevations each year and for evaluating the interference effects of nearby groundwater extraction on static groundwater levels.

The City of Ventura collects and reports groundwater elevation data from the shallow wells in general conformance with the CASGEM program's "Procedures for Monitoring Entity Reporting" (DWR, 2010) and DWR's (2016b) BMPs for monitoring protocols, standards, and sites. Some key elements of DWR guidance include (but are not limited to) the following:

- Depth to groundwater must be measured relative to an established reference point on the well casing;
- Depth to groundwater must be measured to an accuracy of 0.1 ft below the reference point (it is preferable to measure depth to groundwater to an accuracy of 0.01 ft);
- Transducers must be able to record groundwater levels with an accuracy of 0.1 ft;

- Transducer data should periodically be checked against hand-measured groundwater levels to monitor electronic drift or cable movement.

More details are provided in the referenced guidance documents (DWR, 2010, 2016b), and are not repeated in this GSP. It is presently anticipated that MBGSA, United, and the City of Ventura will continue collecting groundwater level data from the existing shallow wells, including any improvements or modifications made in the future, and report those data to CASGEM and DWR.

6.6.1 Relevant Measurable Objective(s) [§354.44(b)(1)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent.*

There is no relevant measurable objective for the interim shallow groundwater data collection and analysis management action.

6.6.2 Implementation Triggers [§354.44(b)(1)(A)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(A) *A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.*

The interim shallow groundwater data collection and analysis management action is a voluntary measure that will be undertaken by the MBGSA at its discretion. As such, there is no definitive implementation trigger for developing this effort.

6.6.3 Public Notice Process [§354.44(b)(1)(B)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(1) *The Plan shall include the following:*
(B) *The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.*

MBGSA will continue to follow its adopted SEP to inform the public about progress implementing the interim shallow groundwater data collection and analysis management action.

6.6.4 Permitting and Regulatory Process [§354.44(b)(3)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(3) *A summary of the permitting and regulatory process required for each project and management action.*

No permits or regulatory approvals are required to implement the interim shallow groundwater data collection and analysis management action.

6.6.5 Implementation Timeline [§354.44(b)(4)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(4) *The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.*

MBGSA is currently coordinating with the City and United to initiate the monitoring program and data management. The interim shallow groundwater data collection and analysis management action is anticipated to be initiated in 2022 and completed during the first 5-year GSP assessment period (i.e., before 2027).

6.6.6 Anticipated Benefits [§354.44(b)(5)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(5) *An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.*

The interim shallow groundwater data collection and analysis management action will benefit beneficial users of the shallow groundwater (GDEs) and surface water (instream uses) within the Basin by providing additional data to ensure no impacts from groundwater extraction in the deeper principal aquifers is occurring. If the data indicate a hydraulic connection between the Shallow Alluvial Deposits and the deeper principal aquifers, then the data and analysis will provide the basis and data to update the HCM, SMC, and monitoring network to protect beneficial uses associated with the Shallow Alluvial Deposits and Santa Clara River from any groundwater extraction impacts.

6.6.7 Implementation Approach [§354.44(b)(6)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(6) *An explanation of how the project or management action will be accomplished. If the project or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.*

The interim shallow groundwater data collection and analysis management action is being developed through collaboration with the City of Ventura and United to collect and manage the data. MBGSA will develop a temporary monitoring plan and conduct the data analysis.

6.6.8 Legal Authority [§354.44(b)(7)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(7) *A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.*

The legal authority for the interim shallow groundwater data collection and study are currently being assessed and will be updated in the next annual report.

6.6.9 Cost & Funding [§354.44(b)(8)]

§354.44 Projects and Management Actions.
(b) *Each Plan shall include a description of the projects and management actions that include the following:*
(8) *A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.*

The estimated costs for the interim shallow groundwater data collection and analysis management action are currently being assessed and will be updated in the next annual report.

7.0 GSP Implementation

This GSP section presents the anticipated GSP implementation costs and schedule. Please note that the costs and schedule are approximate estimates based on currently available information and will be updated annually as needed to satisfy GSP annual reporting requirements and for the Agency's annual budgeting process.

7.1 Estimate of GSP Implementation Costs [§354.6(e)]

§354.6 Agency Information. *When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:*

(e) *An estimate of the cost of implementing the Plan and a general description of how the Agency plans to meet those costs.*

This subsection provides an estimate of the cost to implement the GSP and a general description of how the MBGSA plans to meet those costs. Implementation cost considerations include MBGSA administration, monitoring, data management, maintaining a prudent fiscal reserve, and other costs estimated over the GSP 20-year implementation horizon. The funding sources and mechanisms are also presented. The costs for projects and management actions are not included because none are anticipated to be required to meet the sustainability goal for the Mound Basin. However, costs to develop contingency plans to address unexpected land subsidence or seawater intrusion are included.

The following subsections present estimated costs for each major expense category. The estimated costs include annual costs for ongoing activities and estimated costs for one-time activities that are scheduled to occur within the first 5-year GSP assessment period. This approach enables calculating the 5-year total cost estimate, which is annualized to better inform MBGSA's general estimate of the costs by the major categories. Because costs are based on the best available estimates at the time of preparation, actual costs may vary from those used in the projections below.

The following subsections describe the scope of the various GSP implementation activities. Associated costs are presented in Table 7.1-01. In general, all costs were developed using 2021 dollars and escalated by 3% per year for the remainder of the 20-year GSP implementation period.

7.1.1 Agency Administration

This category includes the costs related to the administration of the MBGSA, including administrative staff support, finance staff support and related expenses, insurance, organizational memberships and conferences, miscellaneous supplies, and materials. The estimated costs are presented in Table 7.1-01. The MBGSA uses a collaborative staffing model to accomplish its work. Executive management is provided under contract with an independent consultant, Bondy Groundwater Consulting, Inc. (Bryan Bondy). Mr. Bondy serves as the Agency's Executive Director and the GSP Plan Manager. Administrative and accounting support is provided under contract with member agency United. This budget category includes finance-related costs for routine accounts payable and receivable functions, extraction fee billing, budgeting, financial reporting, and financial audits. Administrative costs also include annual liability insurance costs, IT services (website, email, and cloud storage), and incidentals (postage, copies, etc.). MBGSA does not own or lease any office space or office equipment.

7.1.2 Legal Counsel

Legal services are provided under contract with Klein Denatale Goldner on an as-needed basis. The budget assumes legal review of contracts and access agreements as well as consultation on other matters, such as Brown Act matters and groundwater extraction fee issues.

7.1.3 Groundwater Management, Coordination, and Outreach

GSP implementation will require certain management and coordination activities. The Executive Director will monitor activities of the Member Agencies, land use planning efforts, the Santa Paula Technical Advisory Committee (management of the adjacent adjudicated Santa Paula Basin), and FCGMA (GSP implementation for the adjacent Oxnard Basin), and the Santa Clara River Watershed Committee (Integrated Regional Water Management program). The Executive Director will also stay abreast of DWR updates concerning the SGMA and related programs. This task also includes ongoing outreach required by the SGMA concerning GSP implementation in accordance with the MBGSA Board-approved SEP (Appendix D).

This cost category also includes miscellaneous technical support that may be needed to implement the GSP that is not captured in other cost categories. The specific needs and costs are yet to be identified but it is expected as the initial GSP implementation efforts proceed that these needs will become evident. Examples of technical support are potential tasks such as ongoing data review (outside of annual reporting and GSP evaluation); day-to-day data management, review of funding mechanisms; development of alternative funding mechanisms (grants), and other technical issues that may arise during GSP implementation. It is envisioned that much of the work will be completed by the Executive Director with support from United staff and other consultants, as needed.

Lastly, the year one (Fiscal Year 2022) included $25,000 for the application for a GSP Implementation Grant.

7.1.4 Data Collection

The MBGSA's proposed monitoring program is presented in the monitoring section (Section 5). The initial monitoring networks for the GSP consist of the existing monitoring programs implemented by United and to a lesser extent the VCWPD and City of Ventura. The existing monitoring networks will be supplemented with monitoring well clusters to be constructed by MBGSA (see Sections 5.3.4 and 6.2) and perhaps several existing wells where opportunities arise.

7.1.4.1 Monitoring Well Construction

Sections 5.3.4, 5.5.4, and 5.6.4 describe monitoring network gaps. In summary, MBGSA concluded that two monitoring wells are needed between the shoreline and locations of water wells to implement minimum thresholds and measurable objectives designed to protect beneficial uses. Two multi-level monitoring wells (clusters) will be constructed to address these needs. The wells were also sited to address monitoring needs for the land subsidence sustainability indicator and, more generally, to better define the potentiometric surface near the coast and provide additional vertical gradient data.

Pursuant to GSP Emergency Regulations § 354.38(d), the multi-level monitoring wells will be installed in a phased approach at prioritized locations within the next 5 years. One well is planned for construction in 2021 under DWR's TSS program (Site A on Figures 5.3-01 through 5.3-04). The fiscal year 2022 budget includes $30,000 for coordination with the DWR TSS. MBGSA will budget for and seek to install the other multi-level monitoring well (Site B on Figures 5.3-01 through 5.3-04) before the 5-year GSP assessment. The MBGSA's cost to construct the multi-level monitoring wells in 2026 is estimated to be approximately $750,000 per site in 2021 dollars. The estimated costs include access agreements, permitting, project management, and construction costs. These approximate costs are estimates as there are uncertainties such as site-specific considerations and construction bid environment, as well as a variety of other factors that will ultimately determine the all-in construction costs.

In addition to the monitoring wells described above, another monitoring well is proposed to provide early detection of seawater at the shoreline (Site C on Figures 5.3-01 through 5.3-04). However, because this well is not needed for establishing minimum thresholds and measurable objectives, this well does not need to be constructed before first 5-year GSP assessment. It is assumed that the well would be constructed before the second 5-year GSP assessment, if funding is available.

7.1.4.2 Groundwater Elevation Monitoring

There is a combined network of 24 wells in the Basin monitored at least quarterly. Monitoring is performed by United and to a lesser extent the VCWPD and City of Ventura (Table 5.3-01). Monitoring is described in detail in Section 5.3. The costs for ongoing monitoring of the existing monitoring network are included in the budgets of the current monitoring entities. United staff have indicated a willingness to incorporate the above-described new monitoring sites into its existing network, but that MBGSA would need to cover the costs for pressure transducers. Therefore, costs are included for pressure transducers.

7.1.4.3 Groundwater Quality Monitoring

There is a combined network of 10 wells in the Basin monitored at least quarterly. Monitoring is performed by United and to a lesser extent the VCWPD and City of Ventura (Table 5.3-01). Monitoring is described in detail in Section 5.6. The costs for ongoing monitoring of the existing monitoring network are included in the budgets of the current monitoring entities. United staff have indicated a willingness to incorporate the above-described new monitoring sites into its existing network, but that MBGSA would need to cover the laboratory fees for water quality testing. Therefore, costs are included for water quality testing.

7.1.4.4 Groundwater Extraction Monitoring

Groundwater extractions are reported semiannually to United pursuant to the Water Code §75611. The reported extractions are shared with MBGSA. There is no cost to MBGSA to obtain the extraction volume data.

7.1.5 Annual Reporting

SGMA regulations require submittal of annual reports to DWR on the status of GSP implementation and basin conditions. The reporting requirements are presented in GSP Emergency Regulations §356.2. In general, the annual report must include an executive summary, description, and graphical presentation basin conditions (groundwater levels and storage), reporting of groundwater extractions, reporting of surface water supplies to the Basin, reporting of total water use in the Basin, and discussion of GSP implementation progress relative to the SMC. It is anticipated the annual reports will be prepared by the Executive Director in coordination with United staff and with consultant support. Additional consultant support will be obtained, as needed, to complete the reports. The cost for the first annual report is anticipated to be greater than the cost for subsequent reports because the first report must be developed from scratch and will include several years of data to bridge the gap between data presented in the GSP and water year 2020/2021. The first annual report is due in April 2022.

Ongoing maintenance for the SMGA-required DMS is included in the annual reporting costs. Please see Section 5.10 and Appendix L for more information concerning the DMS.

7.1.6 Projects and Management Actions

Costs to develop a contingency plan for unexpected land subsidence or seawater intrusion are included. Further information about the contingency plans can be found in Sections 6.3 and 6.4. In addition, MBGSA developed a groundwater protection measures management action to identify and address improperly constructed or abandoned wells that create conduits for migration of poor-quality water from the Shallow Alluvial Deposits into the principal aquifers. This management action will also include coordination with the County of Ventura to review the County well permit ordinance and modify, if necessary, to ensure the future wells are properly sealed to prevent migration of poor-quality water from the Shallow Alluvial Deposits into the principal aquifers. Grant funding will be pursued to address any improperly constructed or abandoned wells that are identified.

7.1.7 GSP Evaluations and Amendments

GSP Emergency Regulations § 356.4 require MBGSA to evaluate the GSP at least every 5 years and in conjunction with any GSP amendments. The initial 5-year GSP evaluation is due to DWR in 2027. It is assumed that any Plan amendments will be timed such that only one GSP assessment will be performed per 5-year period. GSP evaluations will require the activities described in the following subsections.

7.1.7.1 Numerical Model Updates and Simulations

Prior to performing each 5-year GSP evaluation, the numerical flow model used to support GSP development will be updated. The updated model will help inform ongoing performance assessment of the SMC. Periodic updates to the groundwater model will be required to continue to refine and improve its capabilities and maintain ongoing functionality. This includes incorporating new model tools and features, updates to data, and updates to calibration. The model will be an important tool to inform the evaluation of GSP implementation over time. Numerical model updates will be performed by United as part of the activities undertaken to achieve its mission. Therefore, there are no anticipated costs to MBGSA for model updates. Model simulations requested by MBGSA will be performed by United (for a fee) or a consultant. Therefore, estimated costs for model simulations are included in the GSP implementation budget.

7.1.7.2 GSP Evaluation

SGMA regulations require submittal of written evaluation of the GSP to DWR at least once every 5 years. The GSP evaluation requirements are presented in GSP Emergency Regulations §356.4. In general, the GSP evaluation must include a description of groundwater conditions relative to each sustainability indicator, discussion of GSP implementation, proposed revisions to the Basin setting, SMC in light of new information or changes in water use, assessment of the monitoring networks, regulatory actions taken by MBGSA, summary of coordination with agencies located within the Basin and in adjacent basins, and a description of any proposed or adopted GSP amendments. It is anticipated the GSP evaluation will be prepared by the Executive Director in coordination with United staff and with consultant support. The cost of the first GSP evaluation is anticipated to be greater than the cost for subsequent reports because the first evaluation must be developed from scratch.

7.1.7.3 GSP Amendments

To control costs, MBGSA will seek to perform any Plan amendments in conjunction with the required 5-year evaluations. Pertinent sections of the GSP will be amended, as appropriate, based on new information, groundwater conditions and monitoring results, water use, land use changes, land use plan updates, and groundwater conditions and management status of adjacent basins. It is anticipated the GSP evaluation will be prepared by the Executive Director in coordination with United staff and with consultant support.

7.1.8 Respond to DWR GSP Evaluations and Assessments

MBGSA will respond to DWR comments on the initial GSP and requests for additional information following its review of the adopted GSP. It is assumed that DWR comments on the initial GSP will be received and addressed during fiscal year 2024. MBGSA will respond to DWR comments and requests for information associated with its subsequent 5-year GSP assessments. It is anticipated the GSP evaluation will be prepared by the Executive Director in coordination with United staff and with consultant support.

7.1.9 Contingencies

Contingency is included in the budget in recognition that the GSP implementation is new and there is potential for unanticipated expenses. For the purposes of conservatively estimating the cost to implement the GSP, the budget estimate includes a 10% contingency based upon the annual fiscal year budget estimate. The actual need for contingency will be reviewed during each annual budgeting process. It is anticipated the contingency needs will be reduced over time as MBGSA becomes more certain about ongoing GSP implementation costs.

7.1.10 Financial Reserves

Prudent financial management requires that MBGSA carry a general reserve in order to manage cash flow. General reserves have no restrictions on the types of expenses they can be used to fund. Current Board Direction policy on reserve level is $25,000.

7.2 Total Estimated Implementation Costs Through 2042 [§354.6(e)]

> **§354.6 Agency Information.** *When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:*
>
> ***(e)*** *An estimate of the cost of implementing the Plan and a general description of how the Agency plans to meet those costs.*

GSP implementation costs are presented in Table 7.1-01. The estimated cost is presented by budget categories discussed in Section 7.1. The estimated total cost of the GSP implementation over the 20-year planning horizon is [$7,002,188]. Costs through the first 5-year assessment periods are also provided as subtotal, and are estimated to be [1,937,618]. The annual costs include an annual rate of inflation of 3.0% factored into the cost projections. These estimated costs are based on the best available information at the time of Plan preparation and submittal. It represents the MBGSA's current understanding of Basin conditions and the current roles and responsibilities of the MBGSA under SGMA.

7.3 Funding Sources and Mechanisms [§354.6(e)]

> **§354.6 Agency Information.** *When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:*
>
> ***(e)*** *An estimate of the cost of implementing the Plan and a general description of how the Agency plans to meet those costs.*

Funding for GSP implementation will be obtained from groundwater extraction fees charged to groundwater users in the Basin. This funding approach has been used since the MBGSA's formation. This funding approach will be reevaluated over time as the GSP implementation progresses. The MBGSA obtained a $760,000 Proposition 1 Sustainable Groundwater Planning Grant from DWR to fund, in part, the development of the GSP. In addition, the Site A monitoring wells planned for construction in 2021 is being funded by DWR's TSS program. MBGSA will continue to pursue funding from state and federal sources to support GSP planning and implementation.

7.4 Implementation Schedule [§354.44(b)(4)]

> **§354.44 Projects and Management Actions.**
> ***(b)*** *Each Plan shall include a description of the projects and management actions that include the following:*
>
> ***(4)*** *The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.*

The GSP is anticipated to be presented to the MBGSA Board for adoption in December 2021 and will be submitted to DWR no later than January 31, 2022. Many of the budget categories consist of ongoing tasks and efforts that will be conducted throughout GSP implementation. GSP reporting will occur on an annual basis, with reports for the preceding water year due to DWR by April 1. Periodic evaluations (every 5 years) and associated GSP amendments will be submitted to DWR by April 1 at least every 5 years (2027, 2032, 2037, and 2042).

The proposed monitoring well clusters are scheduled for construction in 2021, 2026, and 2032, but it is noted that site identification, access agreements, and permitting will take place in the years immediately preceding construction. Then first well scheduled for 2021 construction will be paid for by DWR's TSS program (Site A on Figures 5.3-01 through 5.3-04). Due to the significant construction costs for the remaining monitoring wells, it is anticipated that the second well (Site B) will be constructed during fiscal year 2026 to provide time to accumulate funding. If necessary, the third well (Site C) would be constructed in 2032 to provide time to accumulate funding after completing the second well[2].

2 Because this well is not needed for establishing minimum thresholds and measurable objectives, this well does not need to be constructed before first five-year GSP assessment.

8.0 References and Technical Studies [§354.4(b)]

§354.4 General Information.
(b) *Each Plan shall include the following general information: A list of references and technical studies relied upon by the Agency in developing the Plan. Each Agency shall provide to the Department electronic copies of reports and other documents and materials cited as references that are not generally available to the public.*

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______. 2010. California Statewide Groundwater Elevation Monitoring (CASGEM) Program Procedures for Monitoring Entity Reporting, December.

______. 2014. Summary of Recent, Historical, and Estimated Future Land Subsidence in California.

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______. 2016c. BMP 2, Best Management Practices for the Sustainable Management of Groundwater—Monitoring Networks and Identification of Data Gaps BMP, December.

______. 2017. BMP 6, Best Management Practices for Sustainable Management Criteria DRAFT. November 6.

______. 2018. Guidance Document for the Sustainable Management of Groundwater Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development. July.

______. 2020a. Sustainable Groundwater Management Act 2019 Basin Prioritization—Process and Results, April.

______. 2020b. SGMA Data Viewer Web-based geographic information system (GIS) viewer. Available at (https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#landsub

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Figures

Figures

Section 2

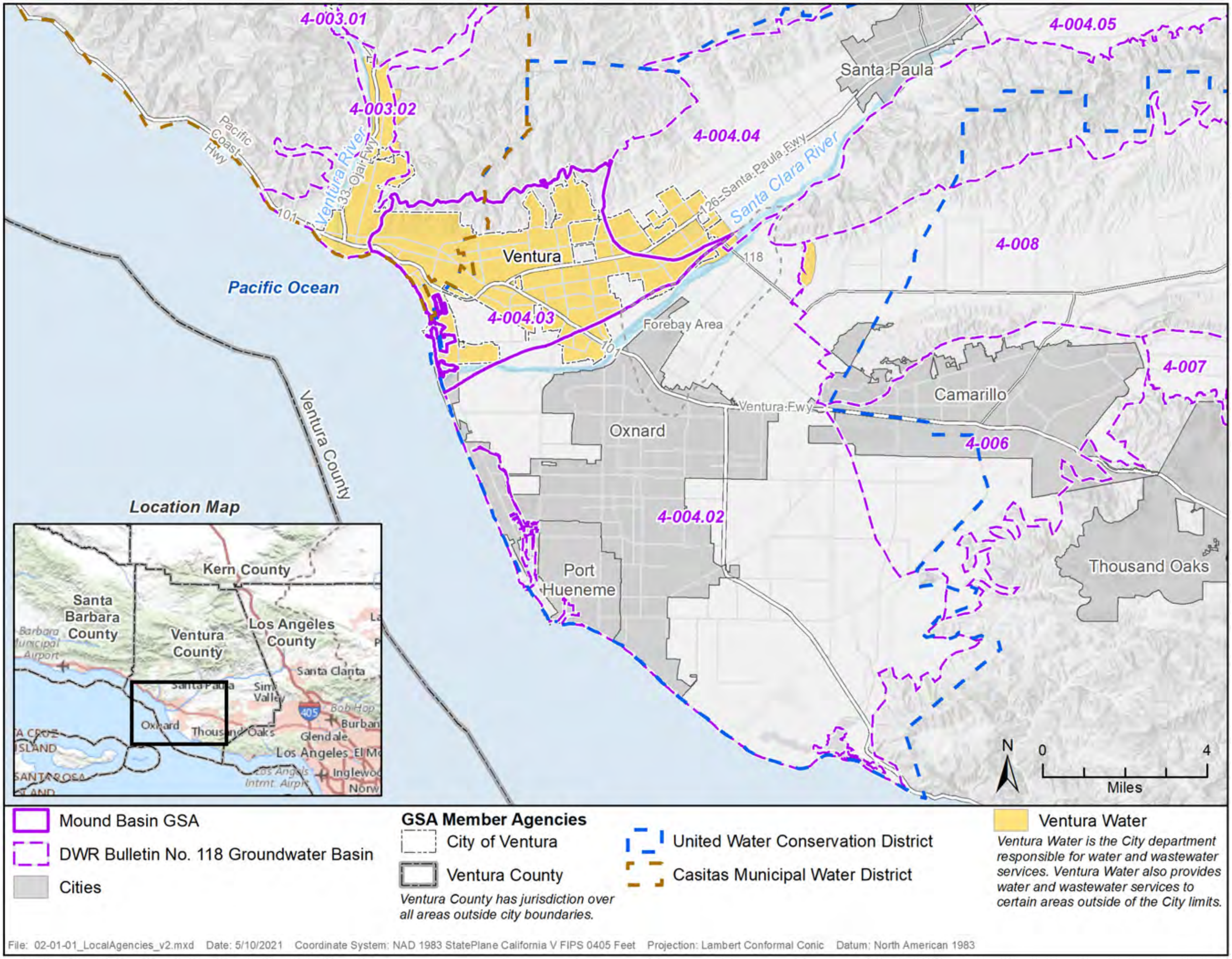


Figure 2.1-01 Local Agency Boundary Map.

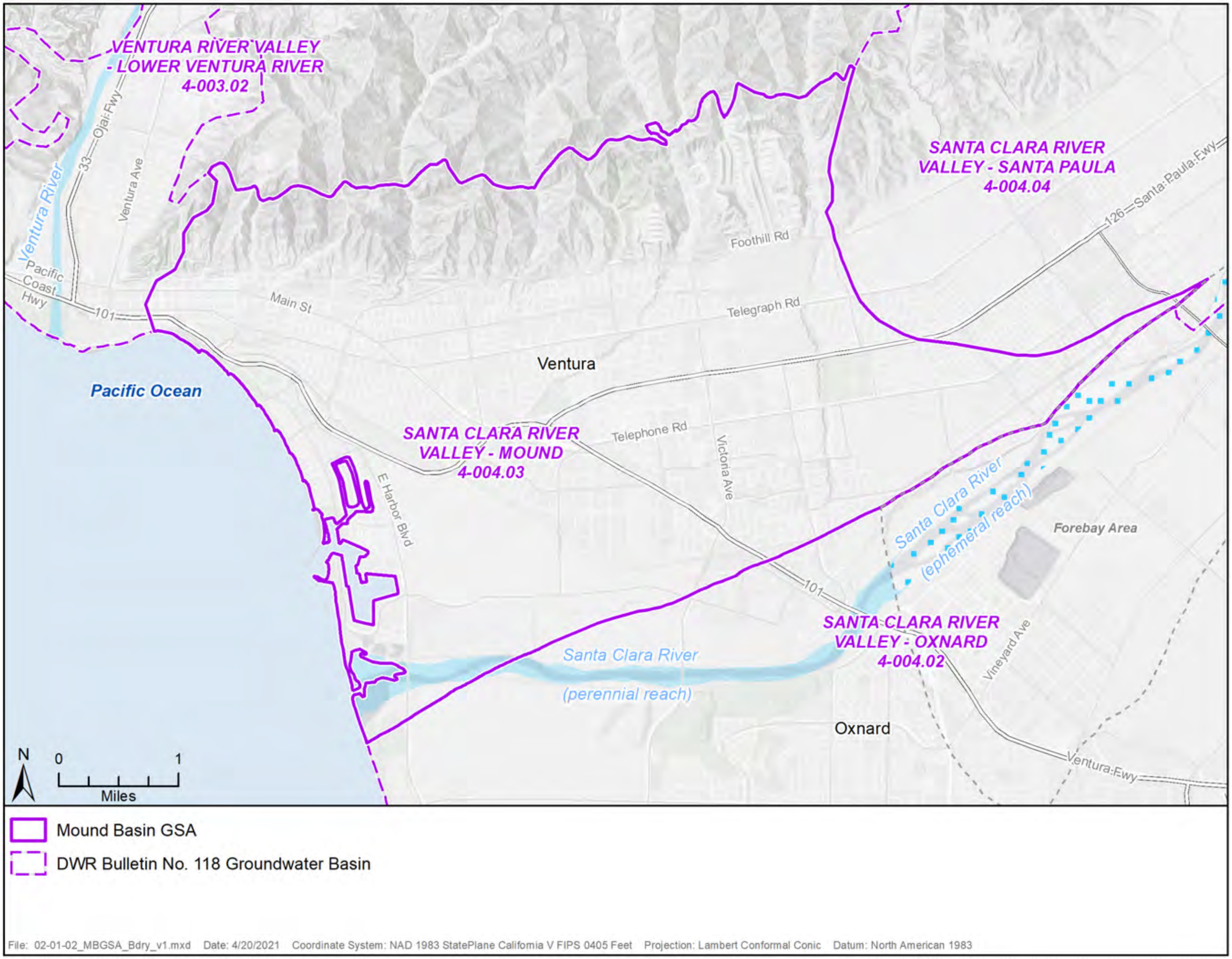


Figure 2.1-02 Mound Basin Groundwater Sustainability Agency Boundary Map.

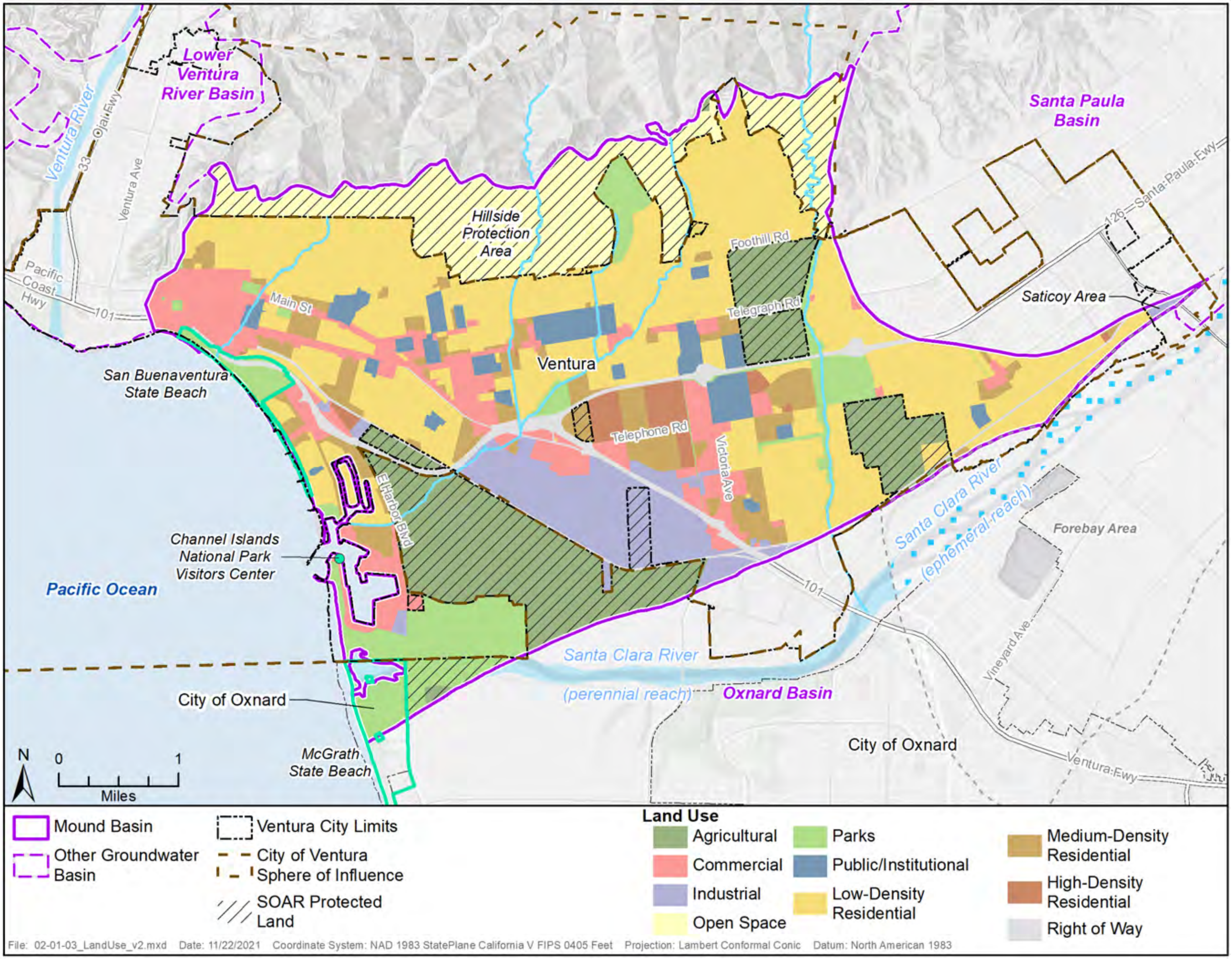


Figure 2.1-03 Mound Basin Land Use Map.

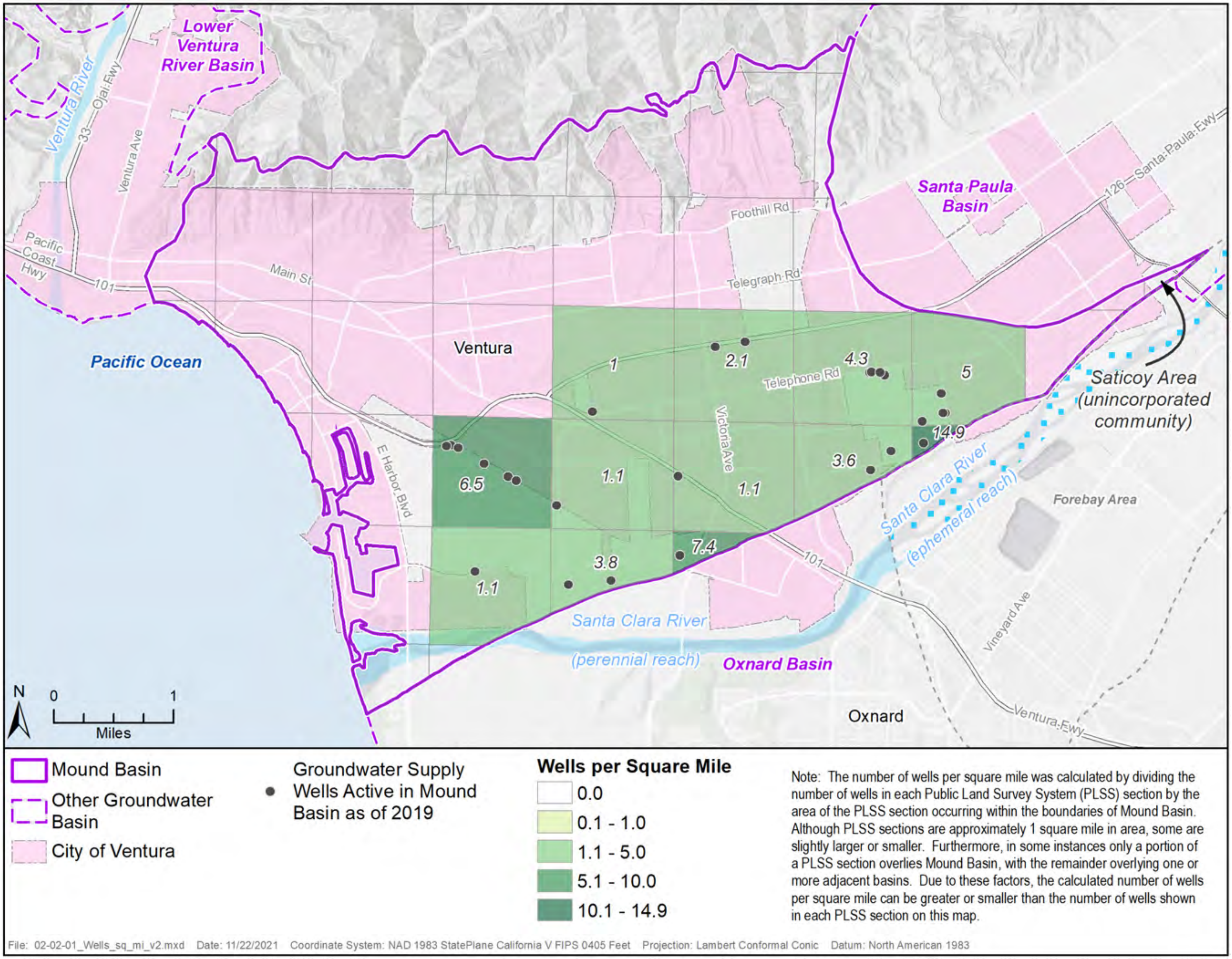


Figure 2.2-01 Groundwater Supply Wells Active in Mound Basin as of 2019 and Communities Dependent on Groundwater.

Figures

Section 3

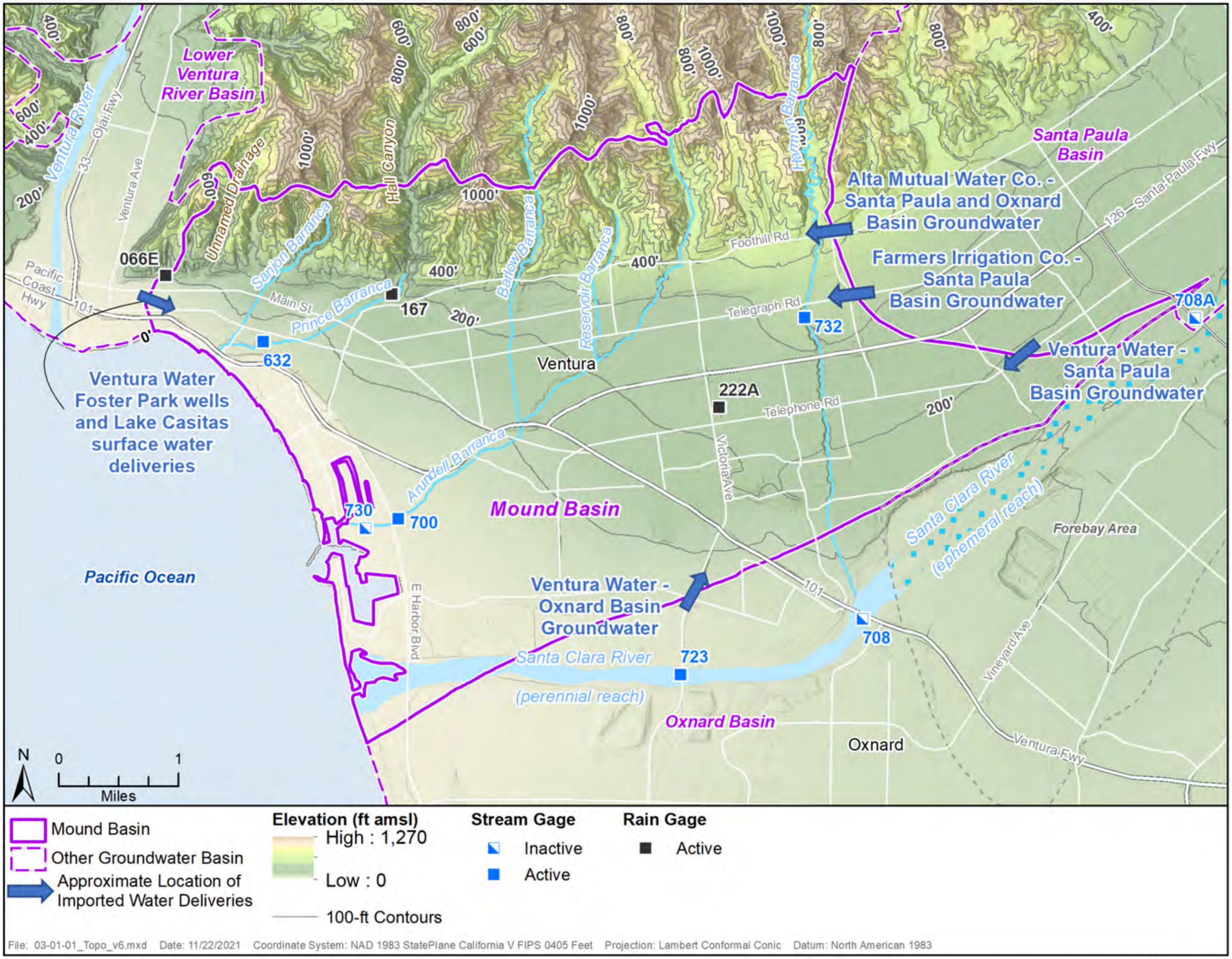


Figure 3.1-01 Topographic Map of Mound Basin with Stream and Precipitation Gage Stations and Imported Water.

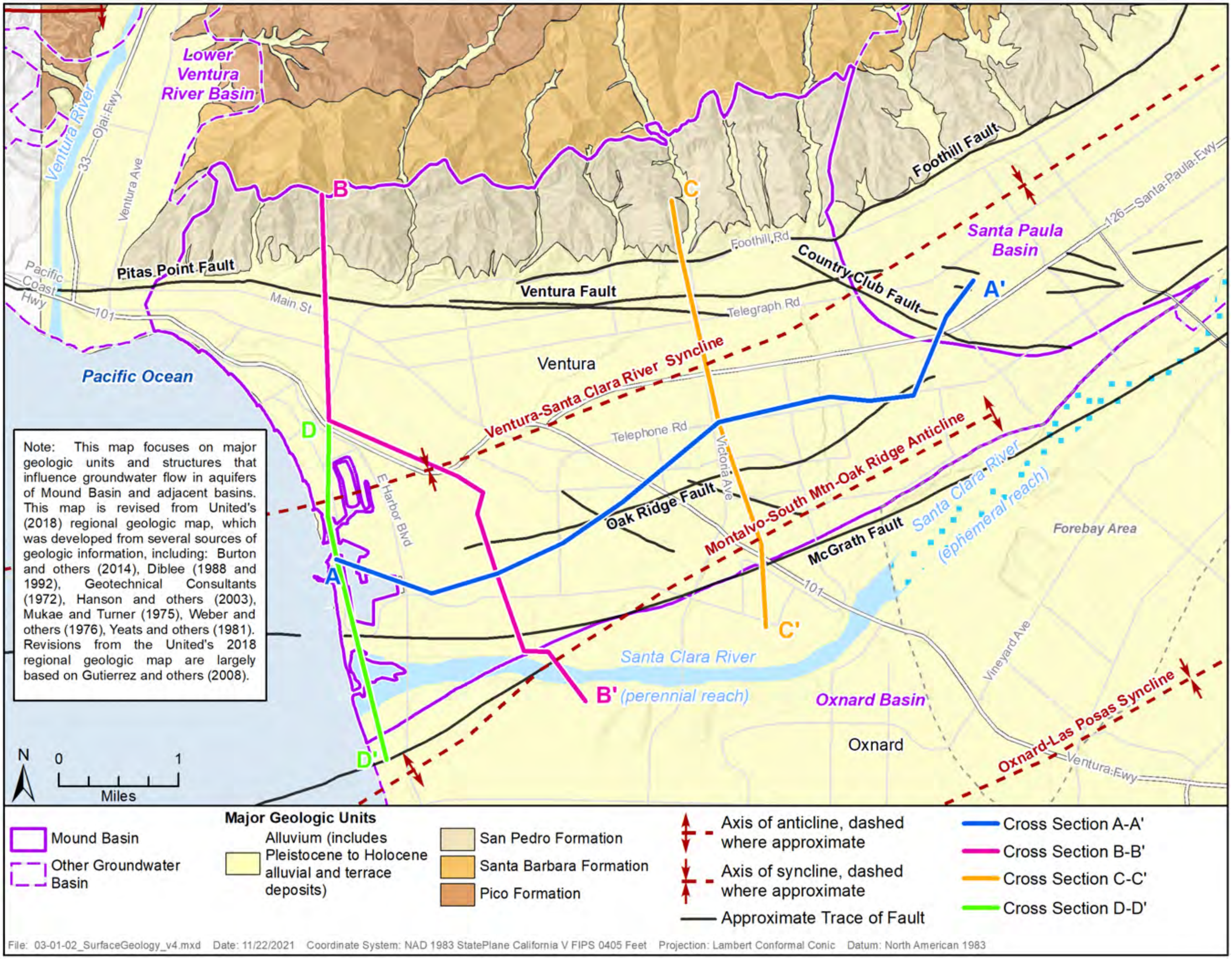


Figure 3.1-02 Simplified Surface Geologic Map of Mound Basin, showing Locations of Cross-Section Lines.

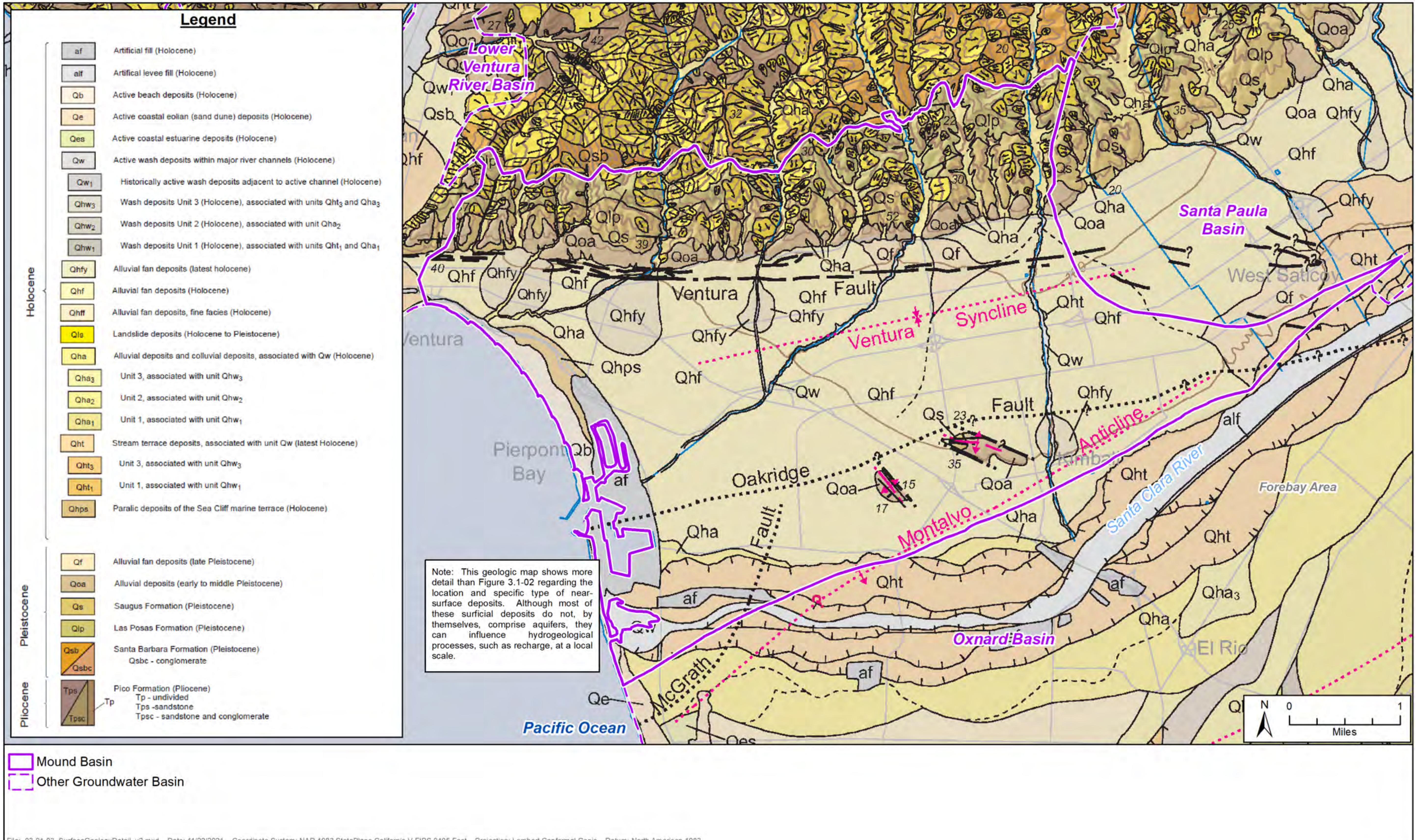


Figure 3.1-03 Detailed Surface Geologic Map of Mound Basin, from Gutierrez et al. (2008).

Hydrostratigraphic Unit	Formation	Age	Aquifer System	United Model Layer
Shallow Alluvial Deposits (rarely used for water supply)	Unnamed alluvium	Holocene to Recent	Shallow	1
Fine-grained Pleistocene deposits (behaves as an aquitard; abuts or interfingers with Oxnard Aquifer along southern boundary of Mound Basin)		Late Pleistocene	Upper Aquifer System	2
				3
				4
Mugu Aquifer (unconformity)				5
Mugu – Hueneme aquitard	San Pedro Formation	Pleistocene	Lower Aquifer System	6
Hueneme Aquifer				7
Hueneme – Fox Canyon aquitard				8
Fox Canyon Aquifer – main				9
Fox Canyon upper-basal aquitard				10
Fox Canyon Aquifer – basal (low hydraulic conductivity in Mound Basin)				11

Figure 3.1-04 Schematic Illustration of HSUs, Aquifer Systems, Formations, Ages, and Model Layers.

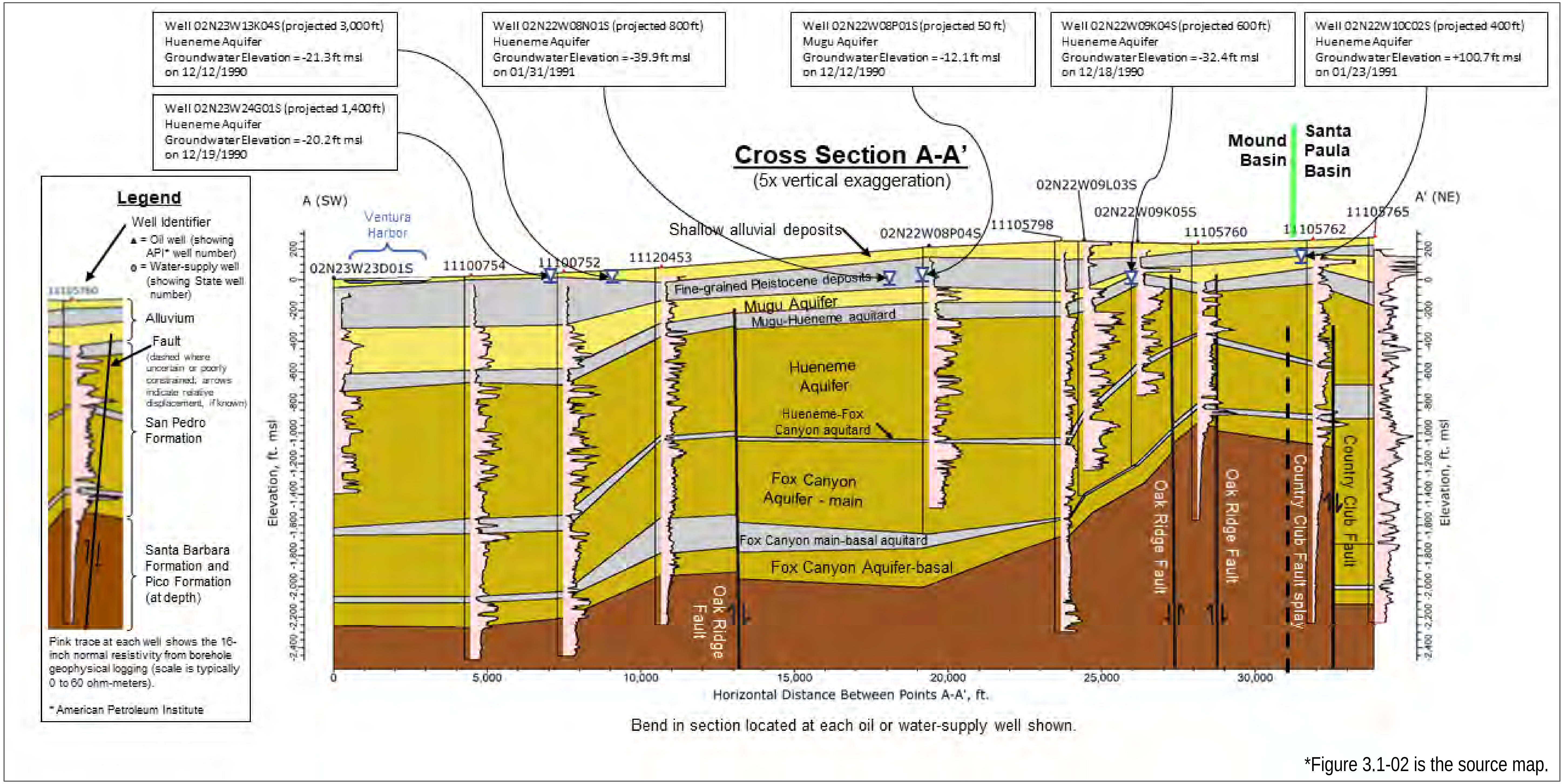


Figure 3.1-05 Cross-Section A-A' (longitudinal).

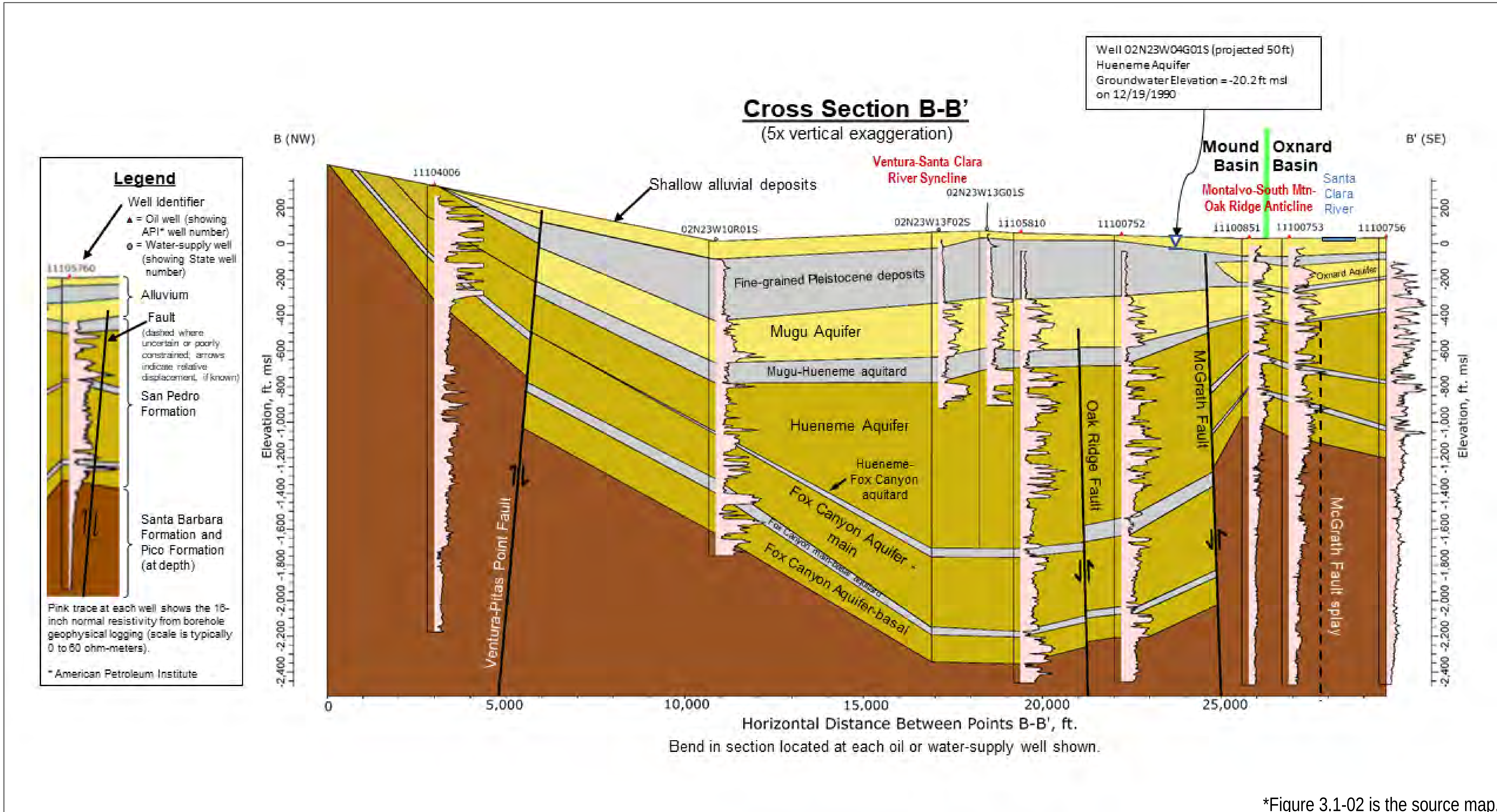


Figure 3.1-06 Cross-Section B-B' (transverse).

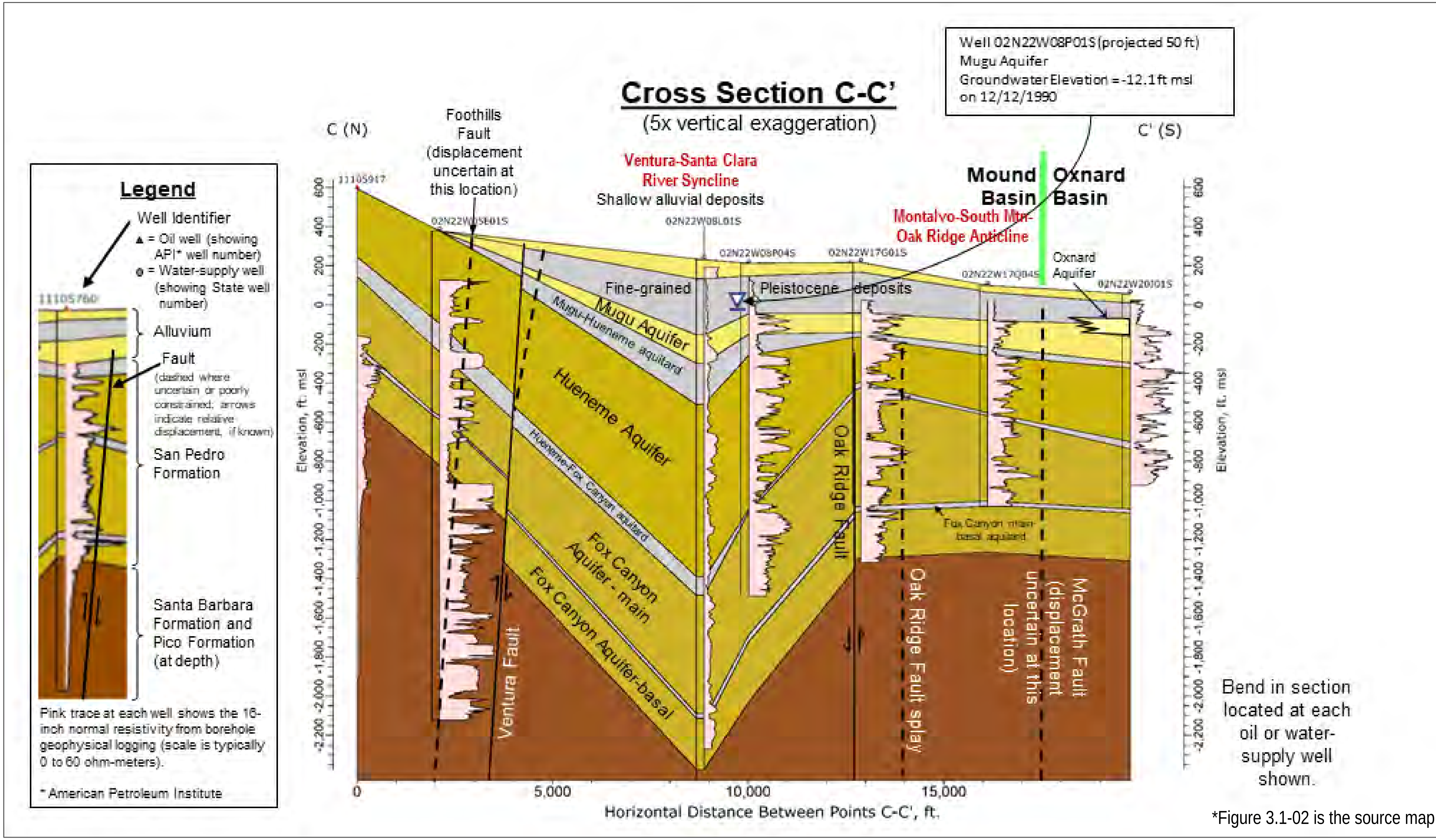


Figure 3.1-07 Cross Section C-C' (transverse).

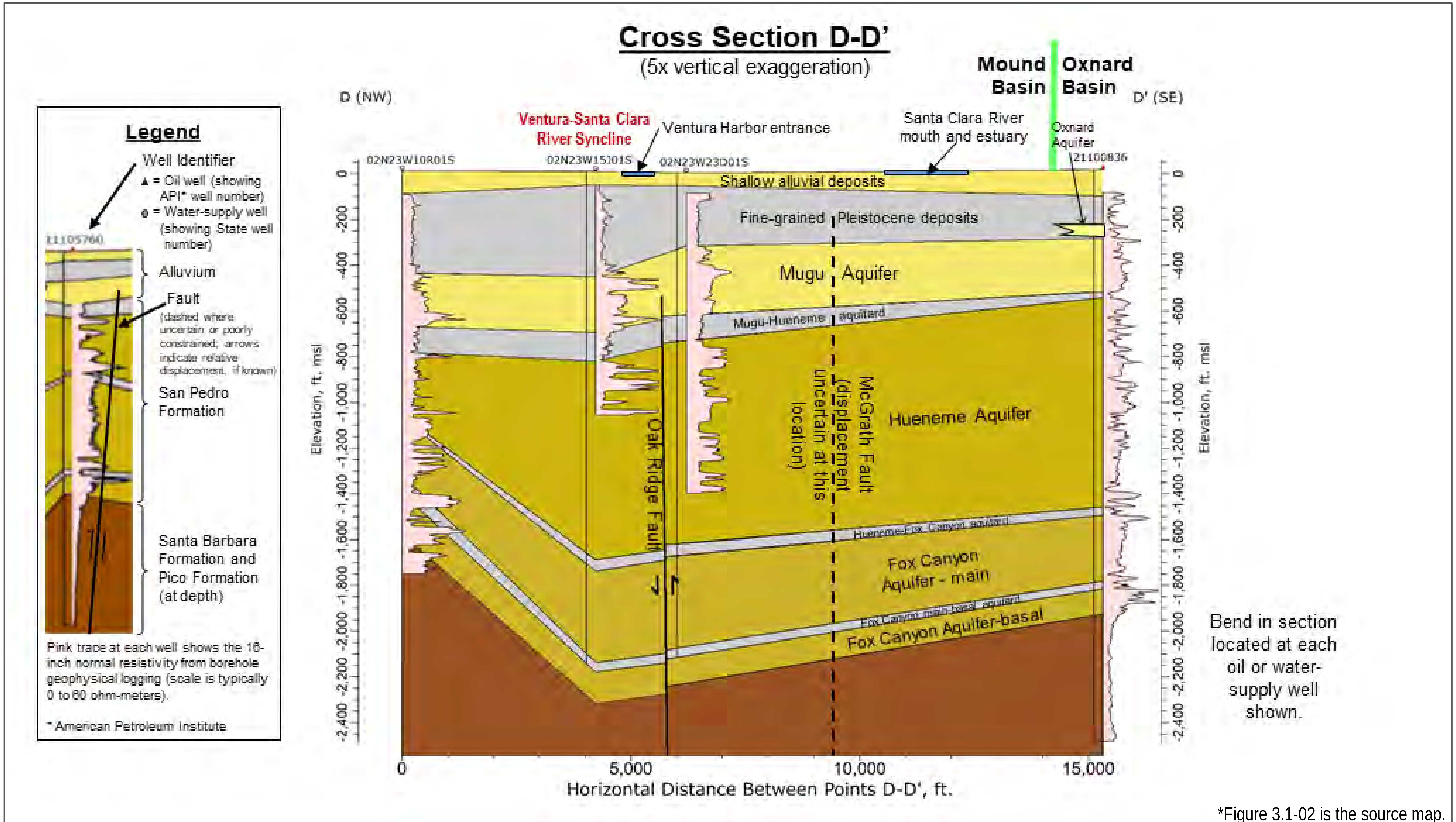


Figure 3.1-08 Cross Section D-D' (transverse).

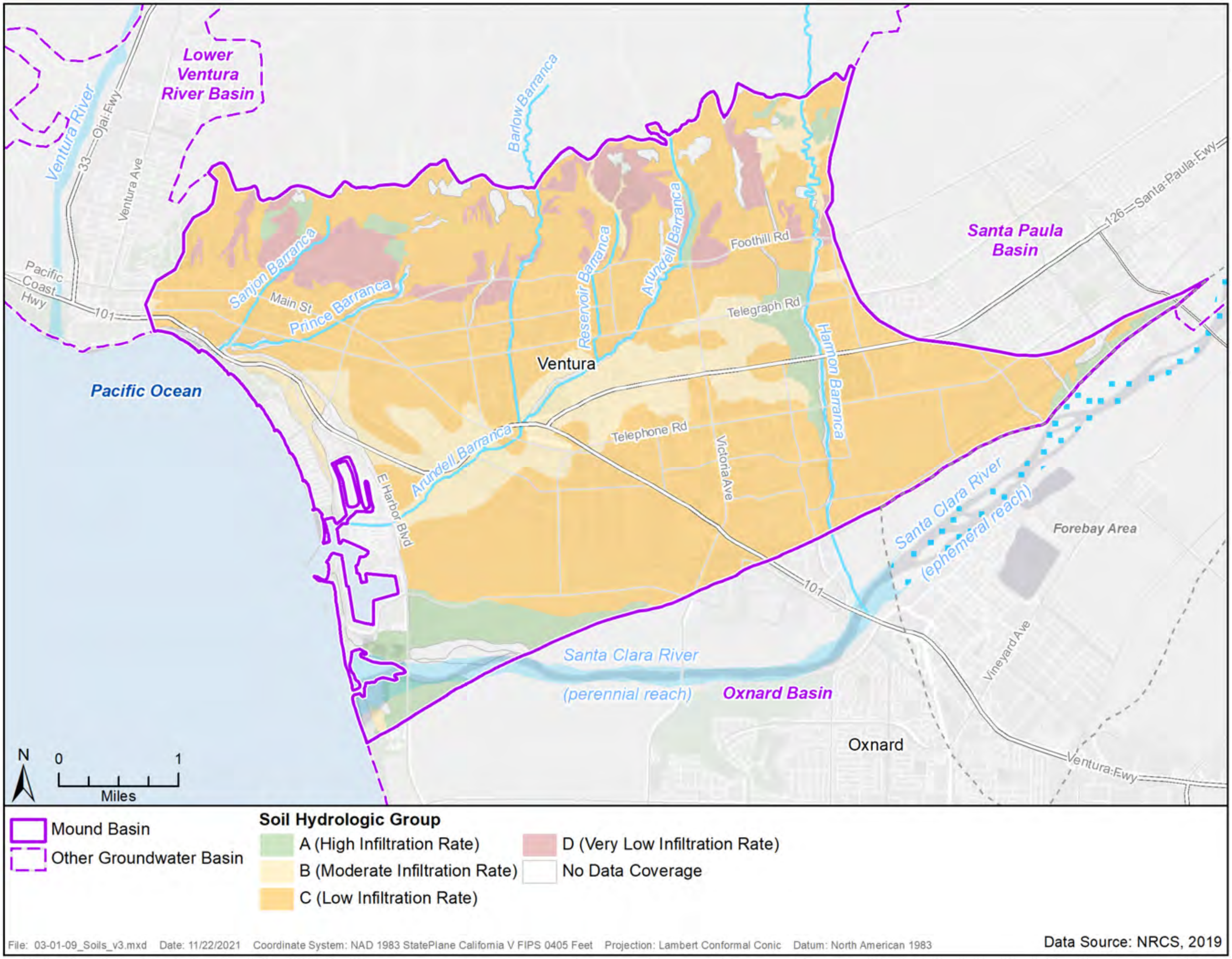


Figure 3.1-09 Soil Characteristics Map.

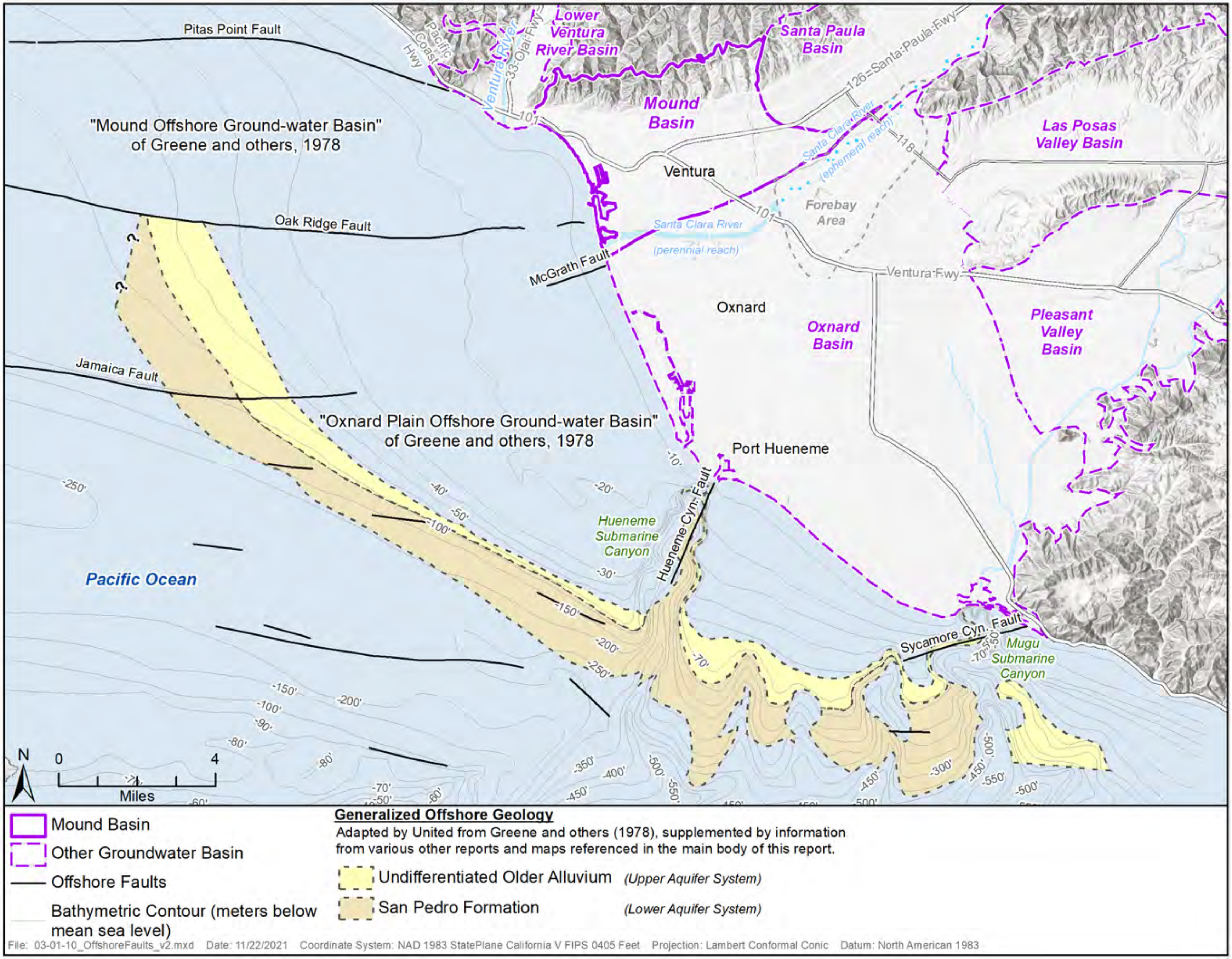


Figure 3.1-10 Offshore Geologic Conditions Influencing Potential for Seawater Intrusion.

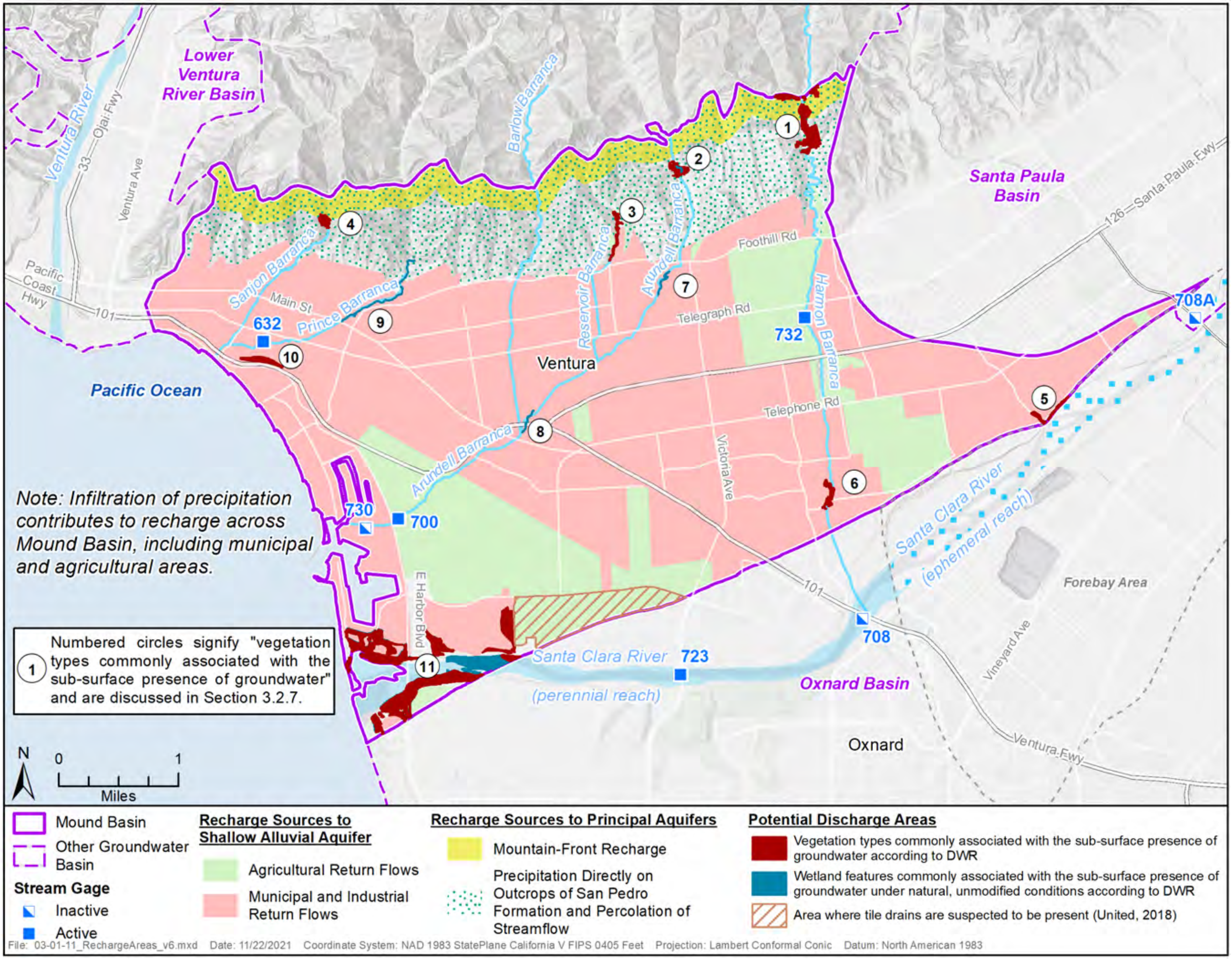


Figure 3.1-11 Map of Groundwater Recharge and Discharge Areas in Mound Basin.

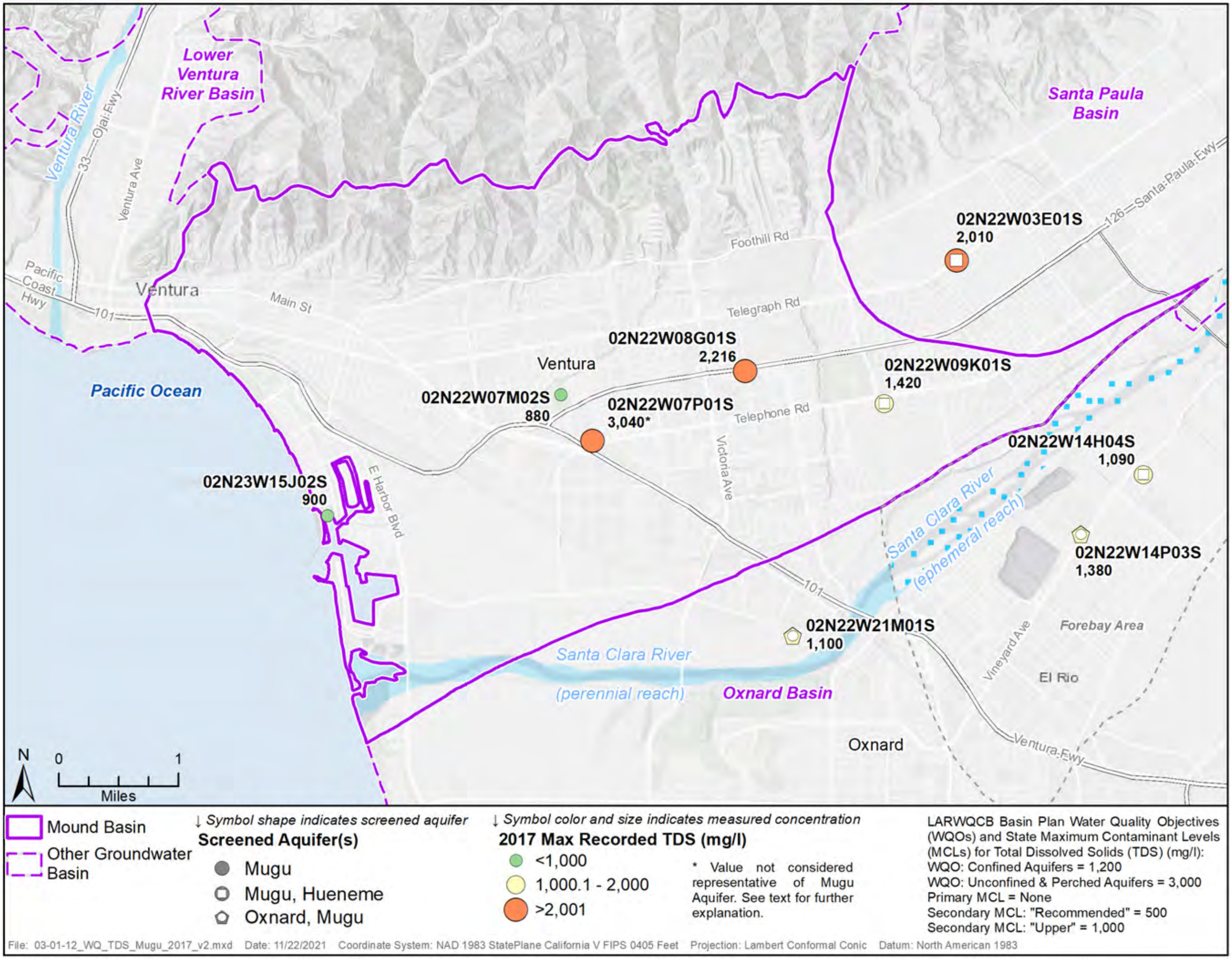


Figure 3.1-12 Maximum TDS Concentrations Detected in Mugu Aquifer during 2017.

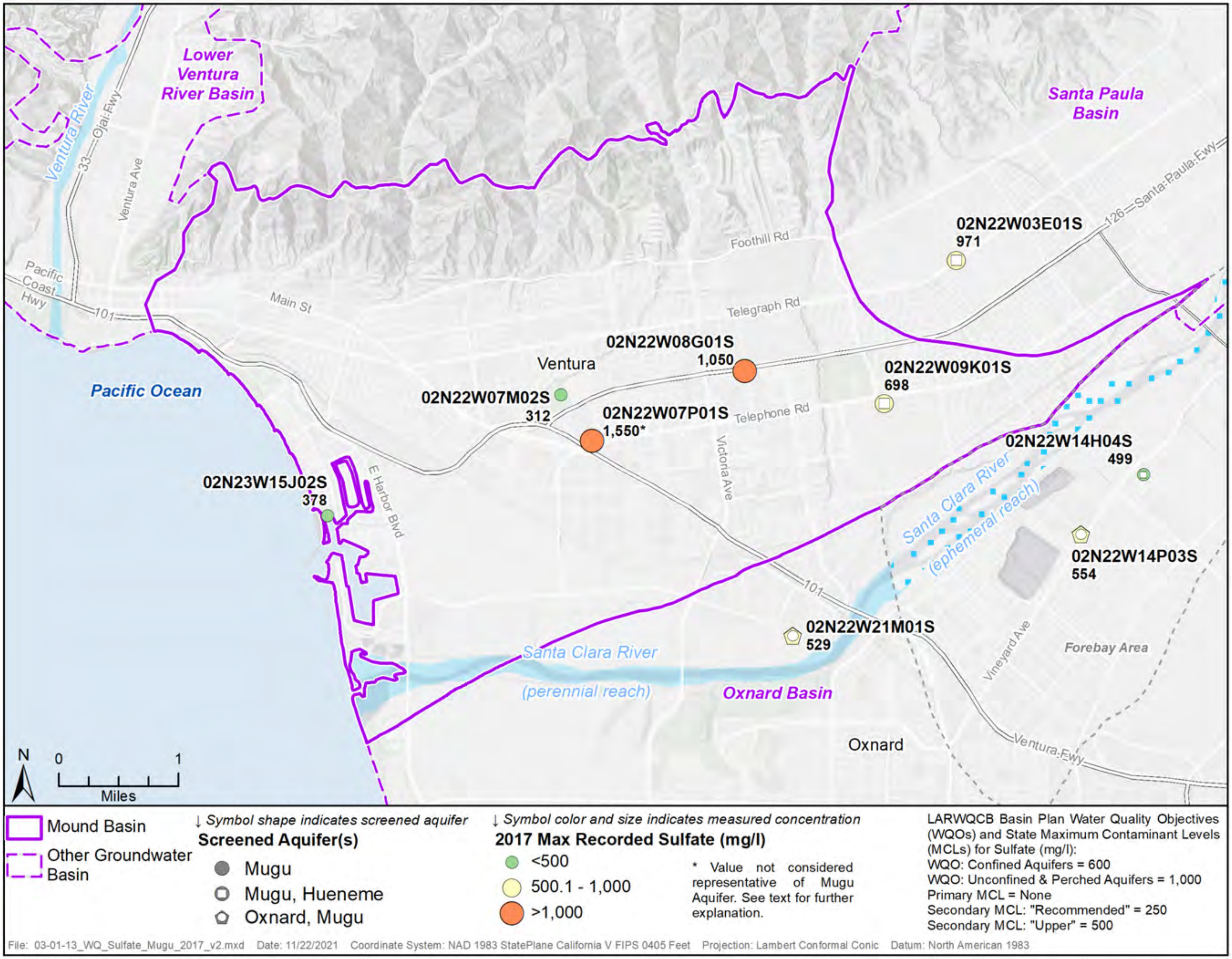


Figure 3.1-13 Maximum Sulfate Concentrations Detected in Mugu Aquifer during 2017.

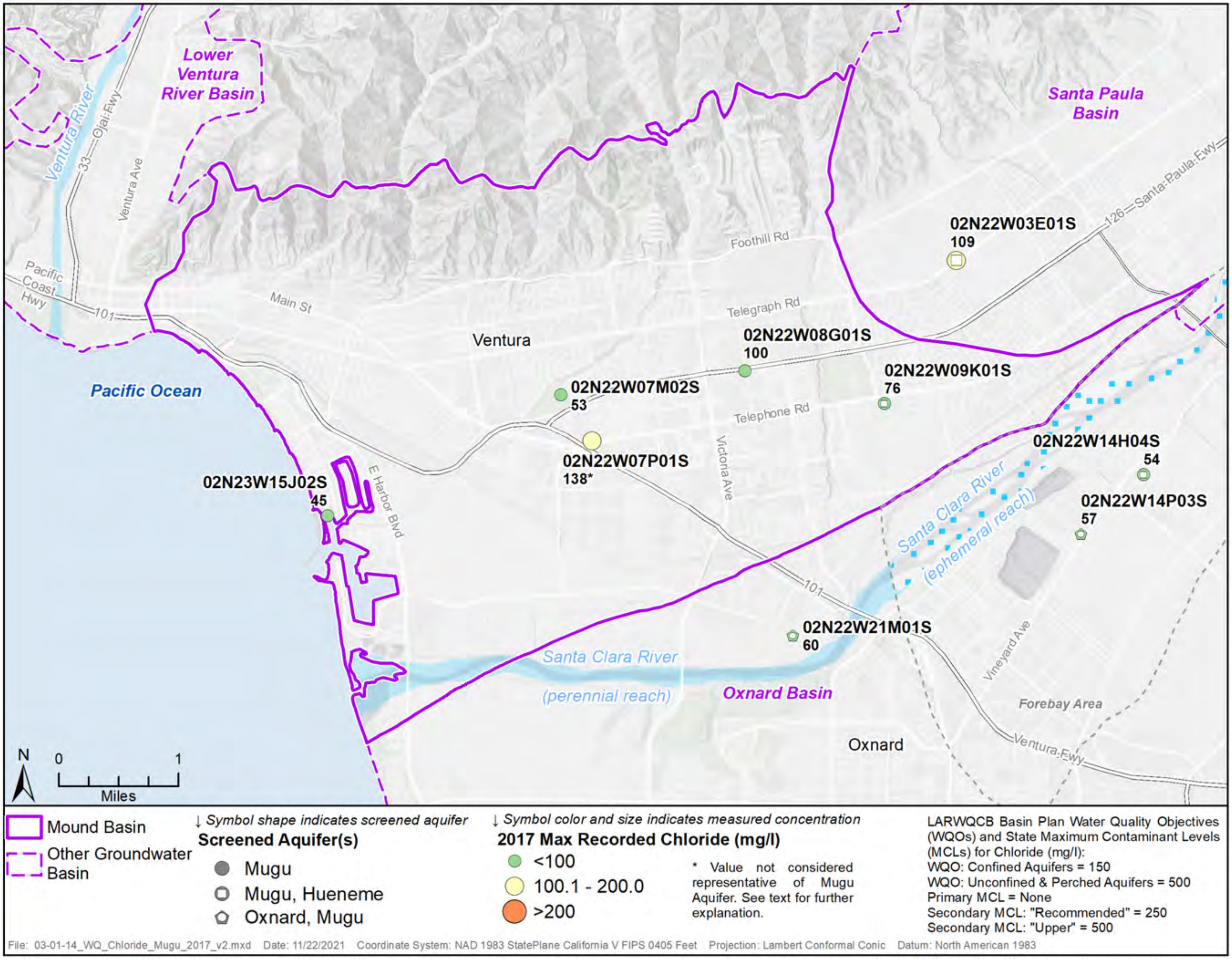


Figure 3.1-14 Maximum Chloride Concentrations Detected in Mugu Aquifer during 2017.

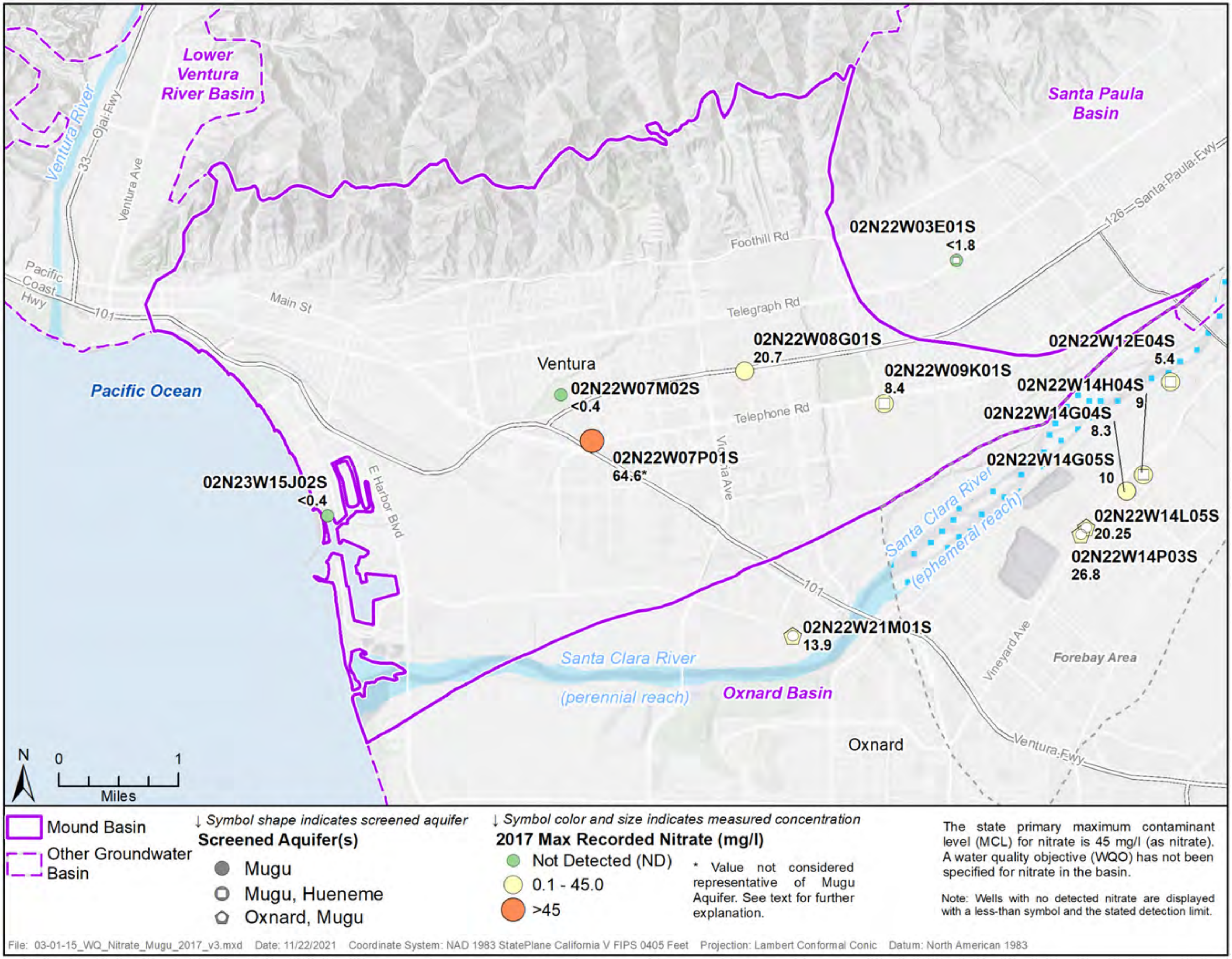


Figure 3.1-15 Maximum Nitrate Concentrations Detected in Mugu Aquifer during 2017.

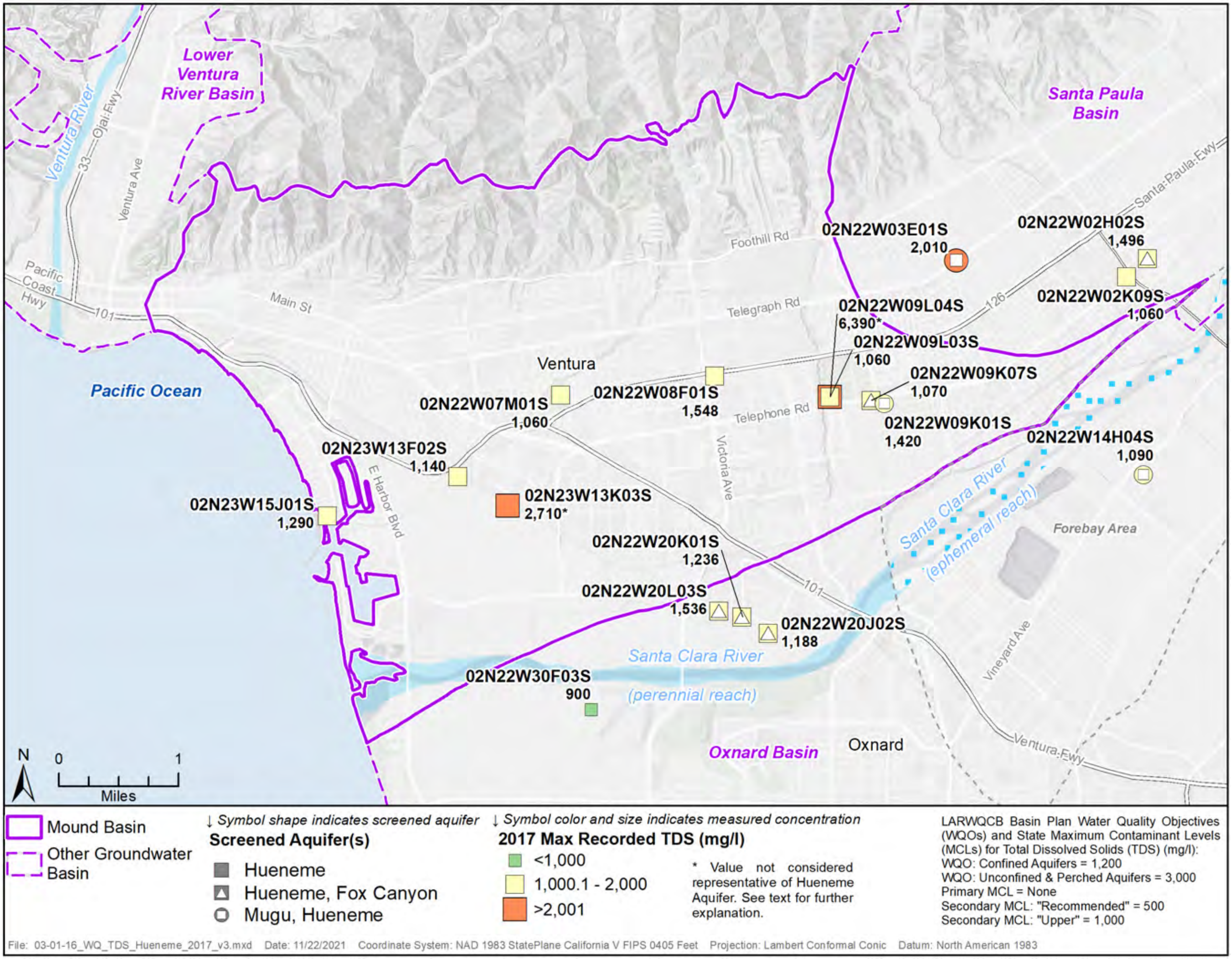


Figure 3.1-16 Maximum TDS Concentrations Detected in Hueneme Aquifer during 2017.

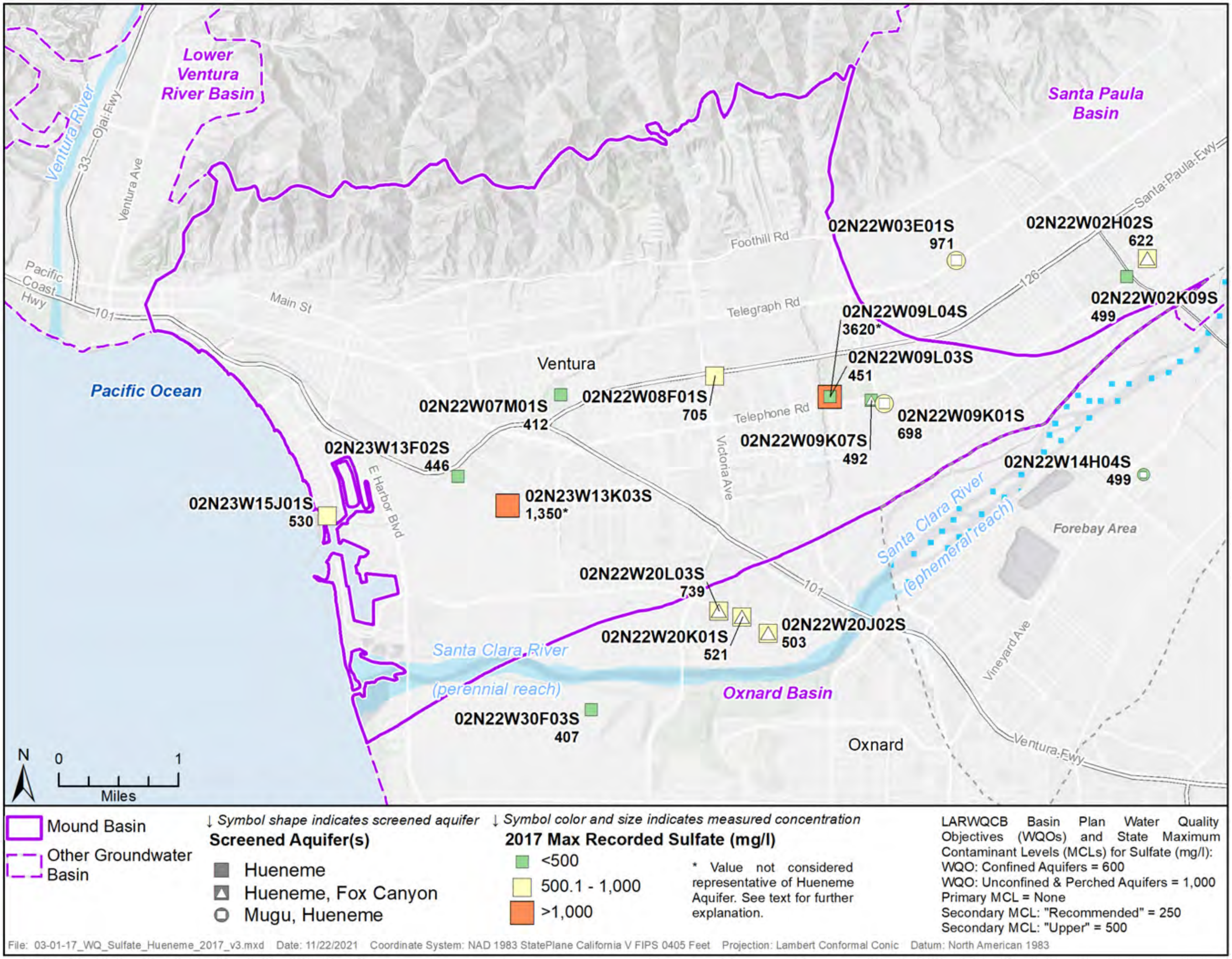


Figure 3.1-17 Maximum Sulfate Concentrations Detected in Hueneme Aquifer during 2017.

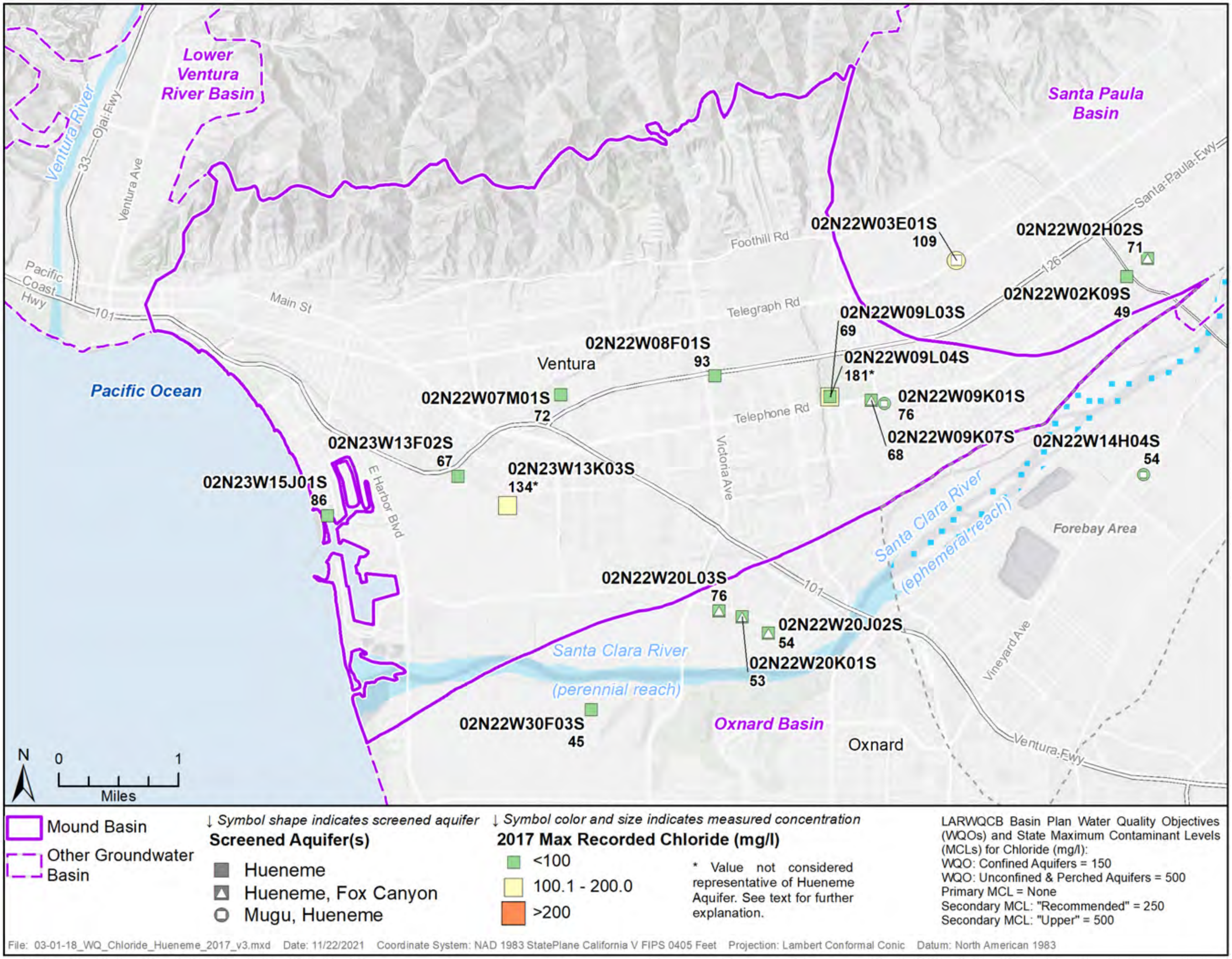


Figure 3.1-18 Maximum Chloride Concentrations Detected in Hueneme Aquifer during 2017.

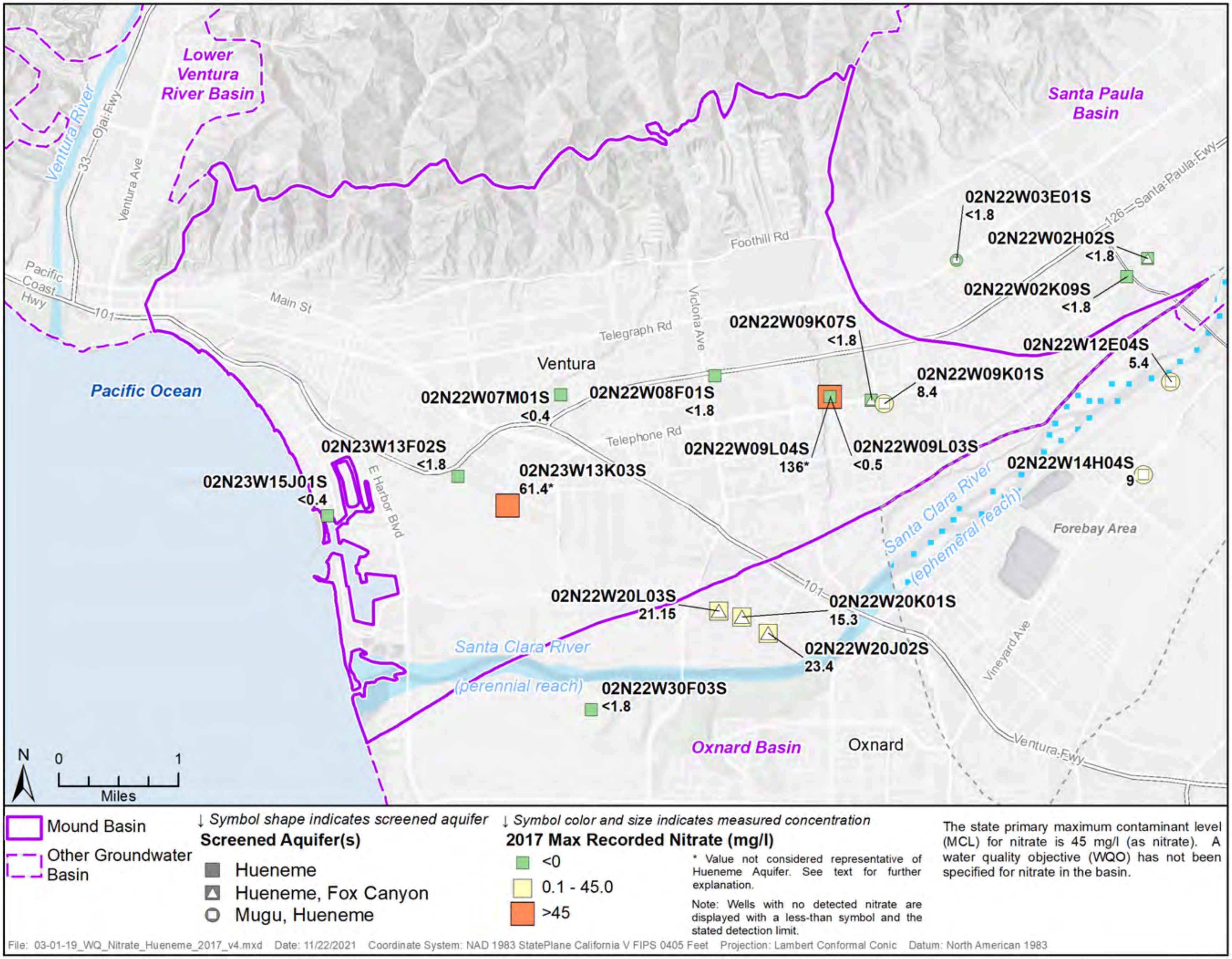


Figure 3.1-19 Maximum Nitrate Concentrations Detected in Hueneme Aquifer during 2017.

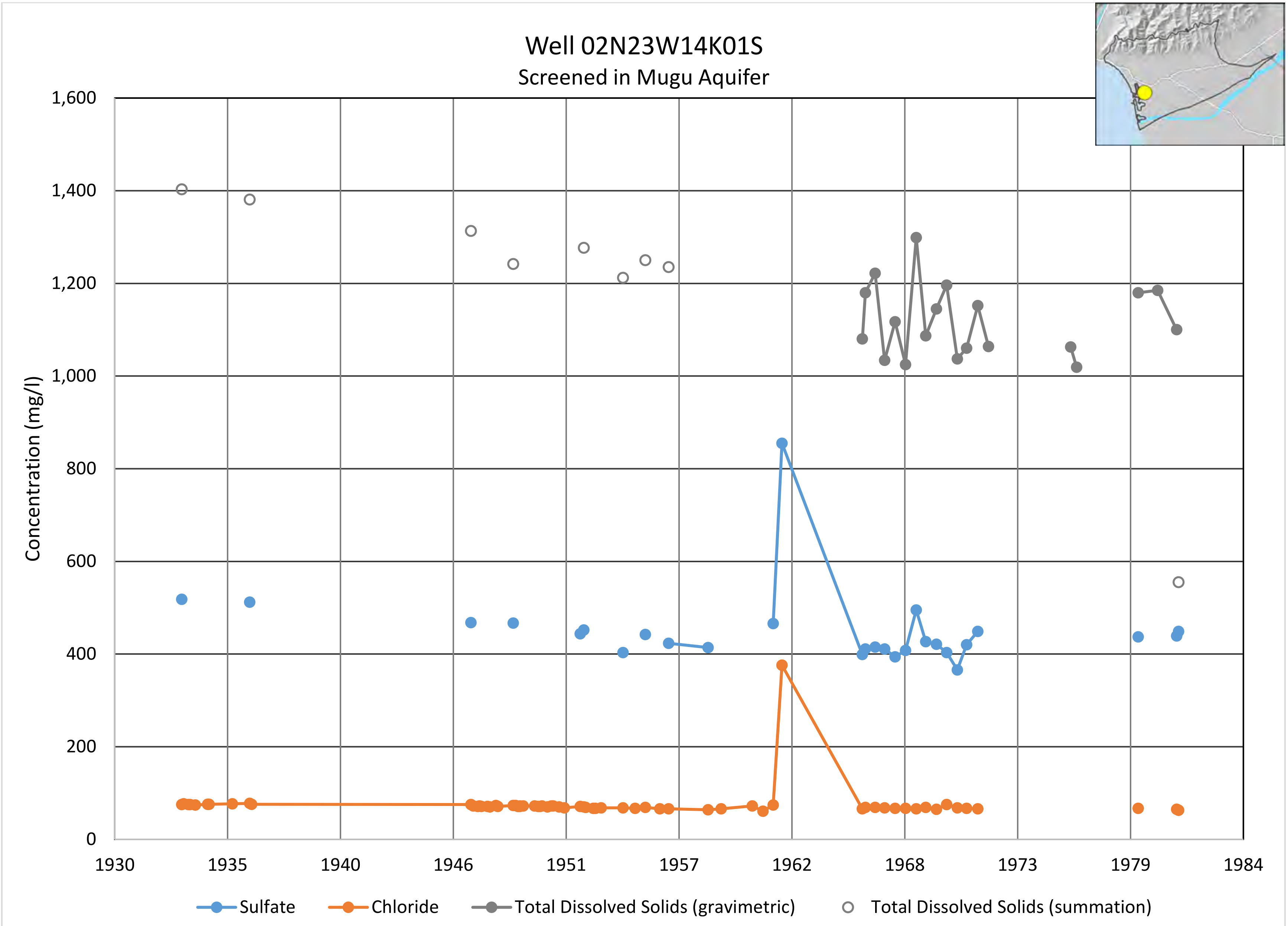
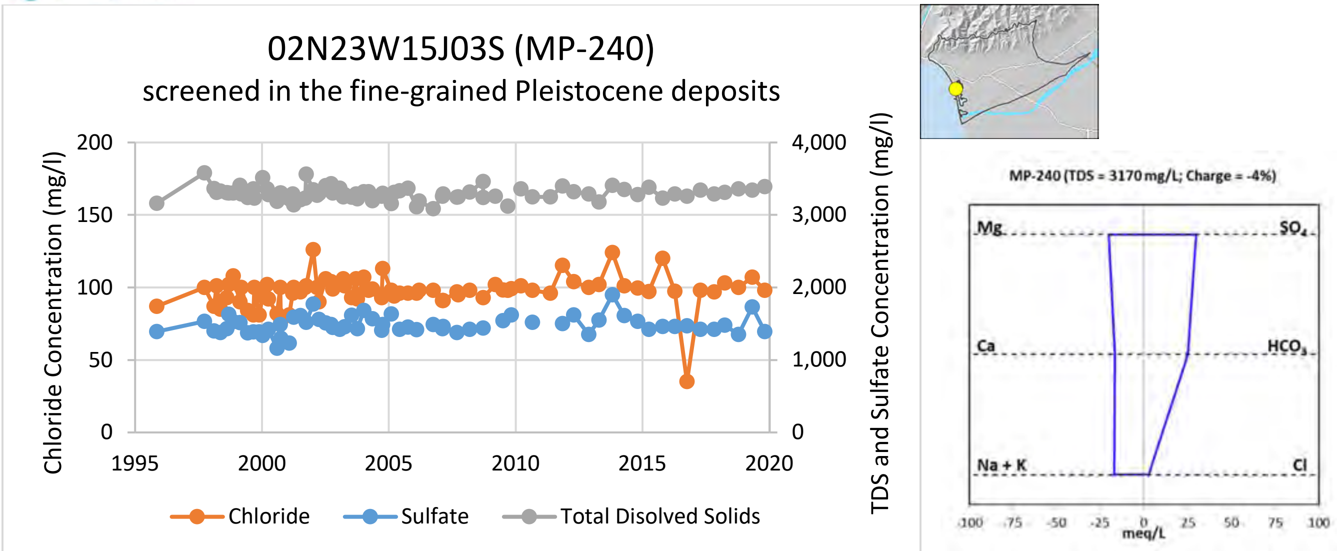
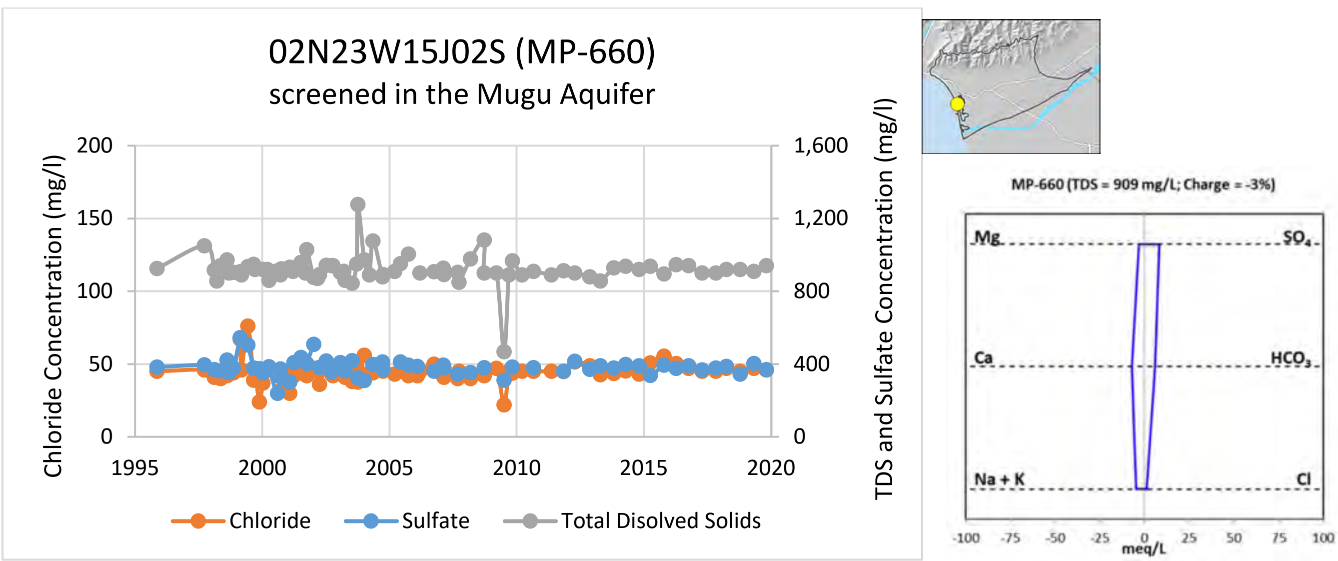


Figure 3.1-20 Well 02N23W14K01S Time Series Data: TDS, Sulfate, and Chloride Records.



Note: To more clearly depict concentration trends for TDS and sulfate, the vertical axis on the right side of the plot above has a different scale than the vertical axis on the right side of the plots below.



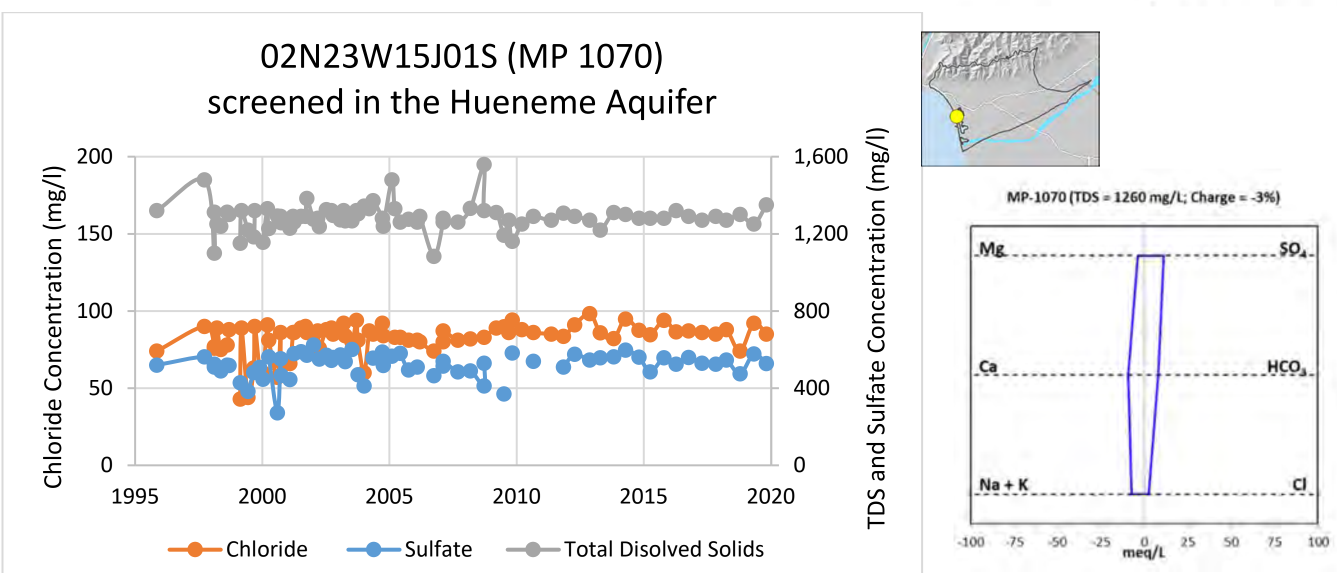
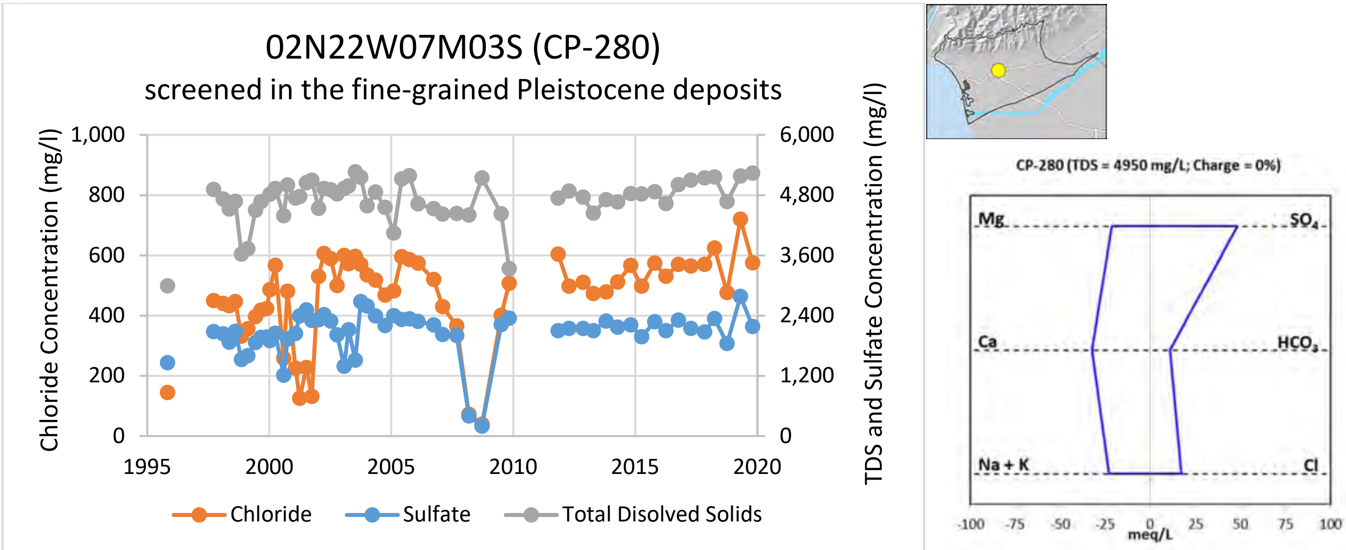
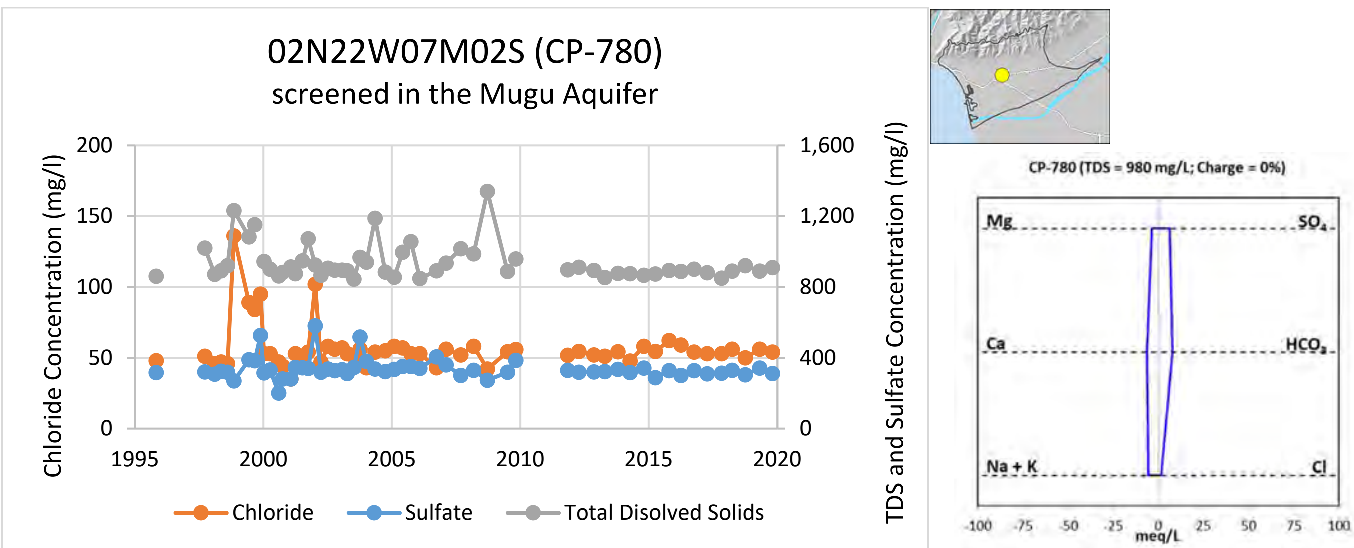


Figure 3.1-21 Monitoring Well Marina Park Time Series Data with Stiff Diagrams: TDS, Sulfate, and Chloride Records.



Note: To more clearly depict concentration trends for chloride, TDS and sulfate, the vertical axis on the left and right side of the plot above have different scales than the vertical axes on both sides of the plots below.



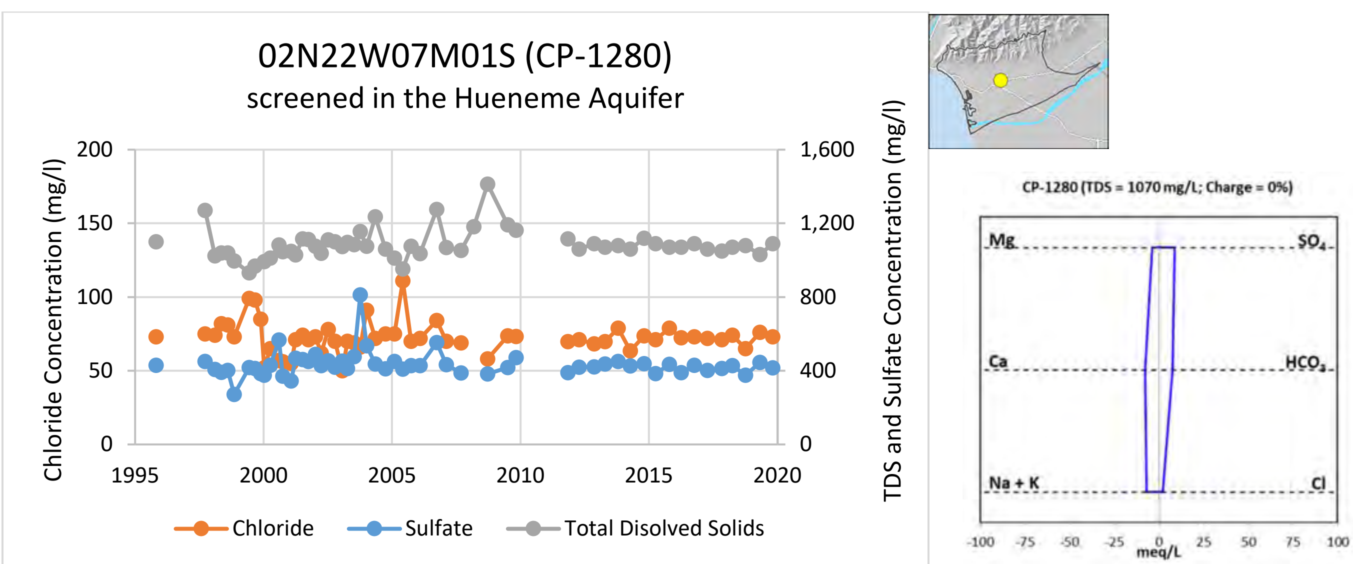
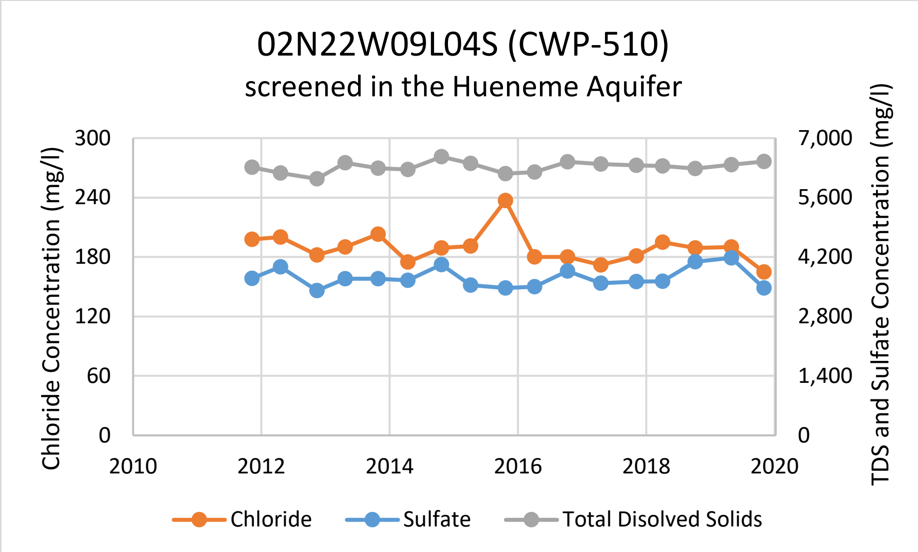
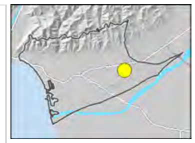
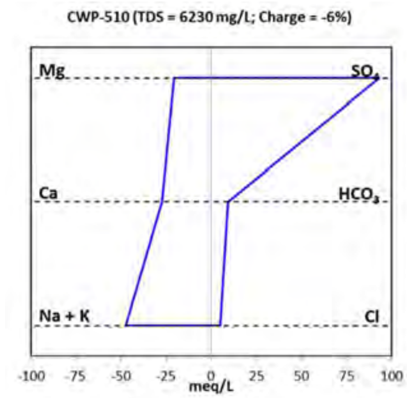


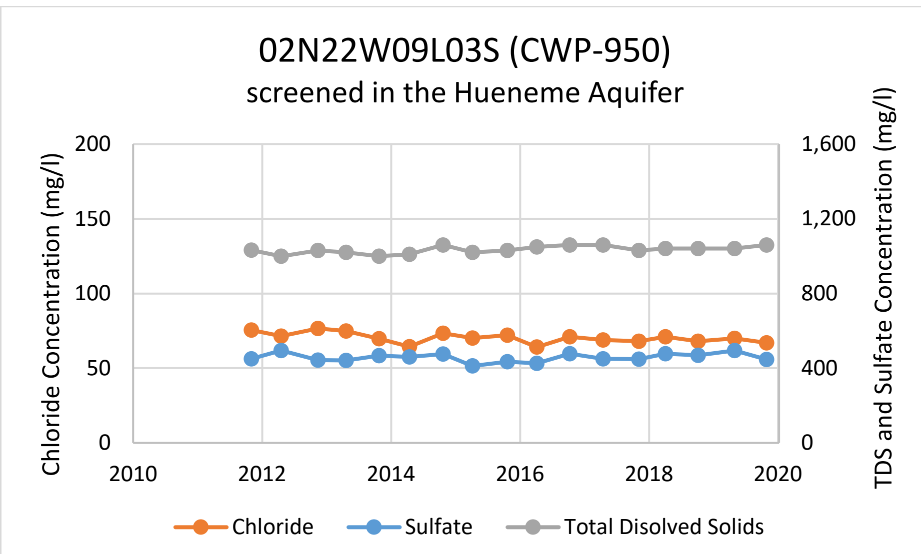
Figure 3.1-22 Monitoring Well Camino Real Park Time Series Data with Stiff Diagrams: TDS, Sulfate, and Chloride Records.







Note: To more clearly depict concentration trends for chloride, TDS and sulfate, the vertical axis on the left and right side of the plot above have different scales than the vertical axes on both sides of the plot below.



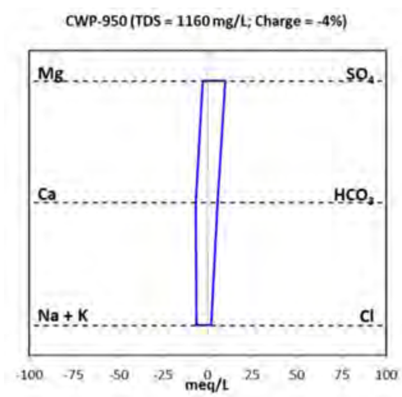


Figure 3.1-23 Monitoring Well Community Water Park Time Series Data with Stiff Diagrams: TDS, Sulfate, and Chloride Records.

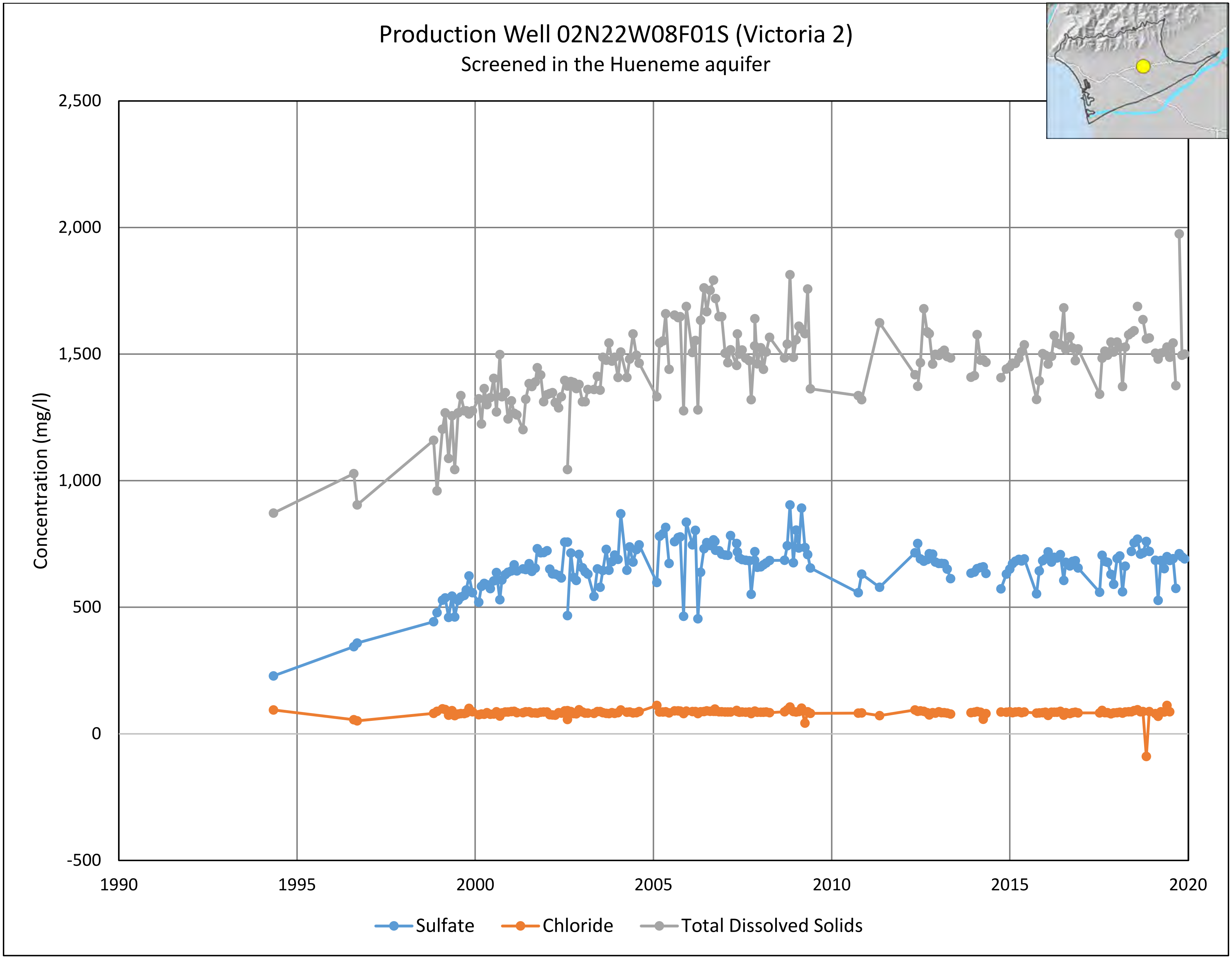


Figure 3.1-24 Well 02N22W08F01S Time Series Data: TDS, Sulfate, and Chloride Records.

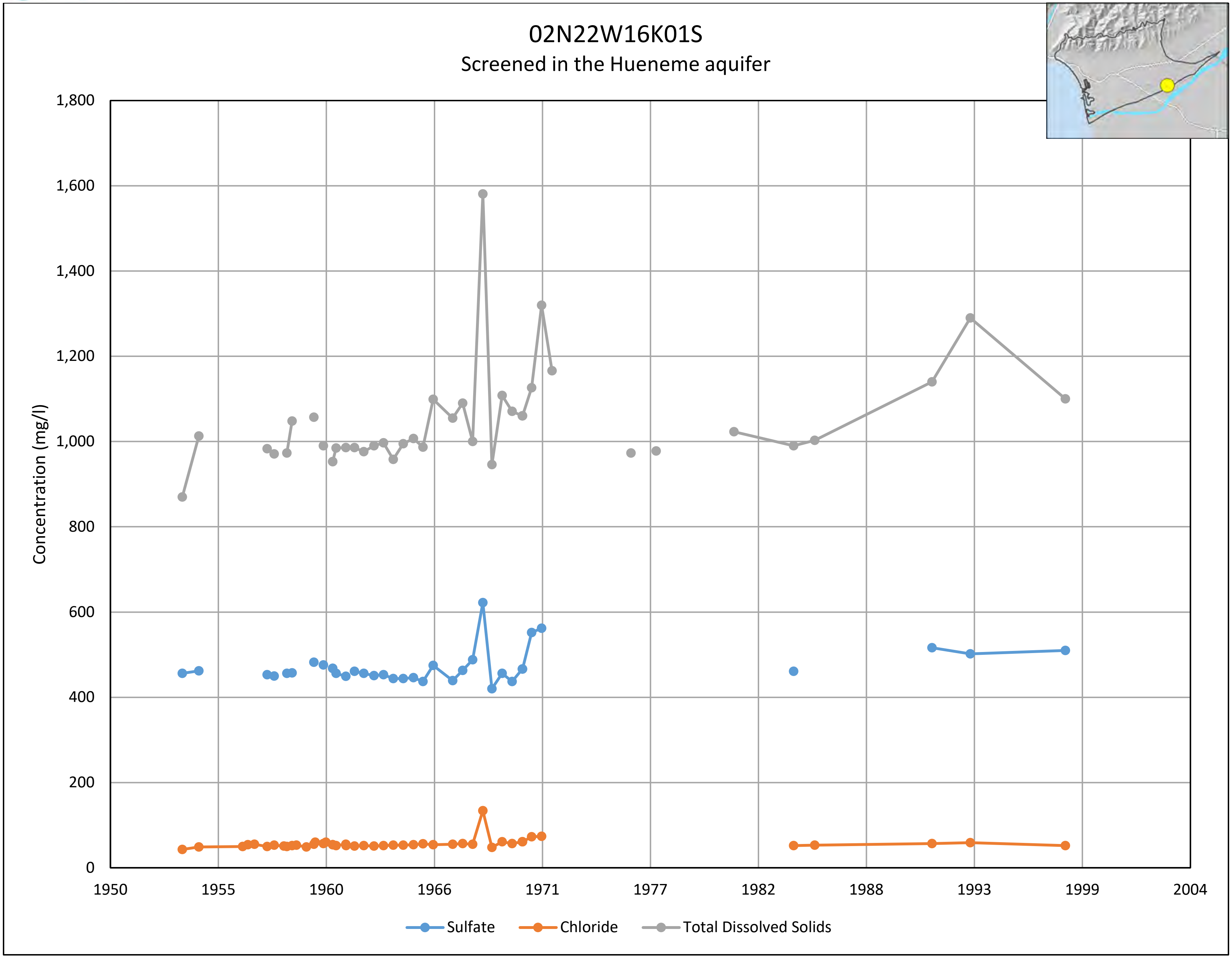


Figure 3.1-25 Well 02N23W16K01S Time Series Data: TDS, Sulfate, and Chloride Records.

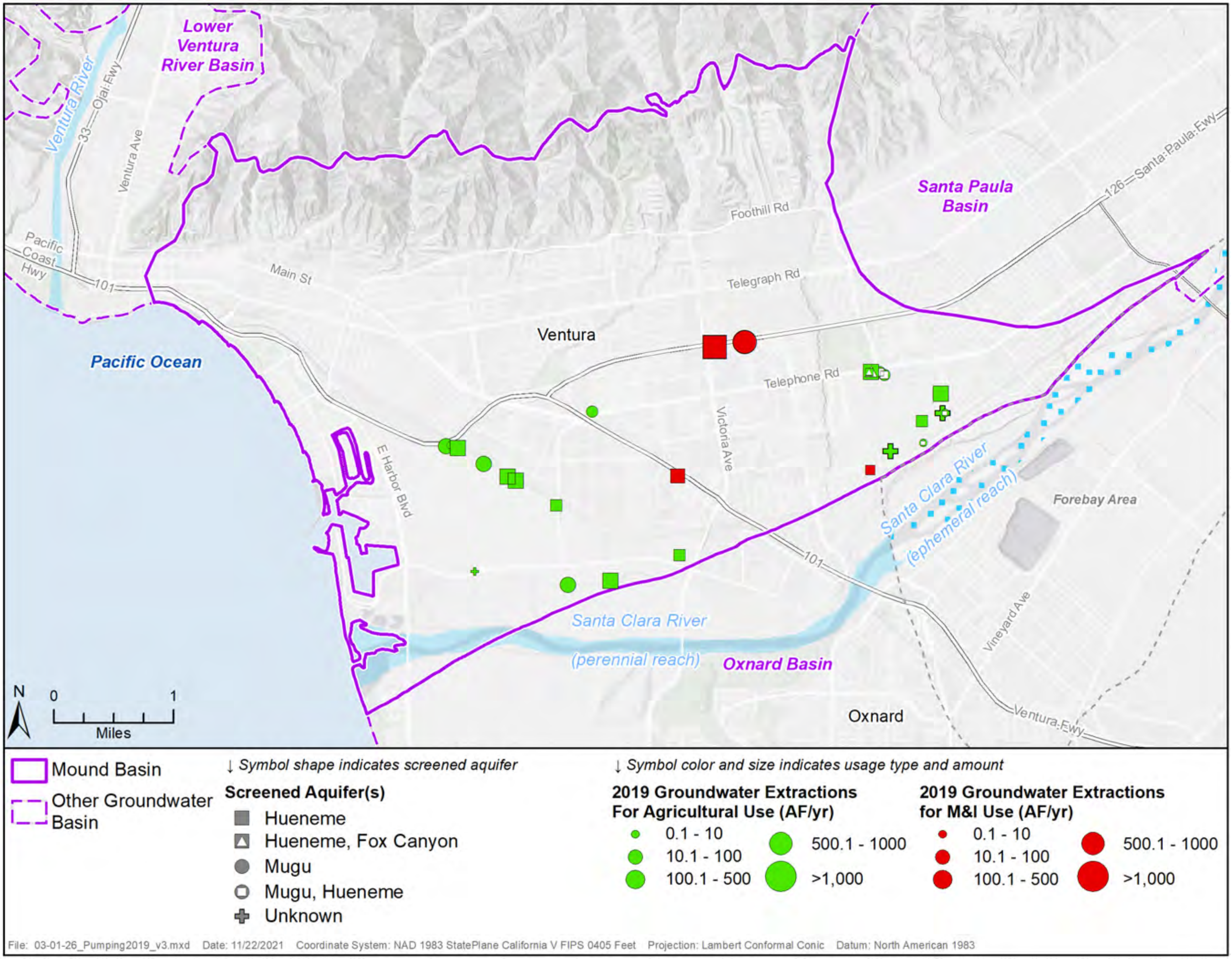


Figure 3.1-26 Map of Active Water Supply Wells in Mound Basin, Showing Groundwater Extractions in 2019.

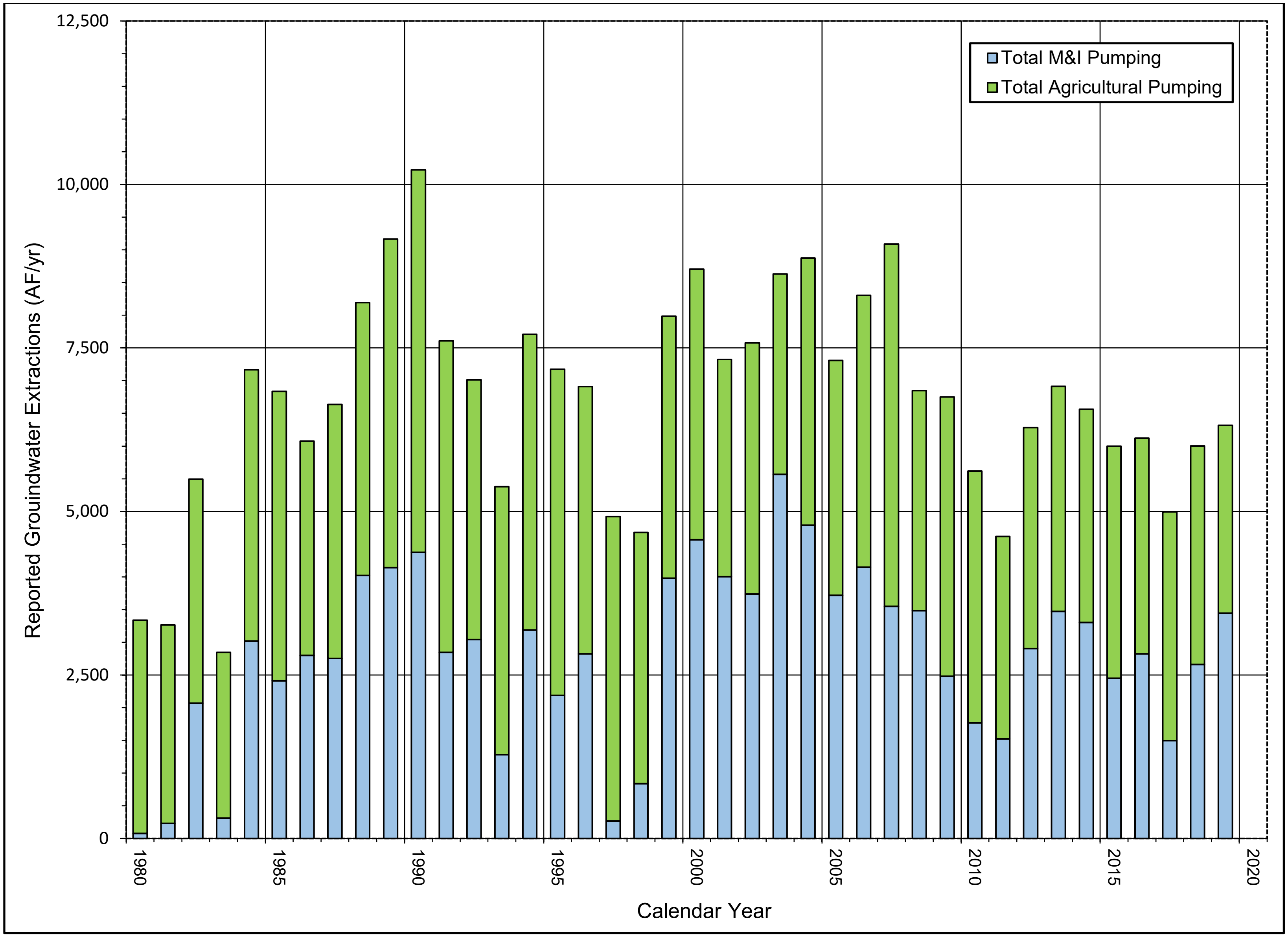


Figure 3.1-27 Graph of Historical (1980-2019) Groundwater Extractions from Mound Basin by Use Sector.

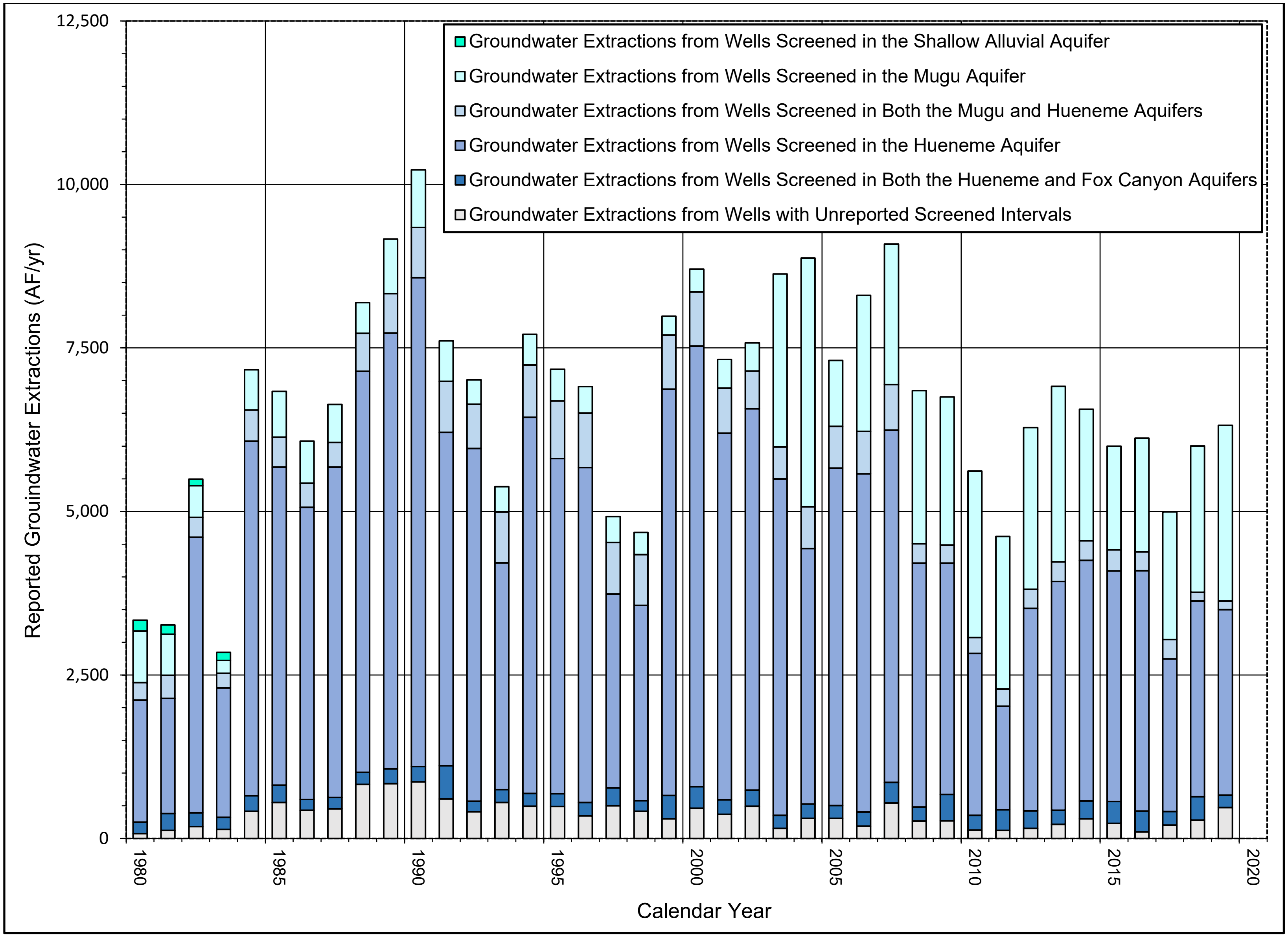


Figure 3.1-28 Graph of Historical (1980-2019) Groundwater Extractions from Mound Basin by Aquifer.

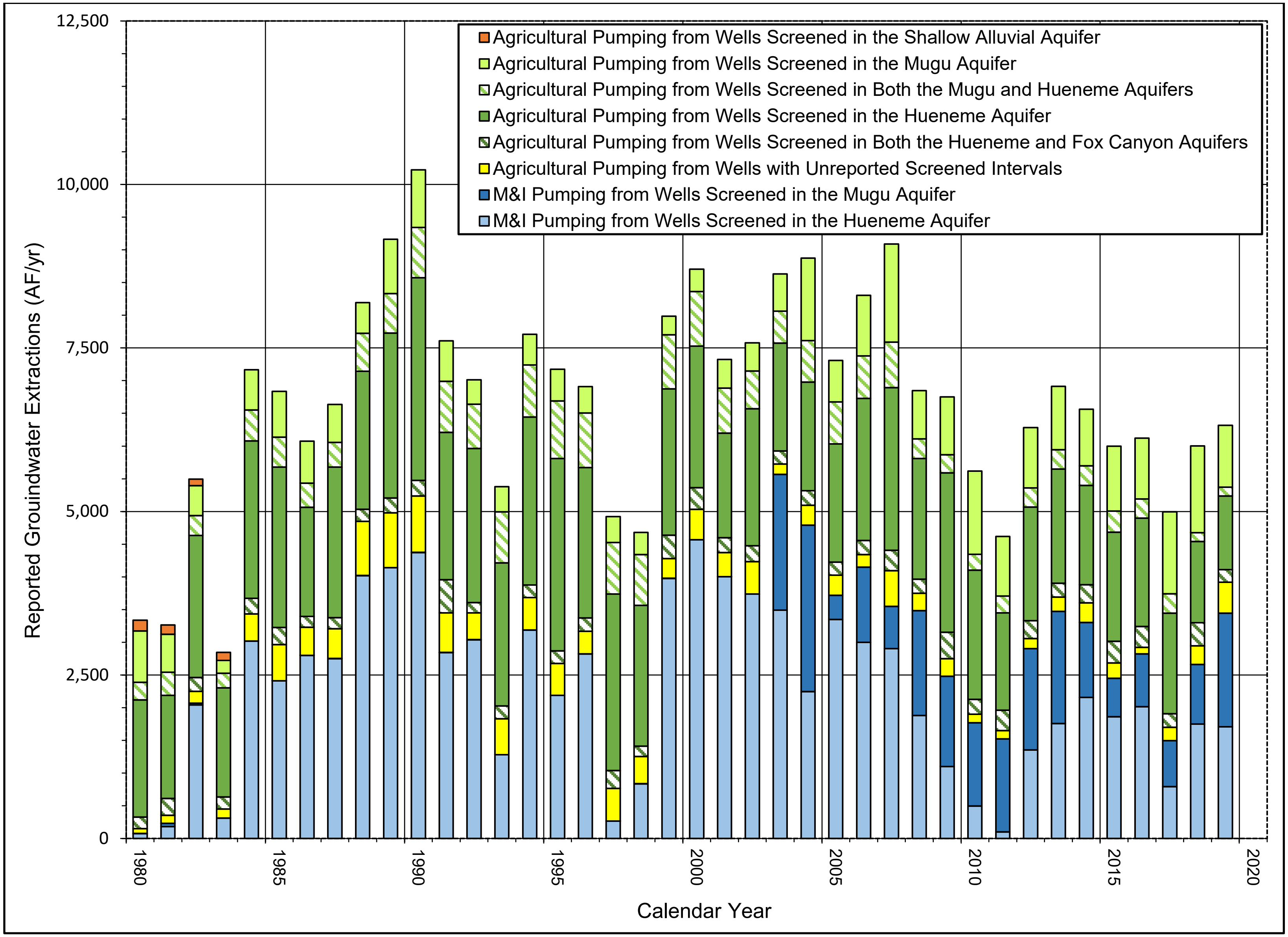


Figure 3.1-29 Graph of Historical (1980-2019) Groundwater Extractions from Mound Basin by Use Sector and Aquifer.

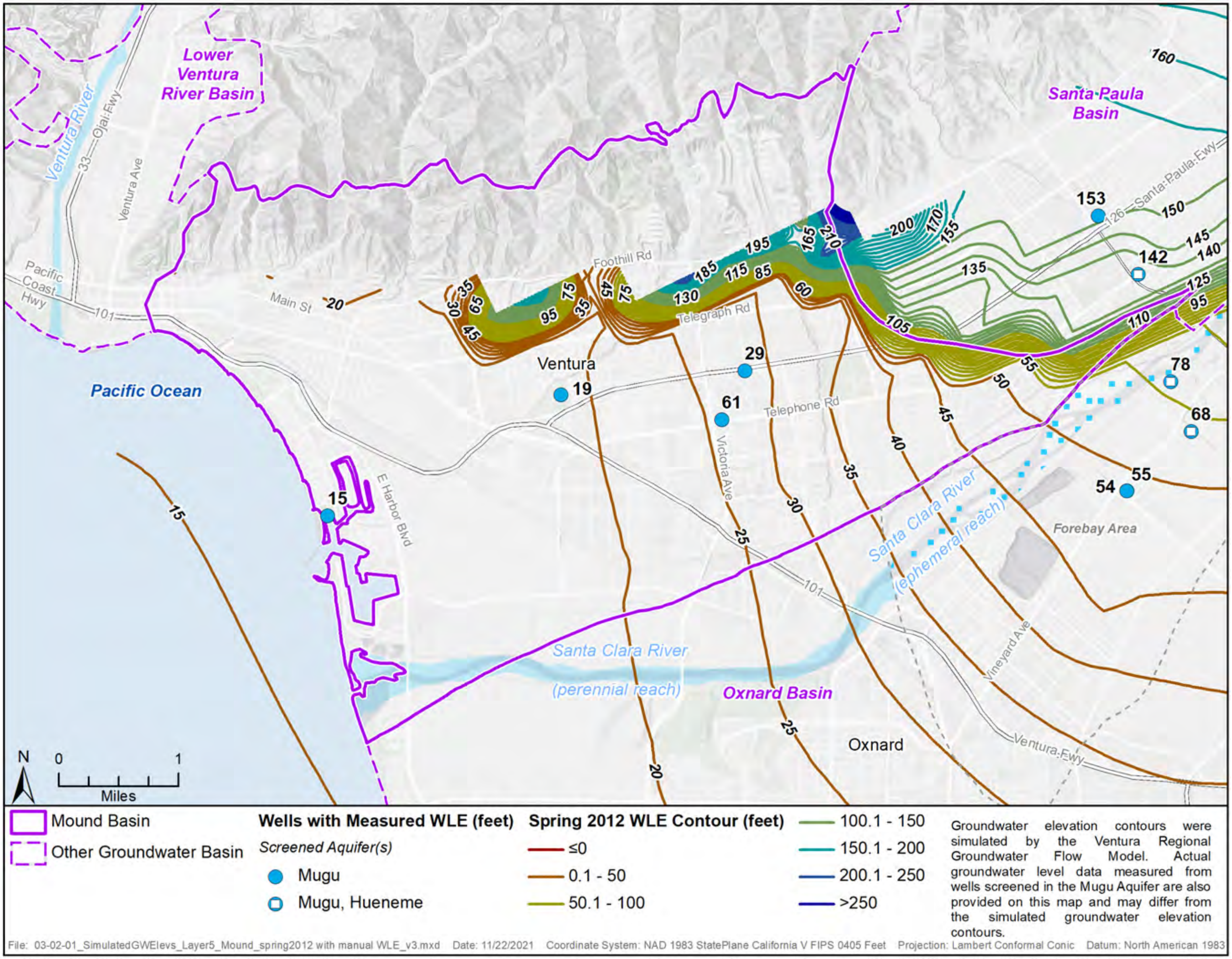


Figure 3.2-01 Water Level Elevation in Mugu Aquifer, Spring 2012.

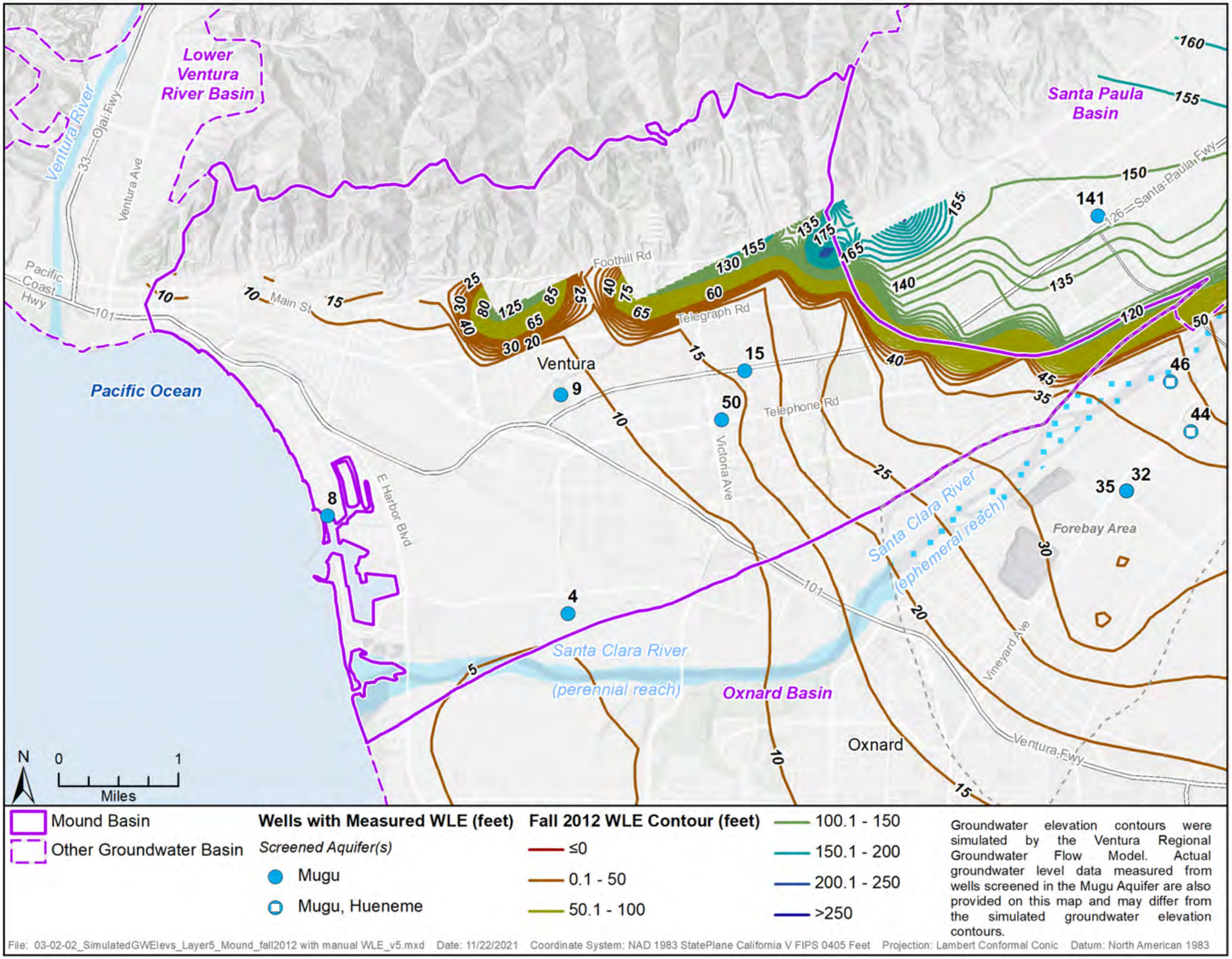


Figure 3.2-02 Water Level Elevation in Mugu Aquifer, Fall 2012.

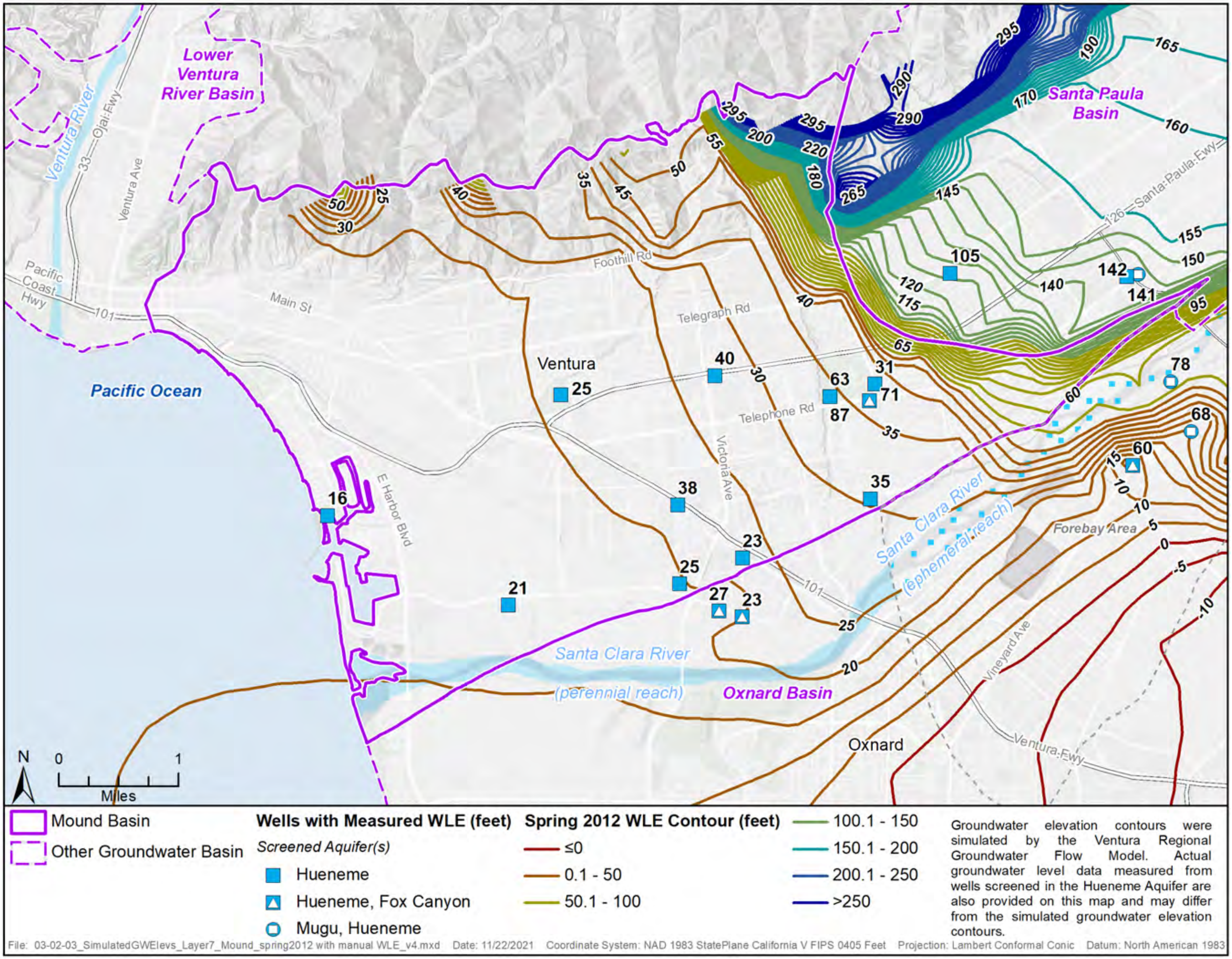


Figure 3.2-03 Water Level Elevation in Hueneme Aquifer, Spring 2012.

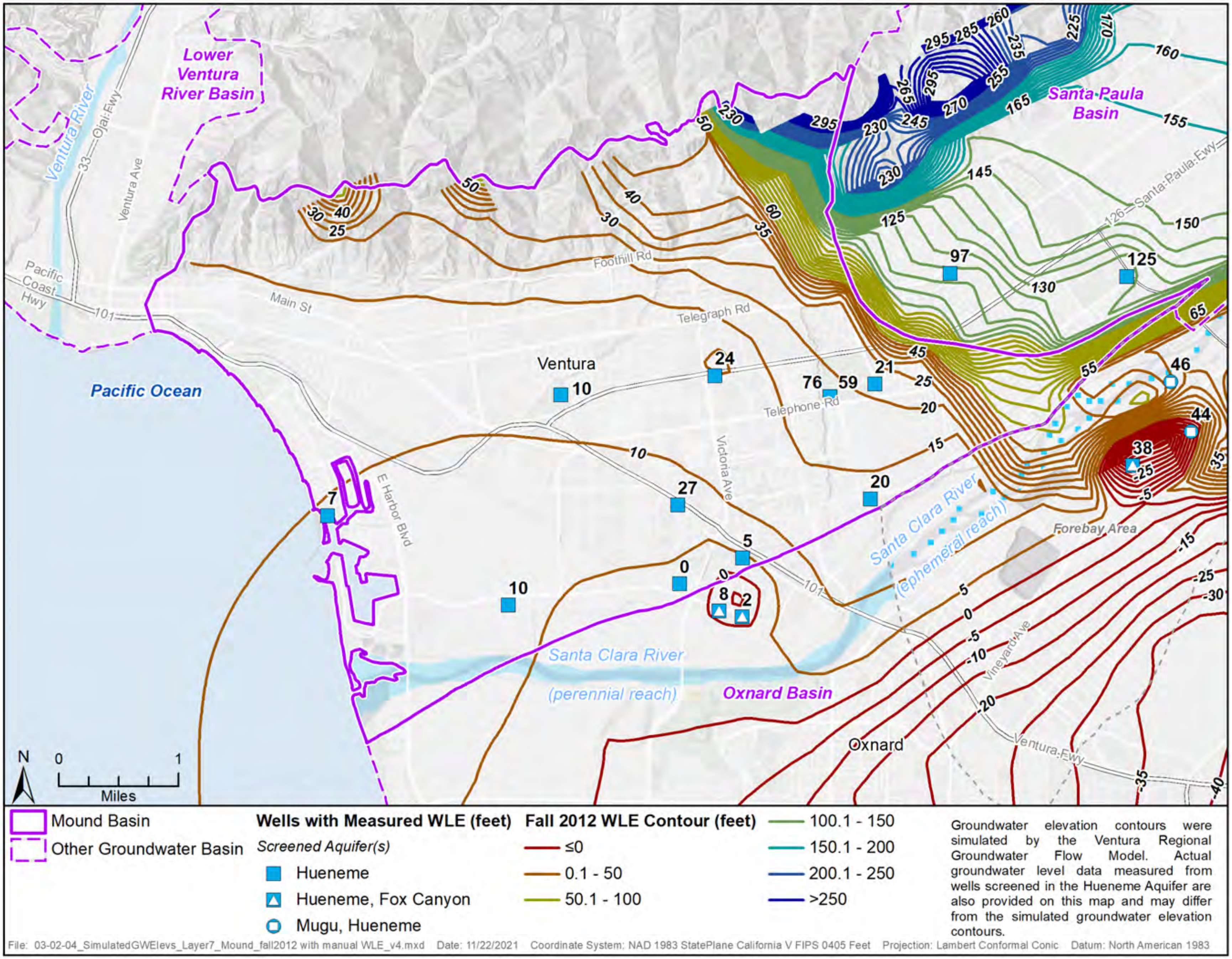


Figure 3.2-04 Water Level Elevation in Hueneme Aquifer, Fall 2012.

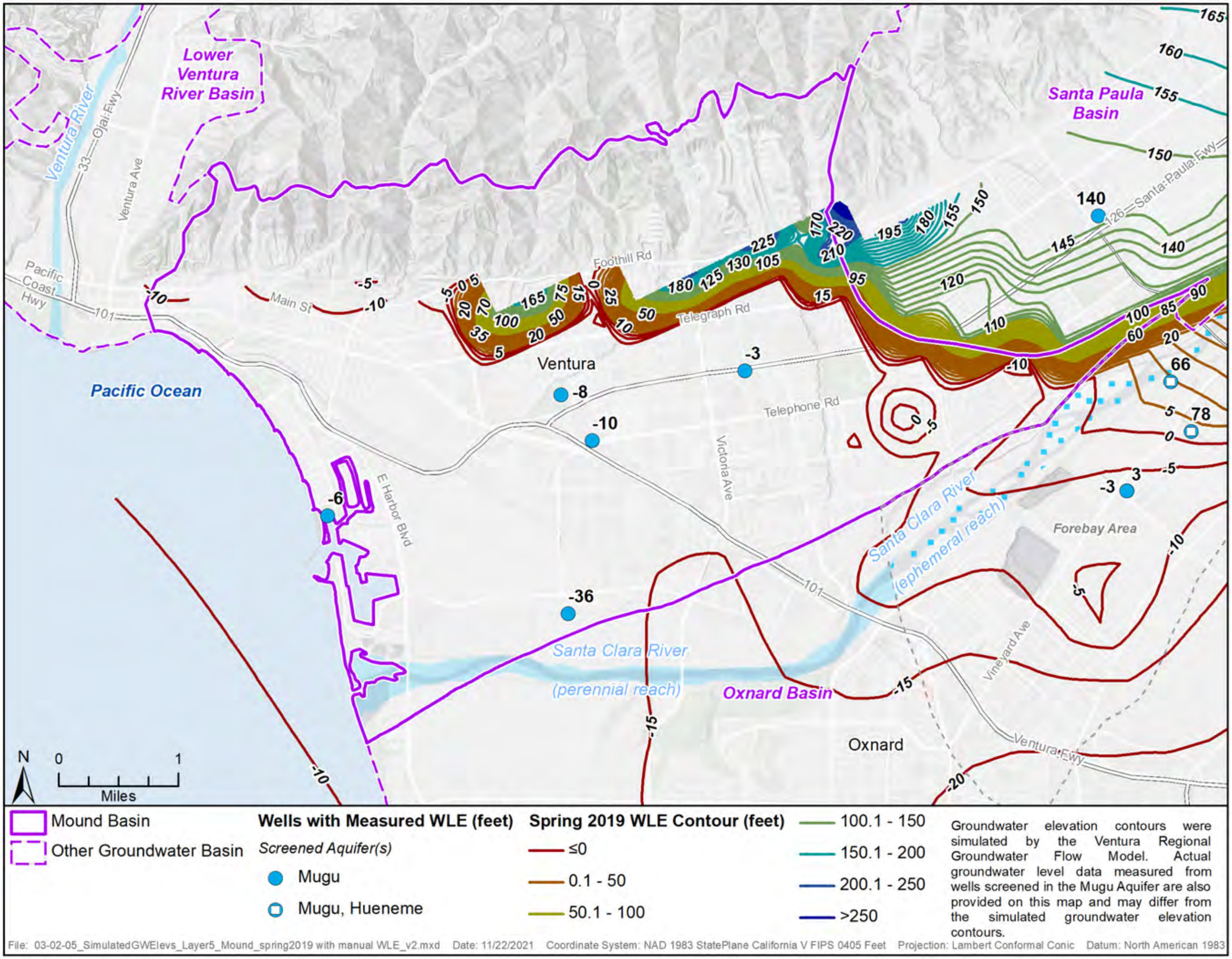


Figure 3.2-05 Water Level Elevation in Mugu Aquifer, Spring 2019.

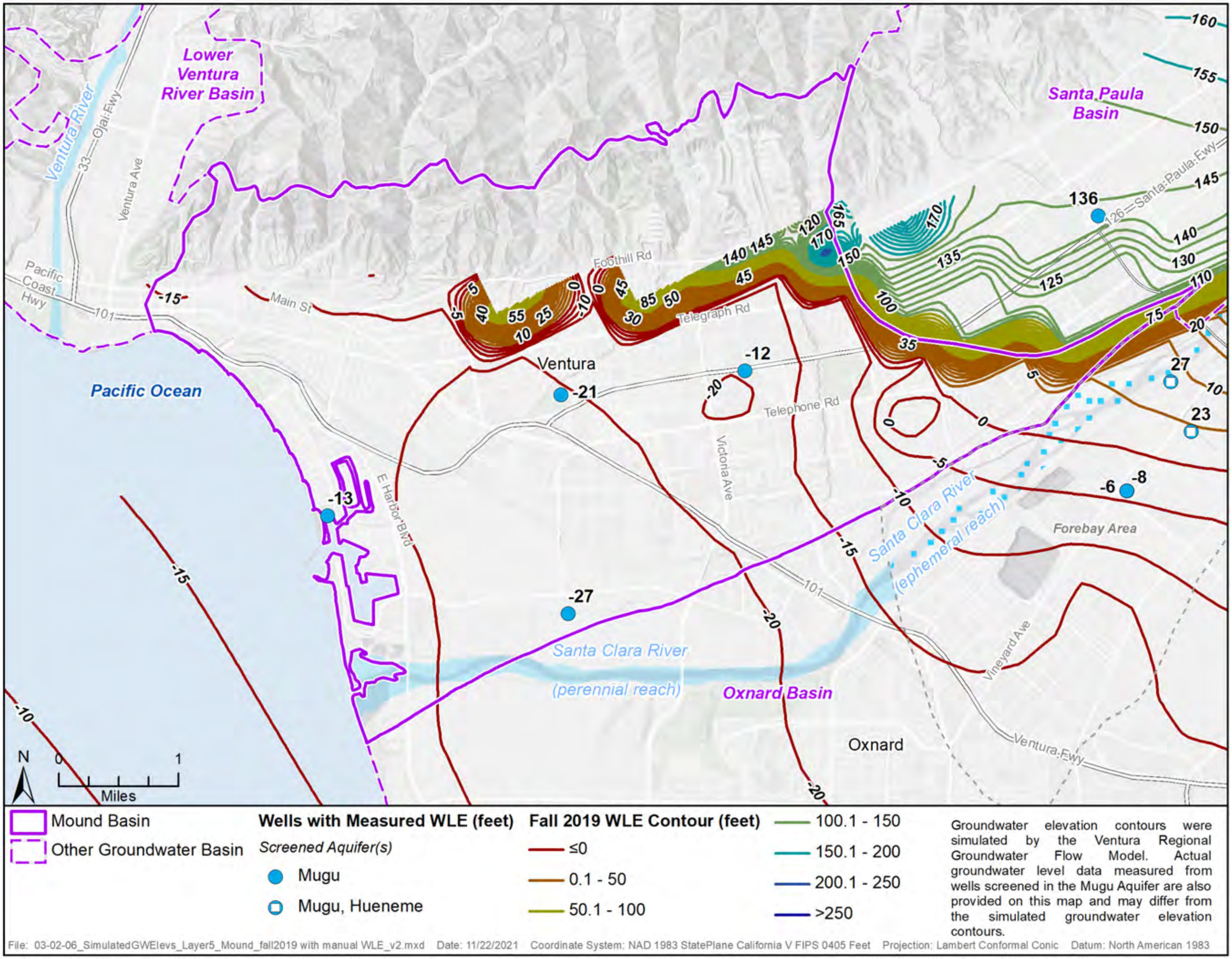


Figure 3.2-06 Water Level Elevation in Mugu Aquifer, Fall 2019.

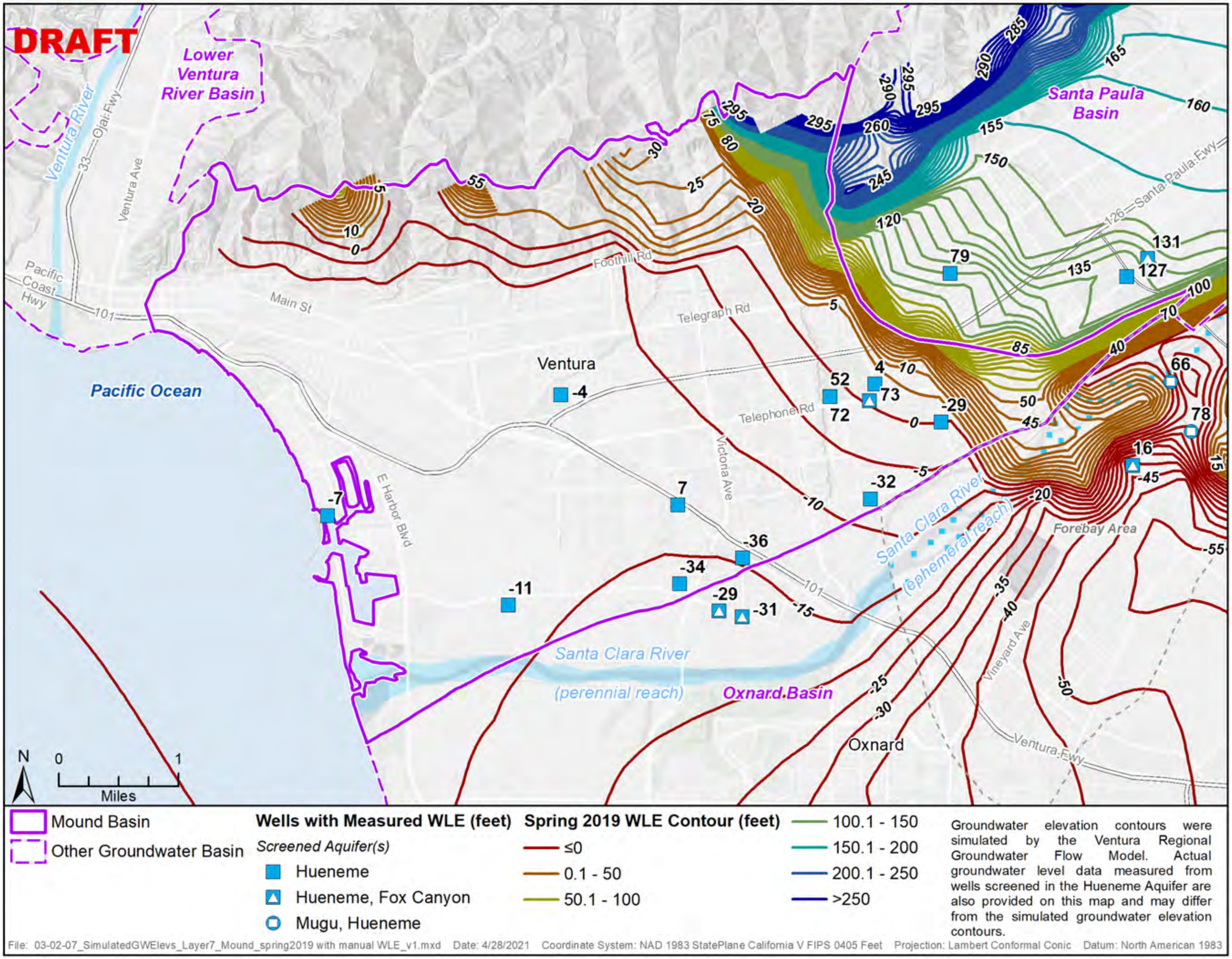


Figure 3.2-07 Water Level Elevation in Hueneme Aquifer, Spring 2019.

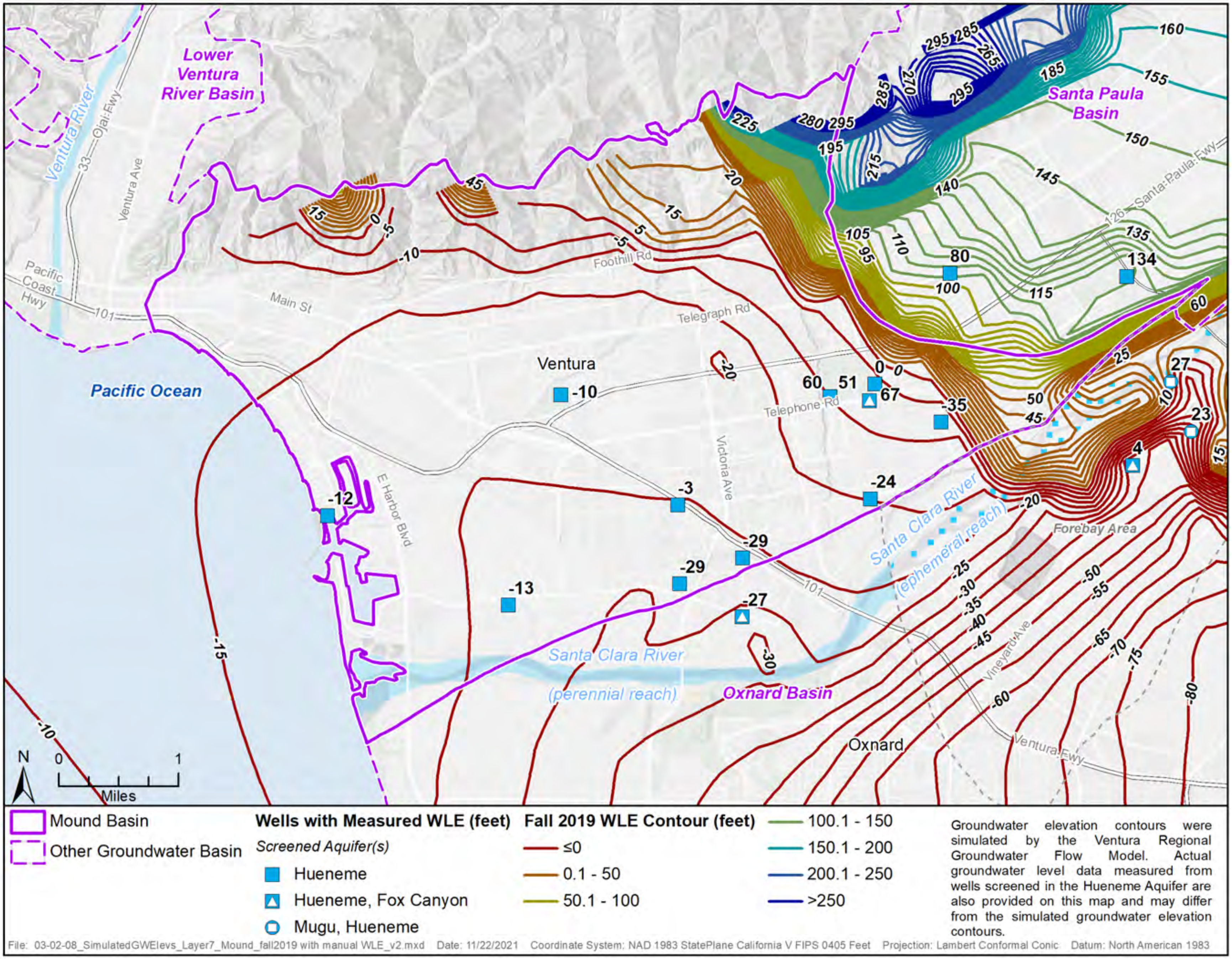


Figure 3.2-08 Water Level Elevation in Hueneme Aquifer, Fall 2019.

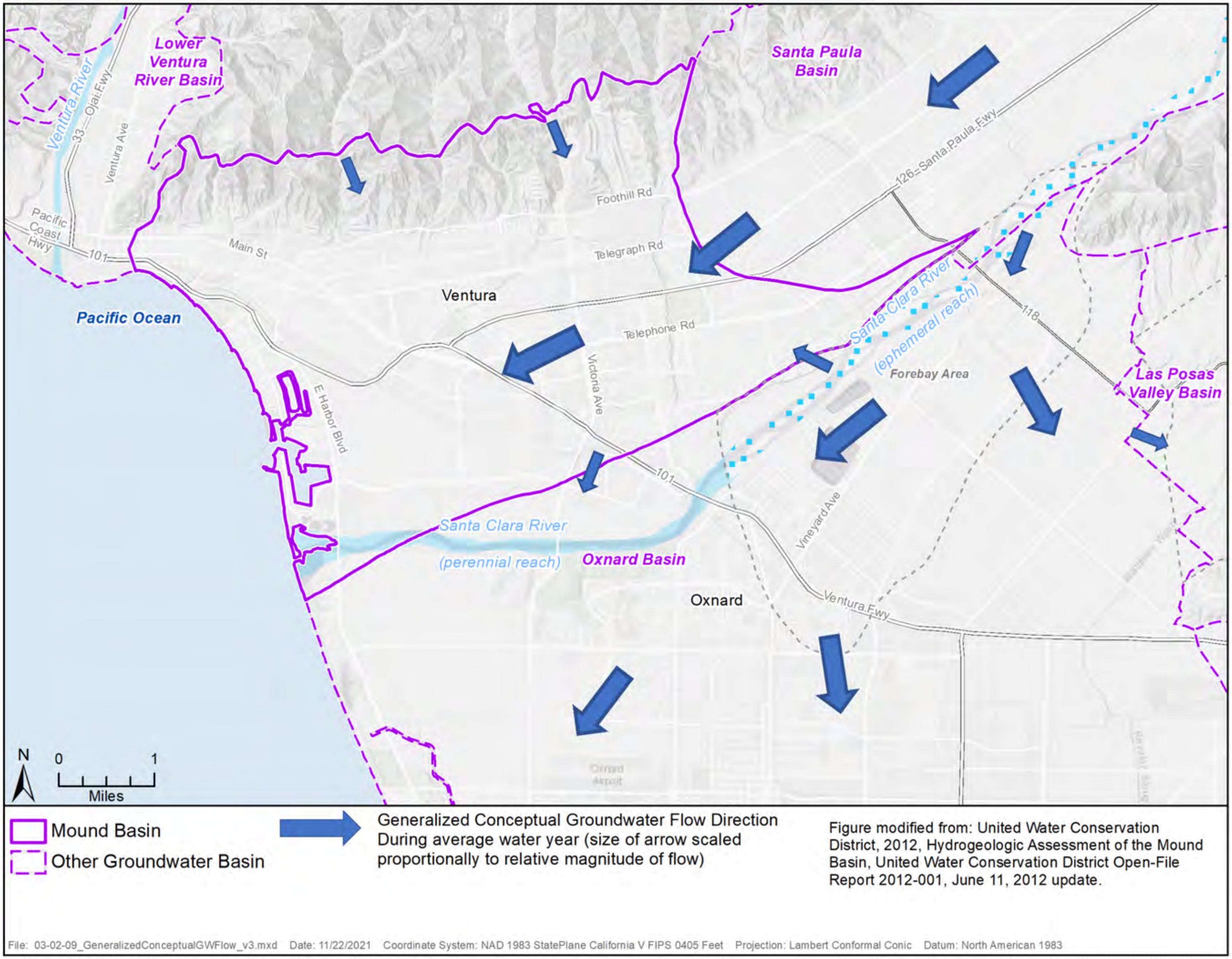


Figure 3.2-09 Generalized Conceptual Groundwater Flow Paths in Principal Aquifers.

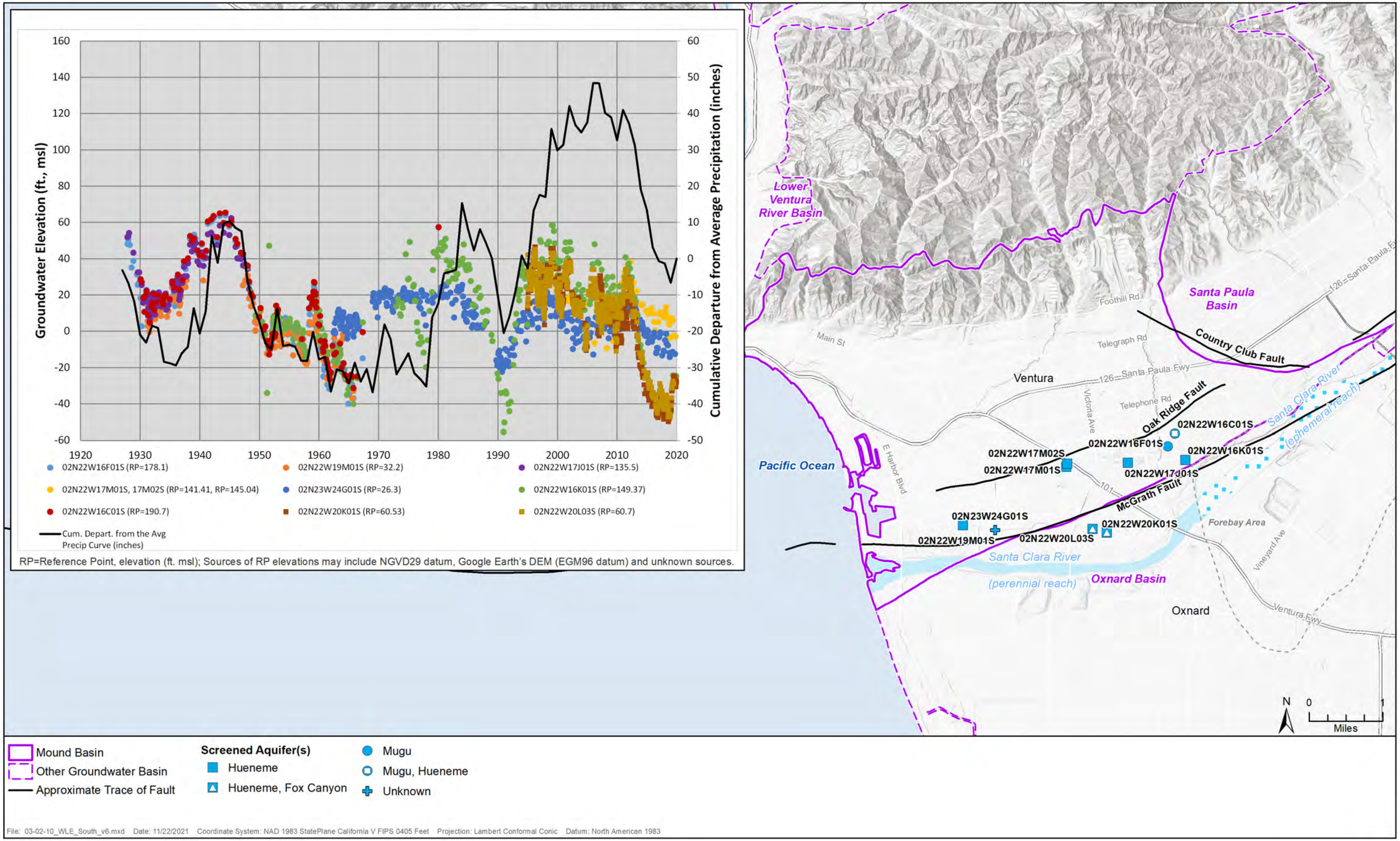


Figure 3.2-10 Location Map for Southern Mound Basin Wells with Recorded Groundwater Elevations.

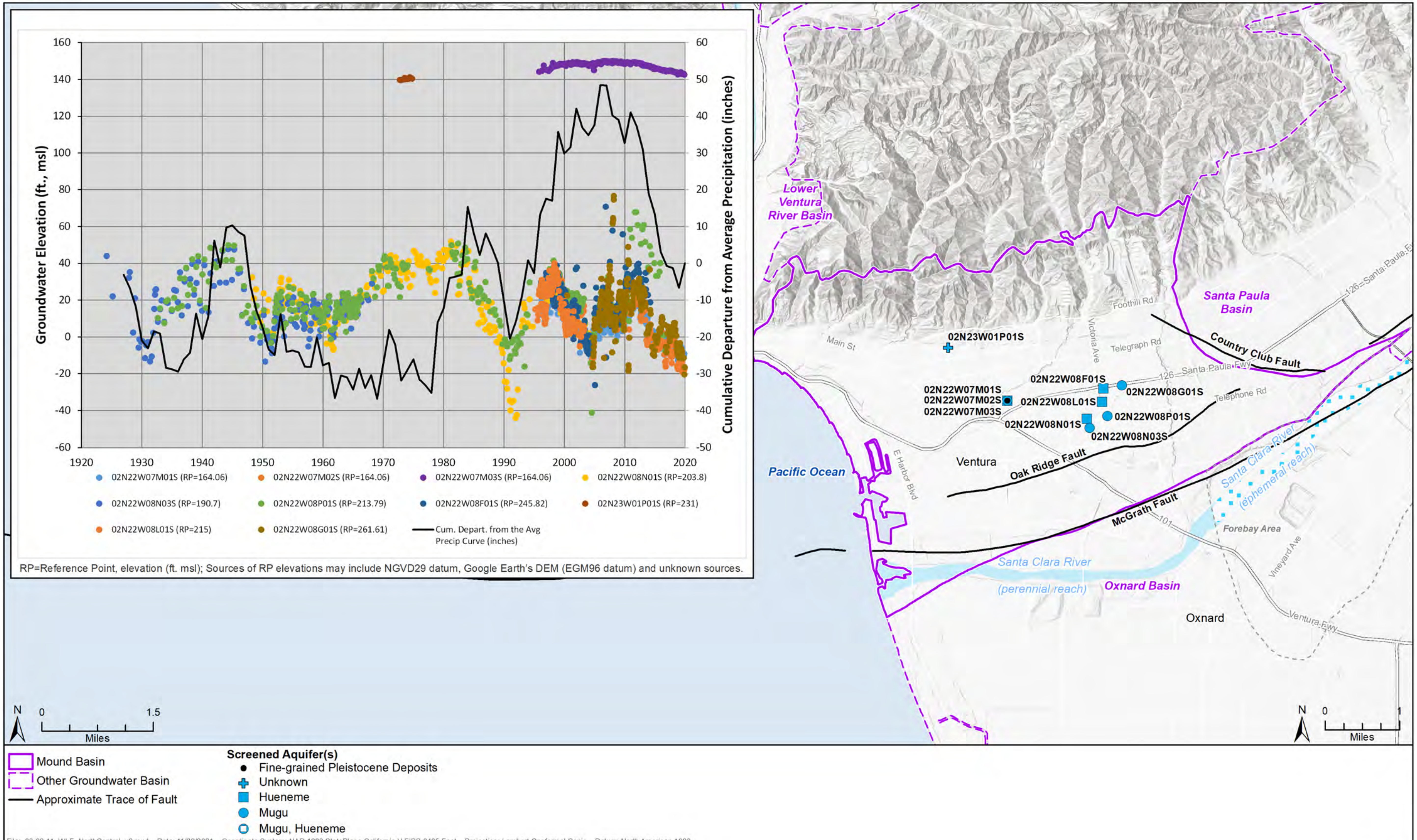


Figure 3.2-11 Location Map for North and Central Mound Basin Wells with Recorded Groundwater Elevations.

MoundBasin
GROUNDWATER SUSTAINABILITY AGENCY

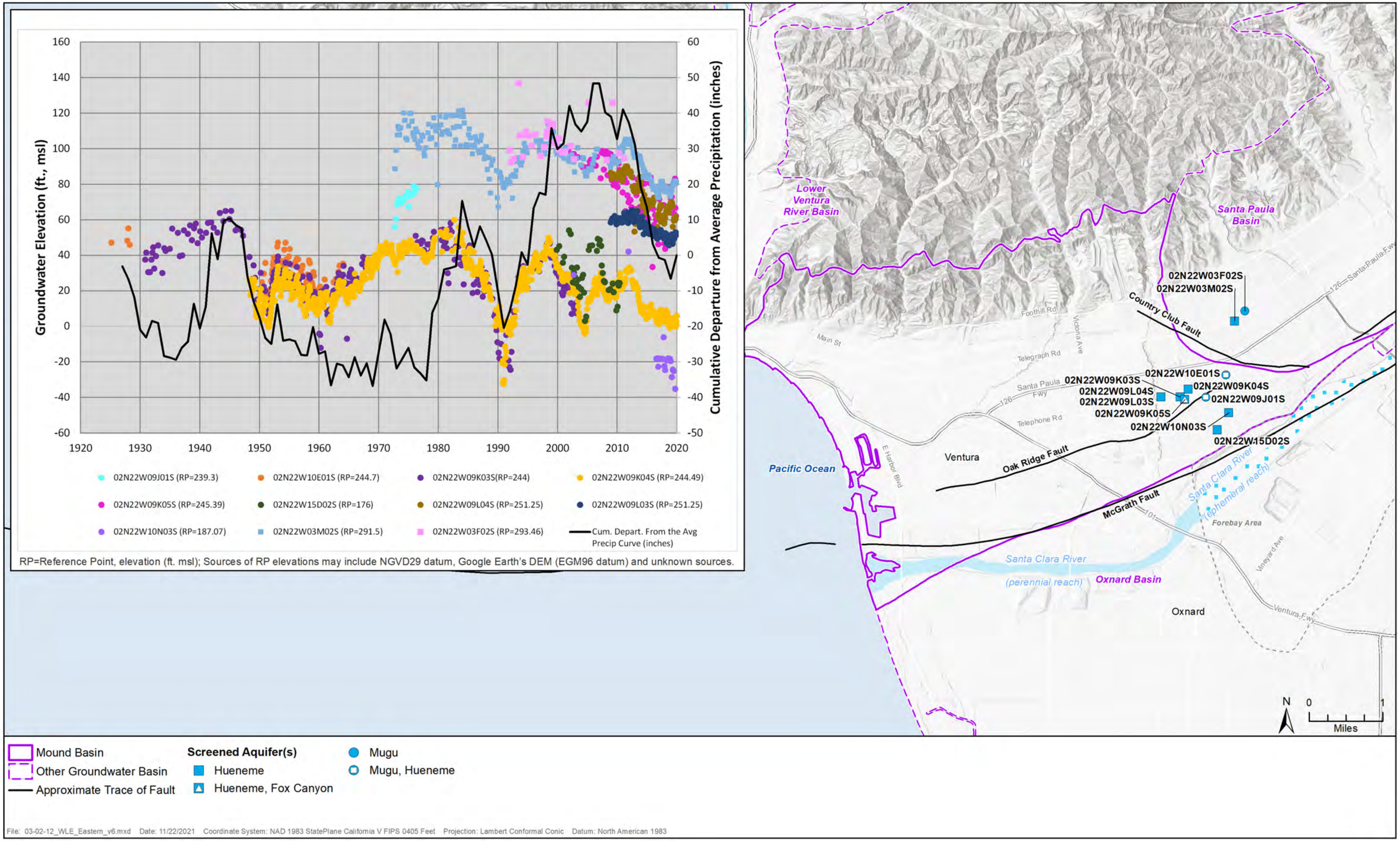


Figure 3.2-12 Location Map for Eastern Mound Basin Wells with Recorded Groundwater Elevations.

MoundBasin
GROUNDWATER SUSTAINABILITY AGENCY

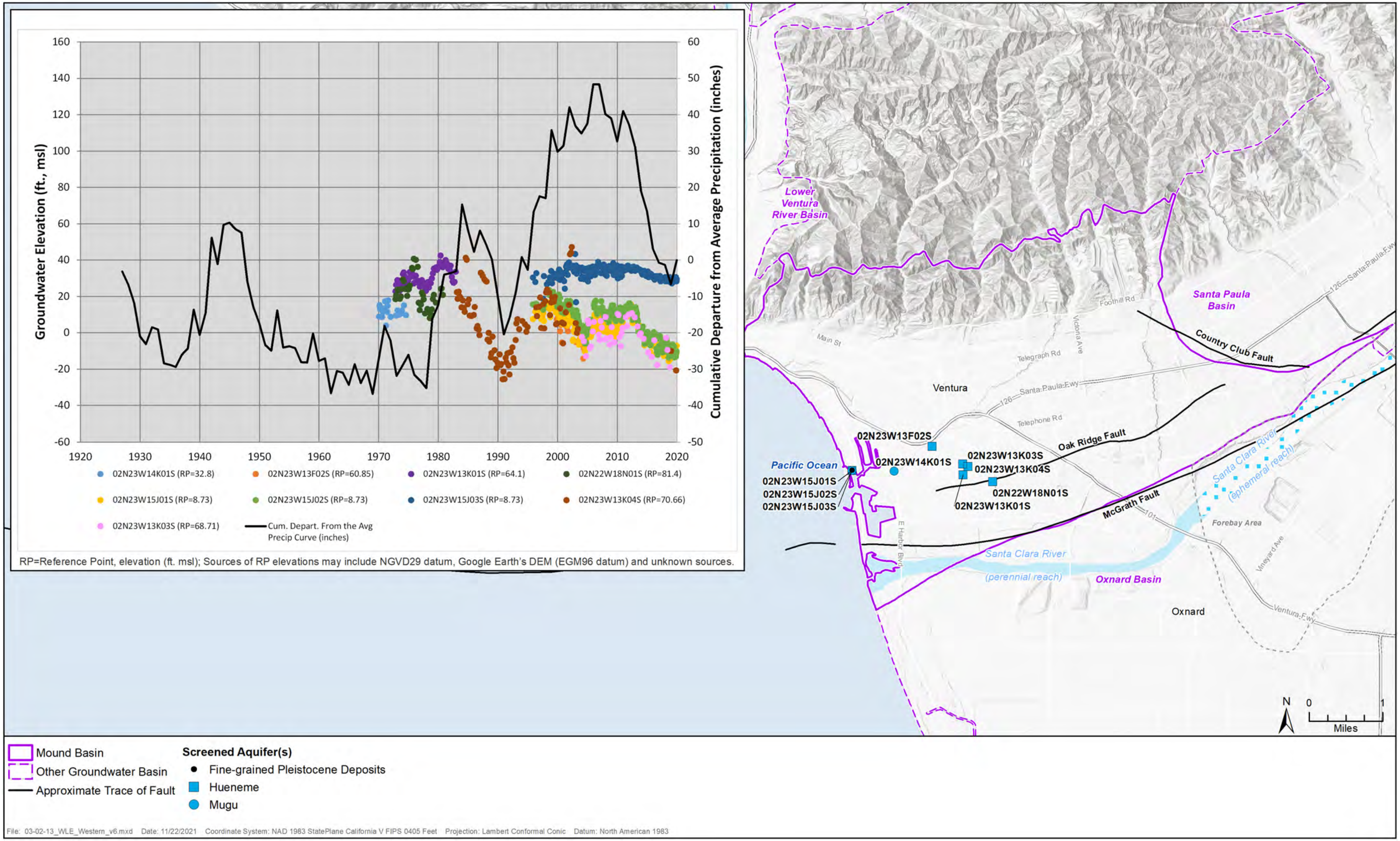


Figure 3.2-13 Location Map for Western Mound Basin Wells with Recorded Groundwater Elevations.

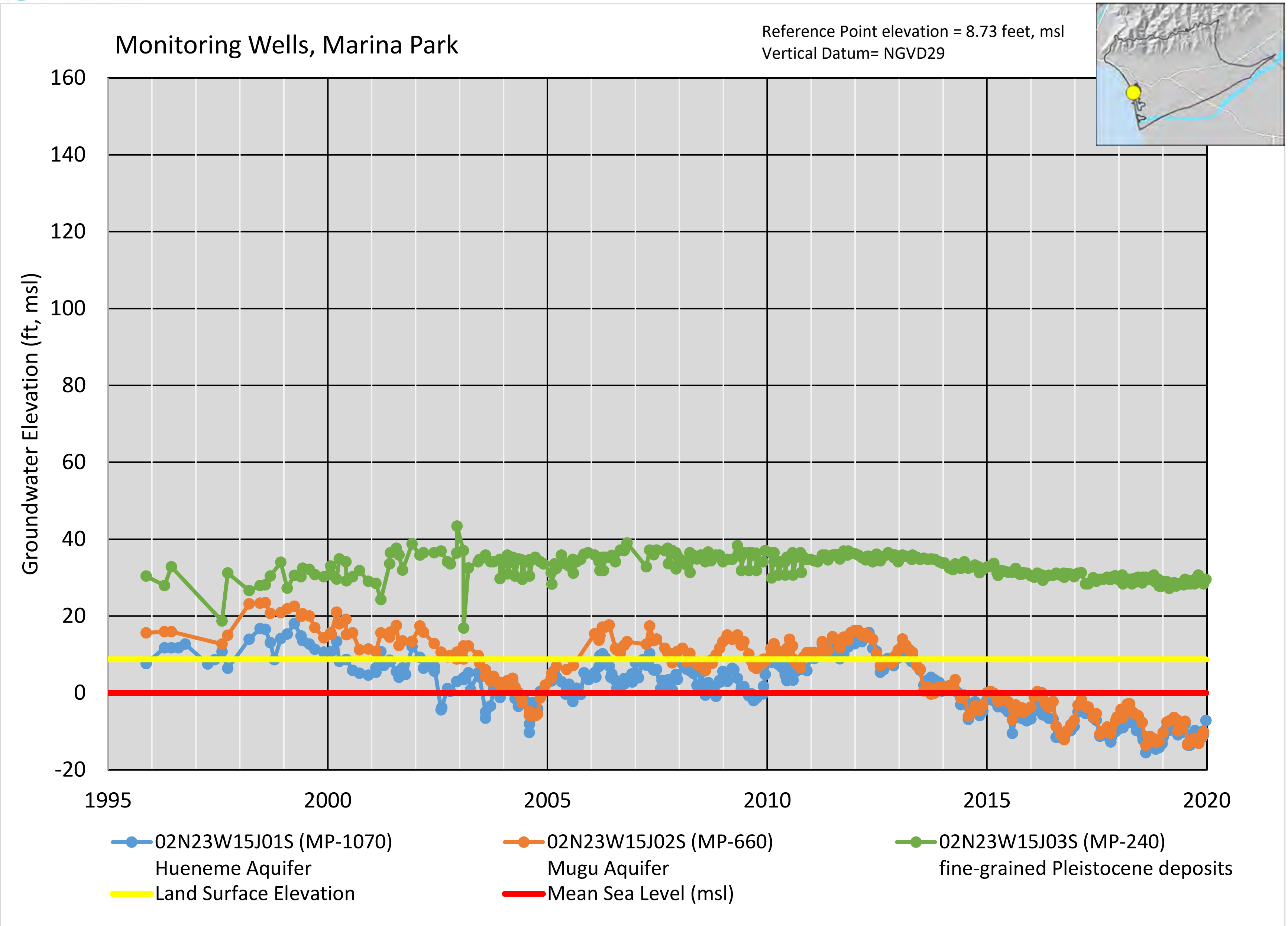


Figure 3.2-14 Groundwater Level Records for Marina Park Monitoring Wells.

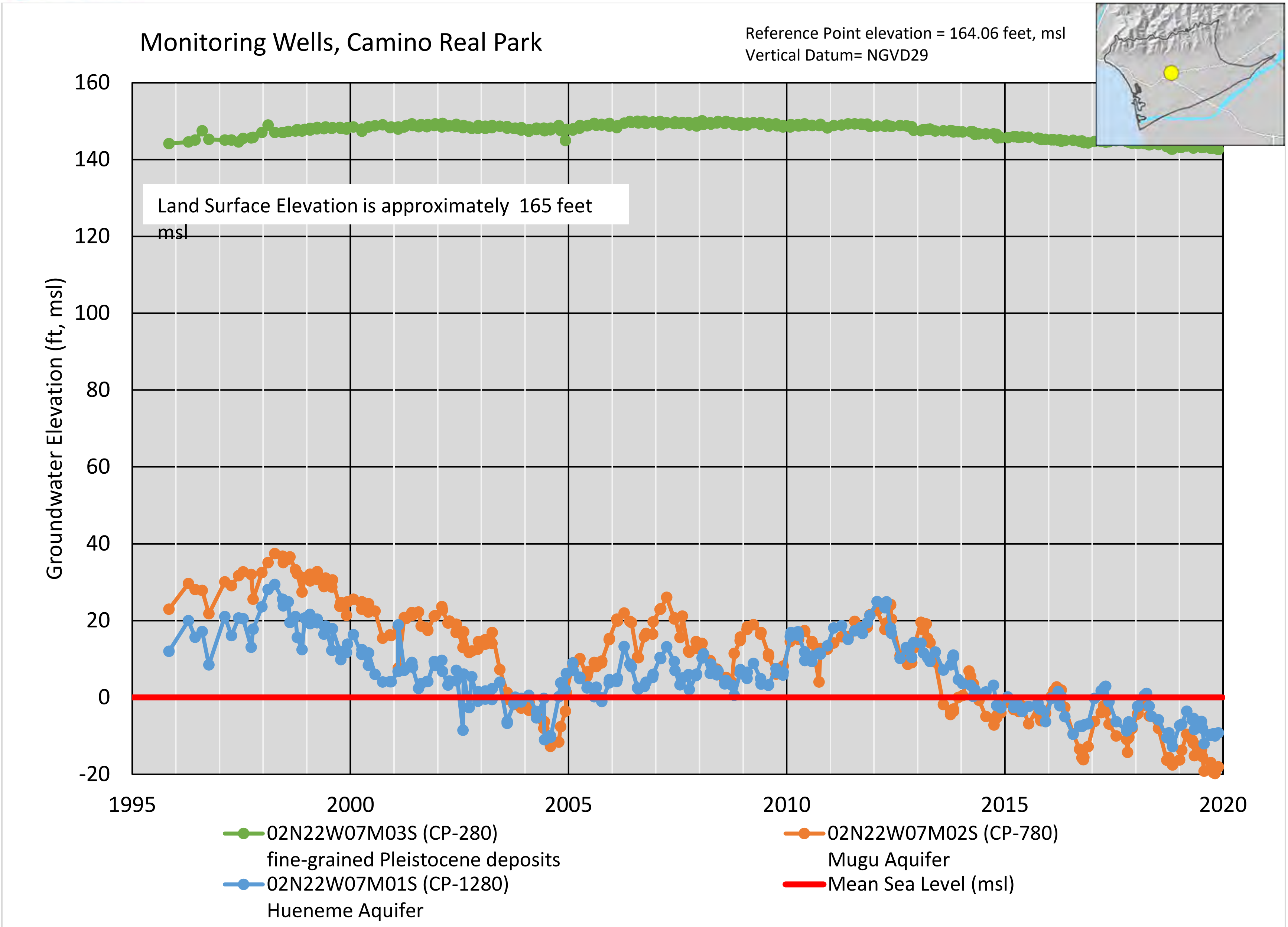


Figure 3.2-15 Groundwater Level Records for Camino Real Park Monitoring Wells.

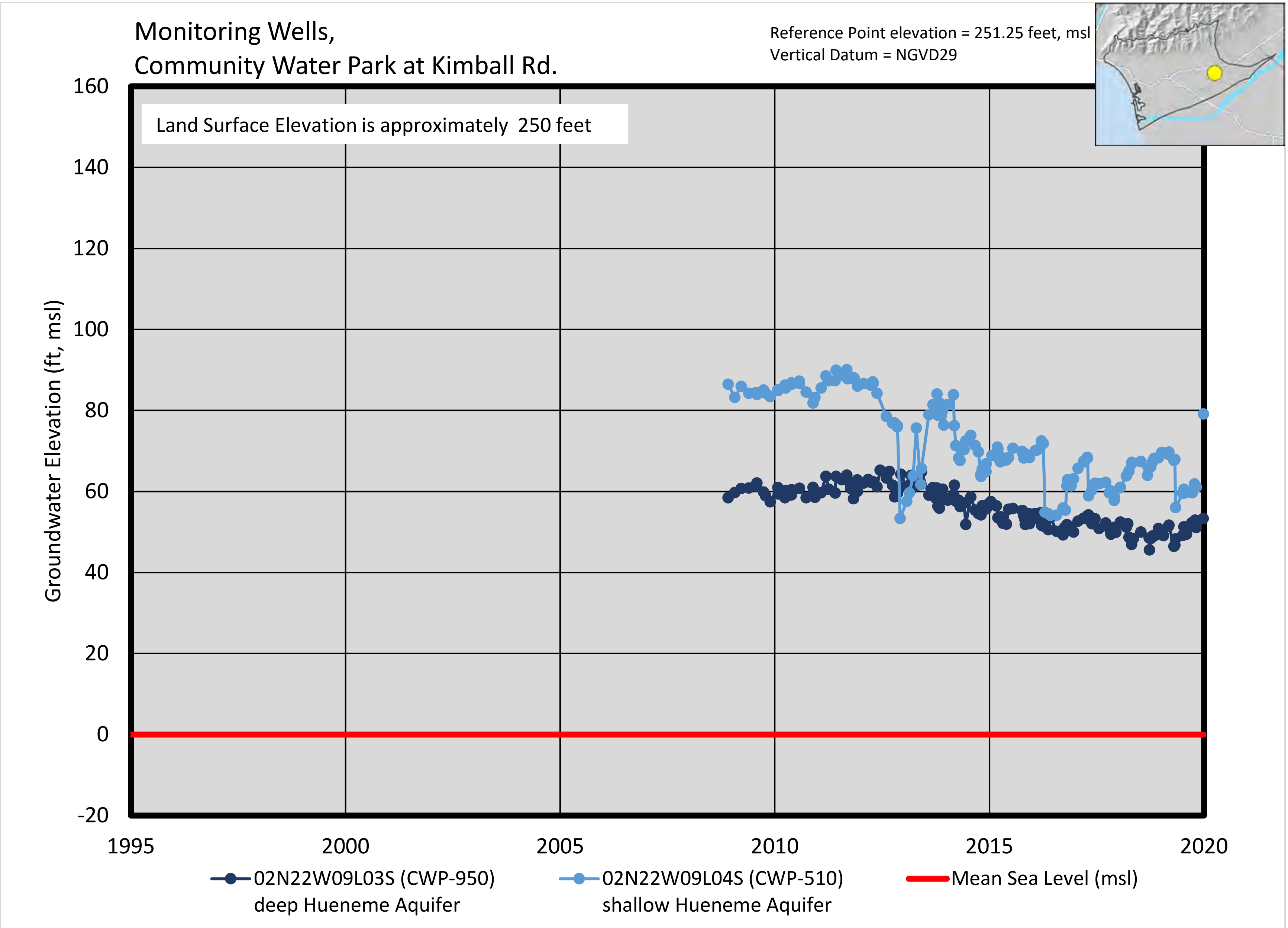


Figure 3.2-16 Groundwater Level Records for Community Water Park at Kimball Road Monitoring Wells.

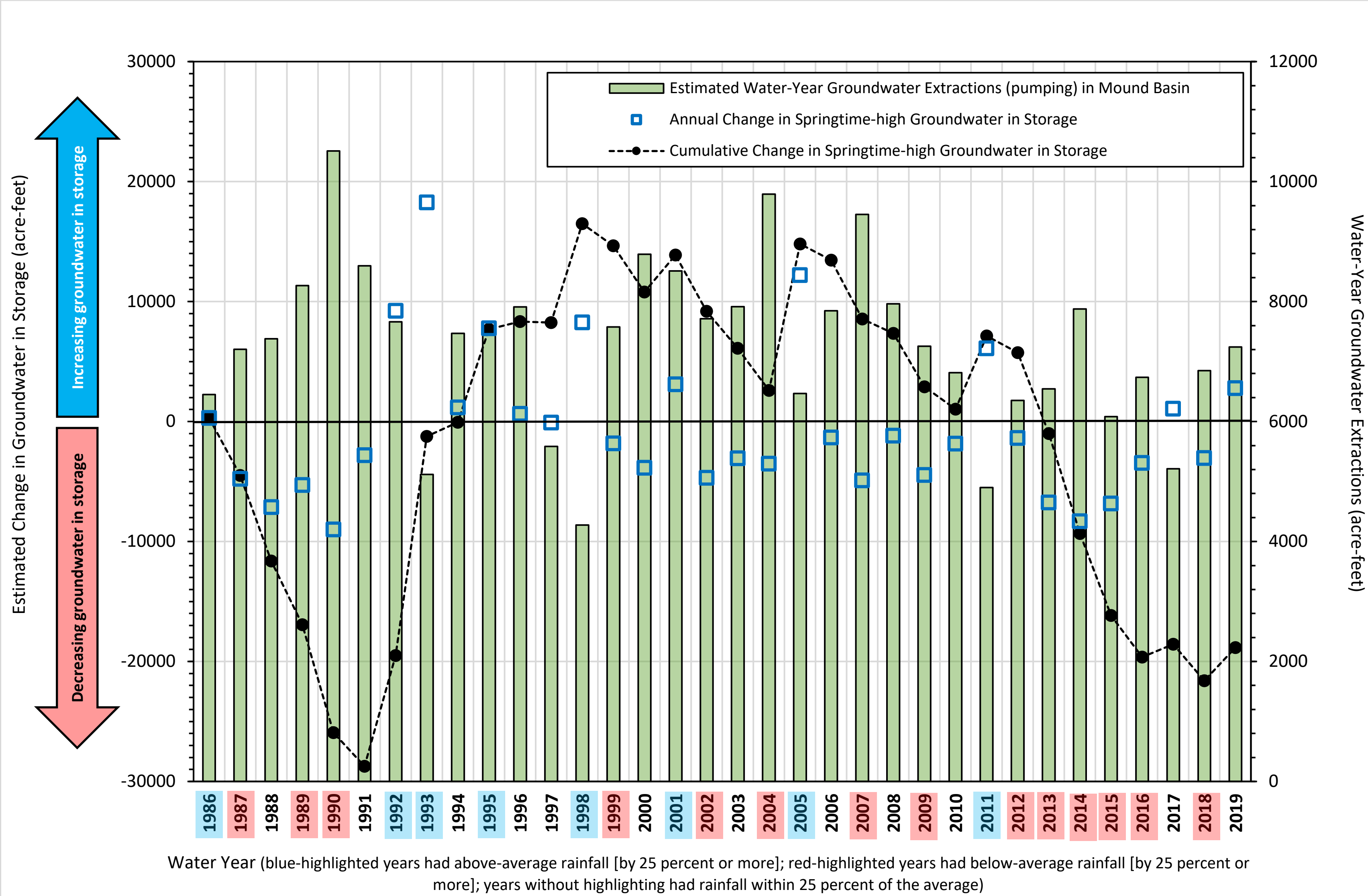


Figure 3.2-17 Change in Storage.

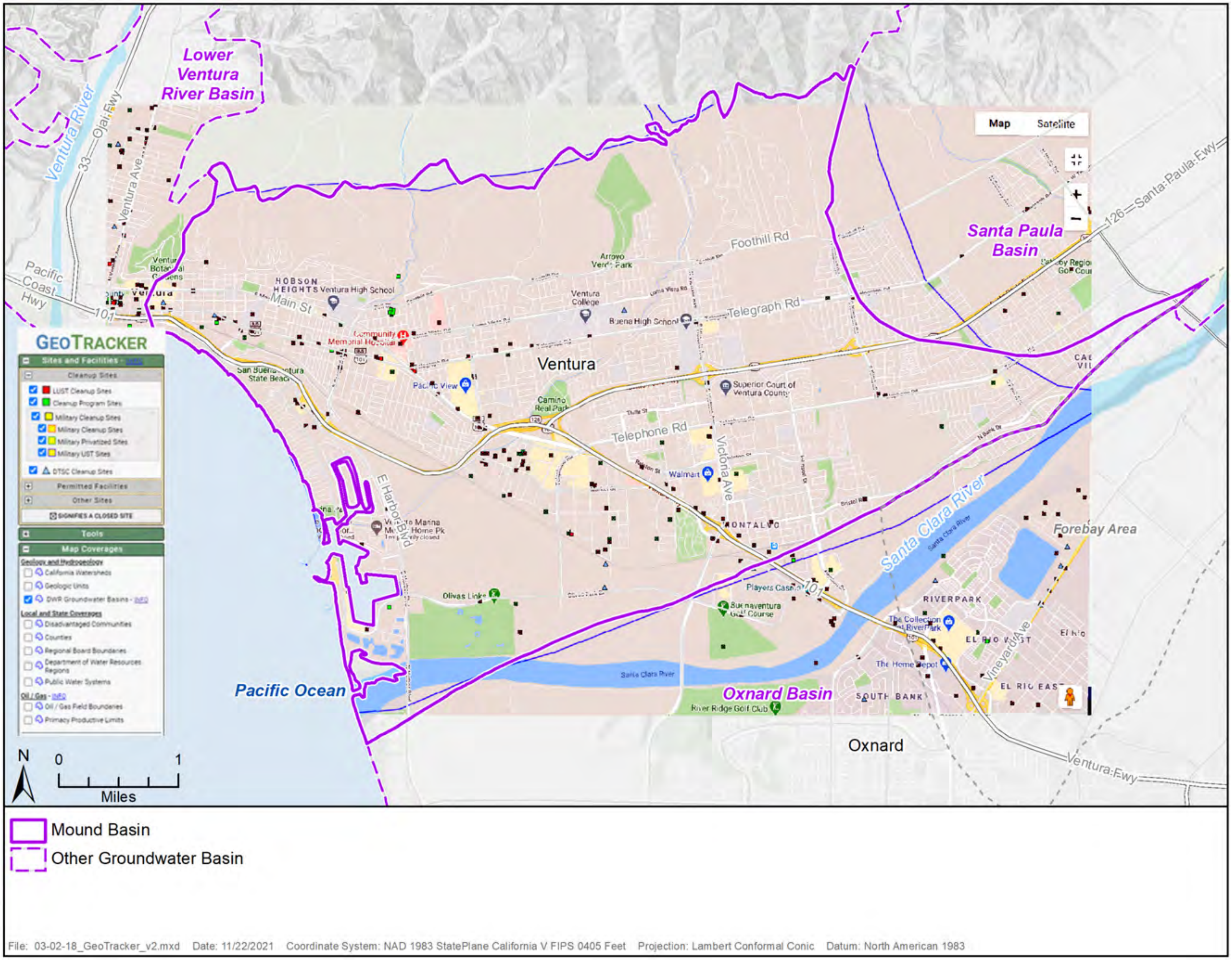


Figure 3.2-18 Map of Cleanup Sites and Facilities from Geotracker Database Mapping Website (https://geotracker.waterboards.ca.gov/, screenshot taken June 17, 2020).

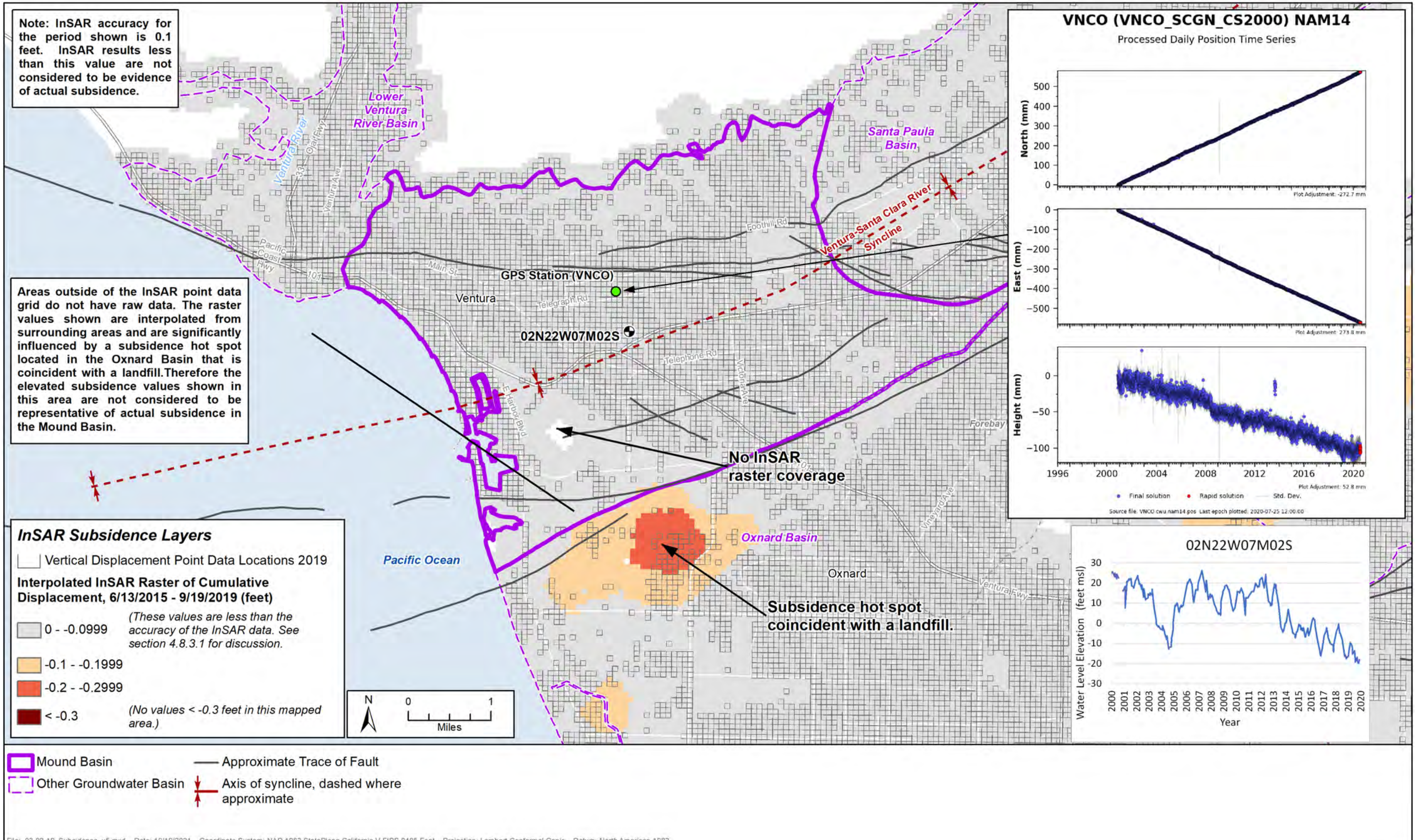


Figure 3.2-19 Cumulative Vertical Displacement from 2015 – 2019.

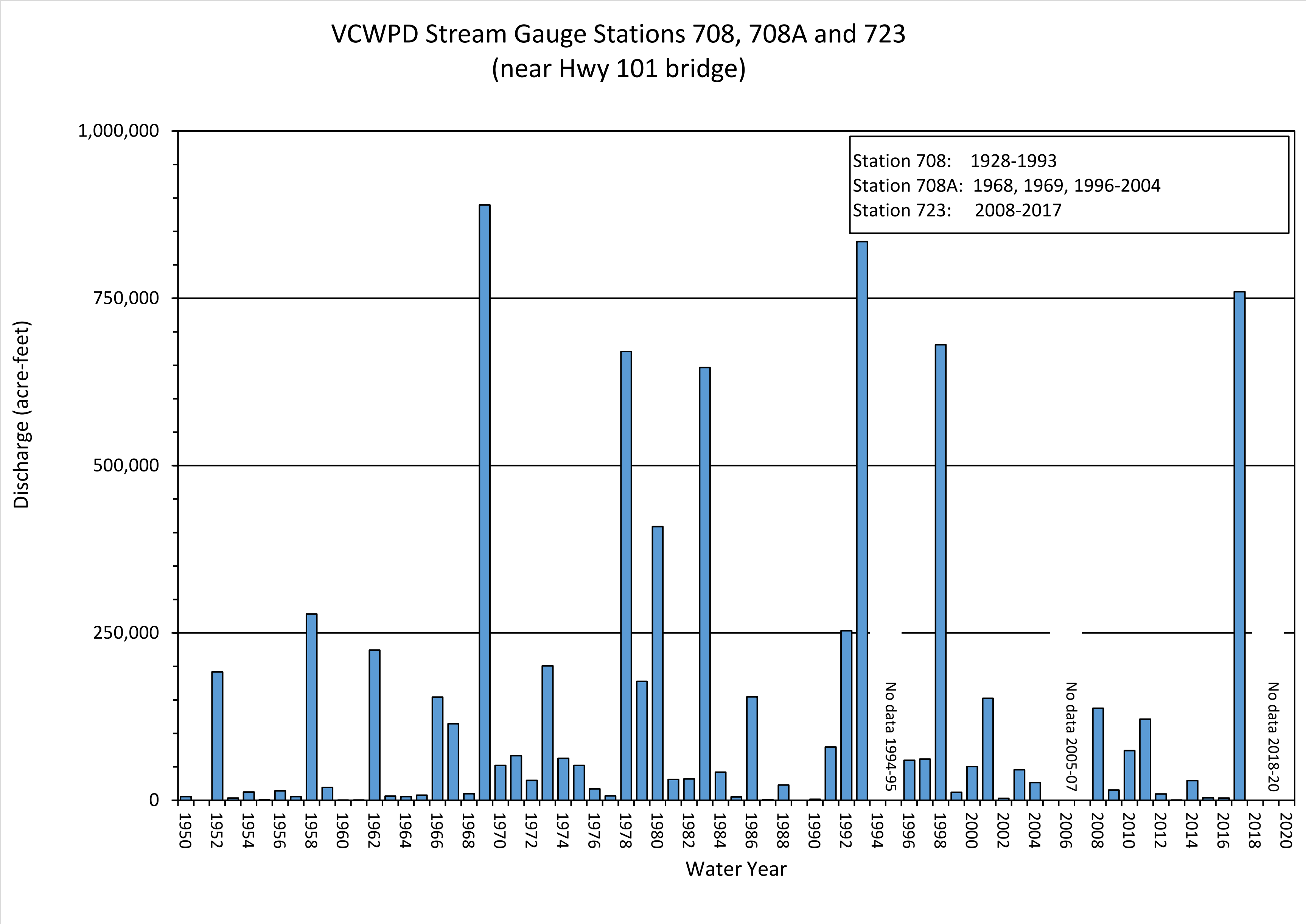


Figure 3.2-20 Annual Discharge of Santa Clara River near Mound Basin.

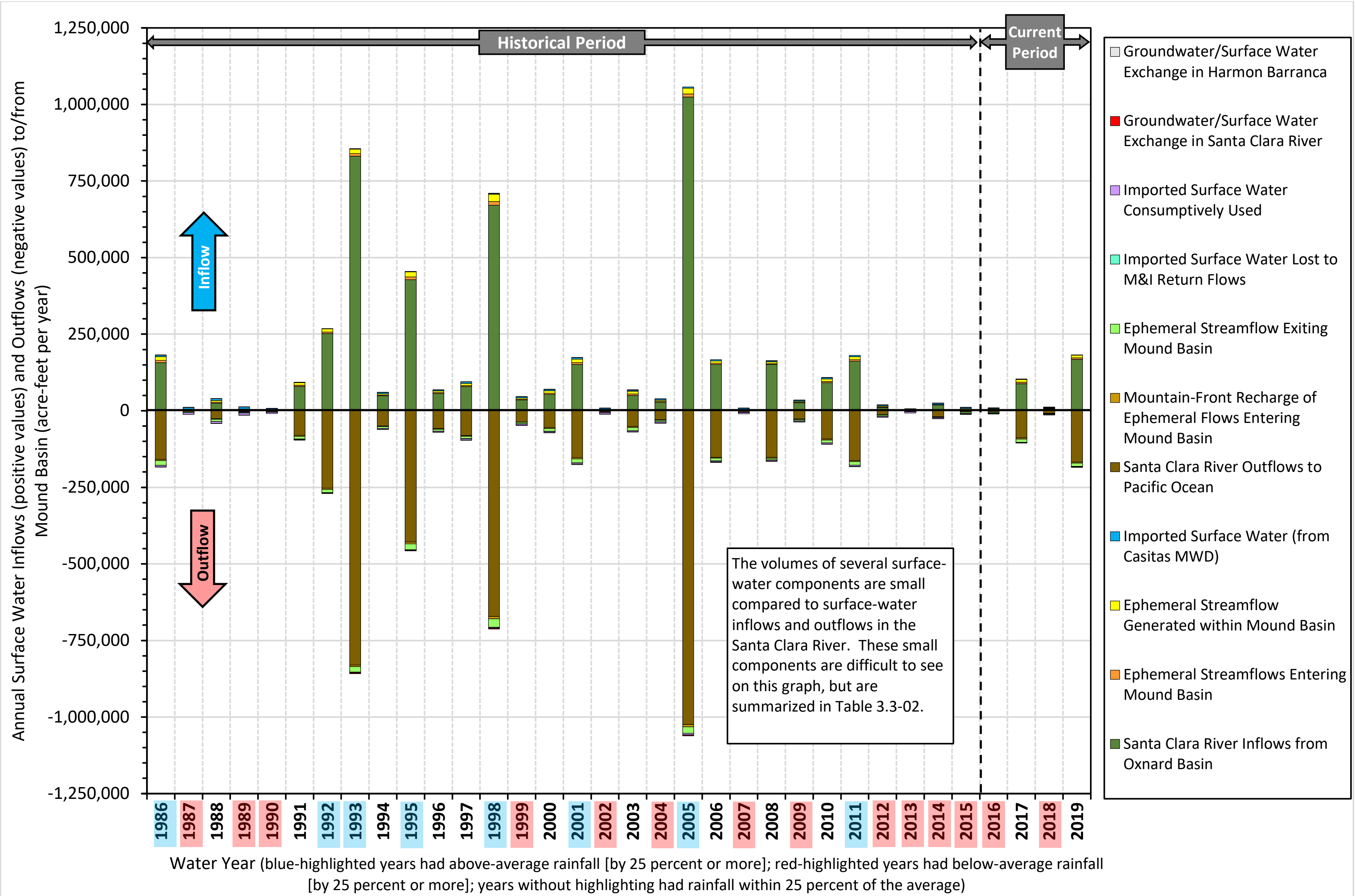


Figure 3.3-01 Annual Surface Water Inflows (positive values) and Outflows (negative values) to/from Mound Basin (acre-feet per year).

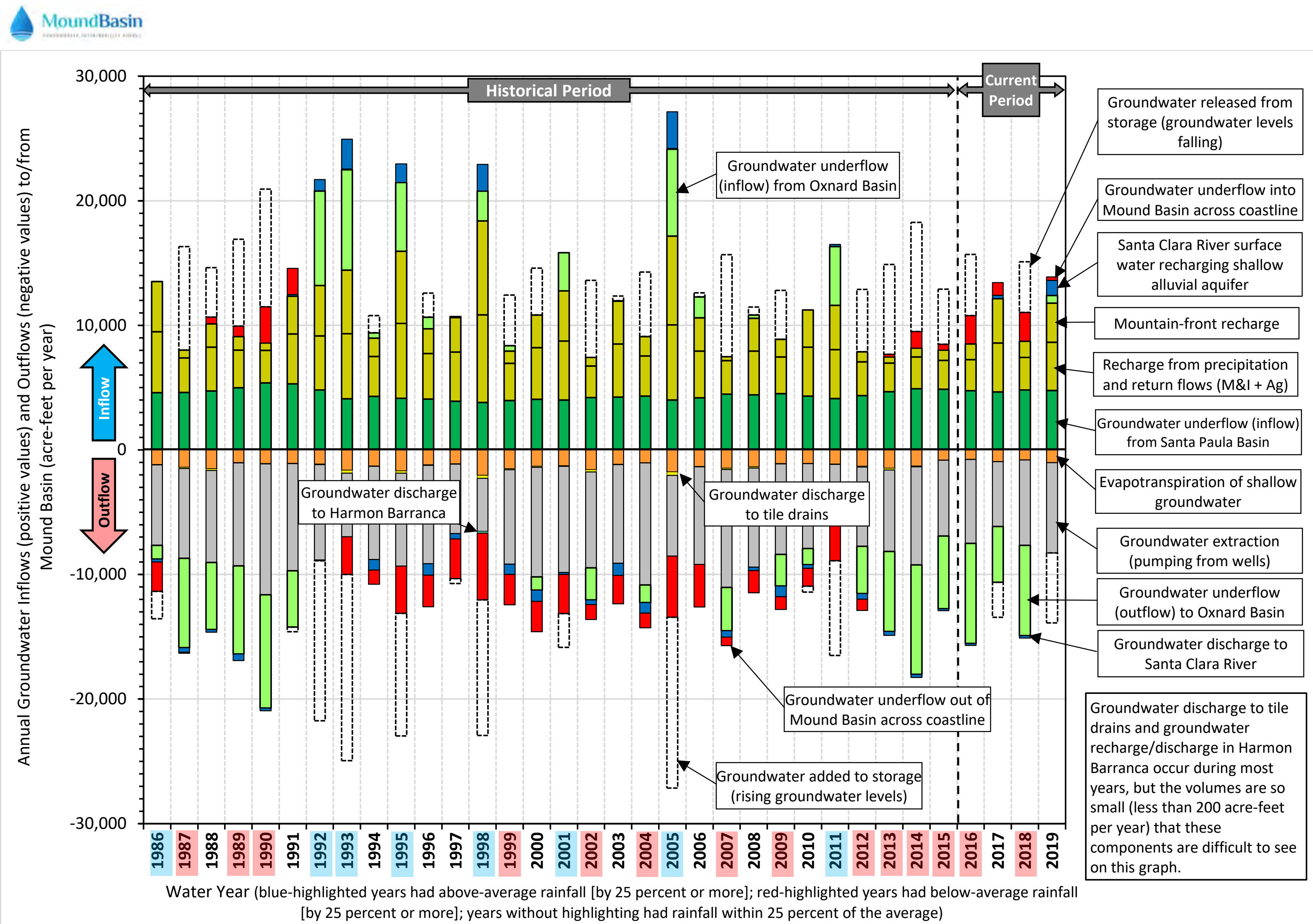


Figure 3.3-02 Annual Groundwater Inflows (positive values) and Outflows (negative values) to/from Mound Basin (acre-feet per year).

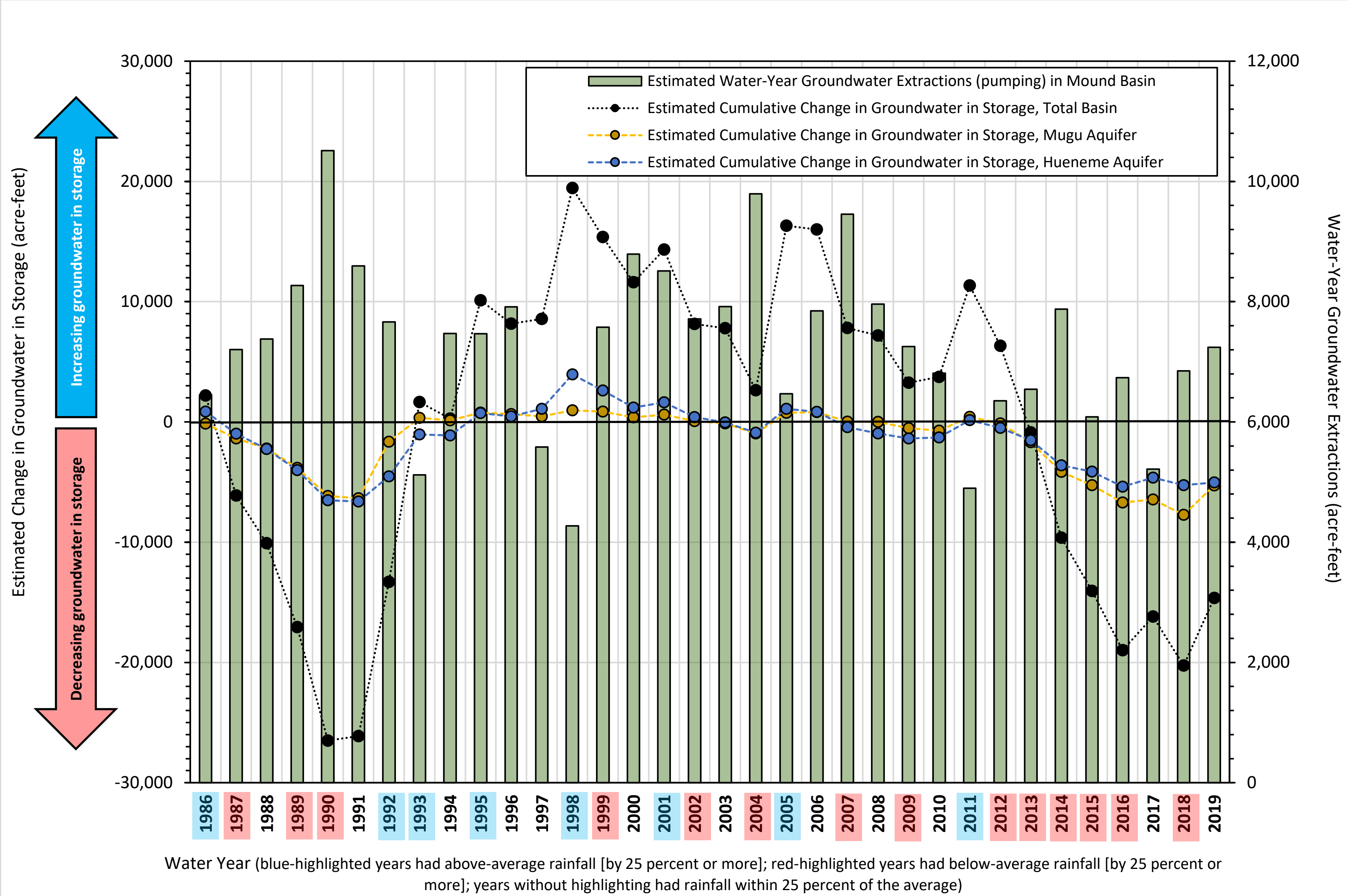


Figure 3.3-03 Estimated Change in Groundwater in Storage (acre-feet) and Water Year Extraction Volumes (acre-feet).

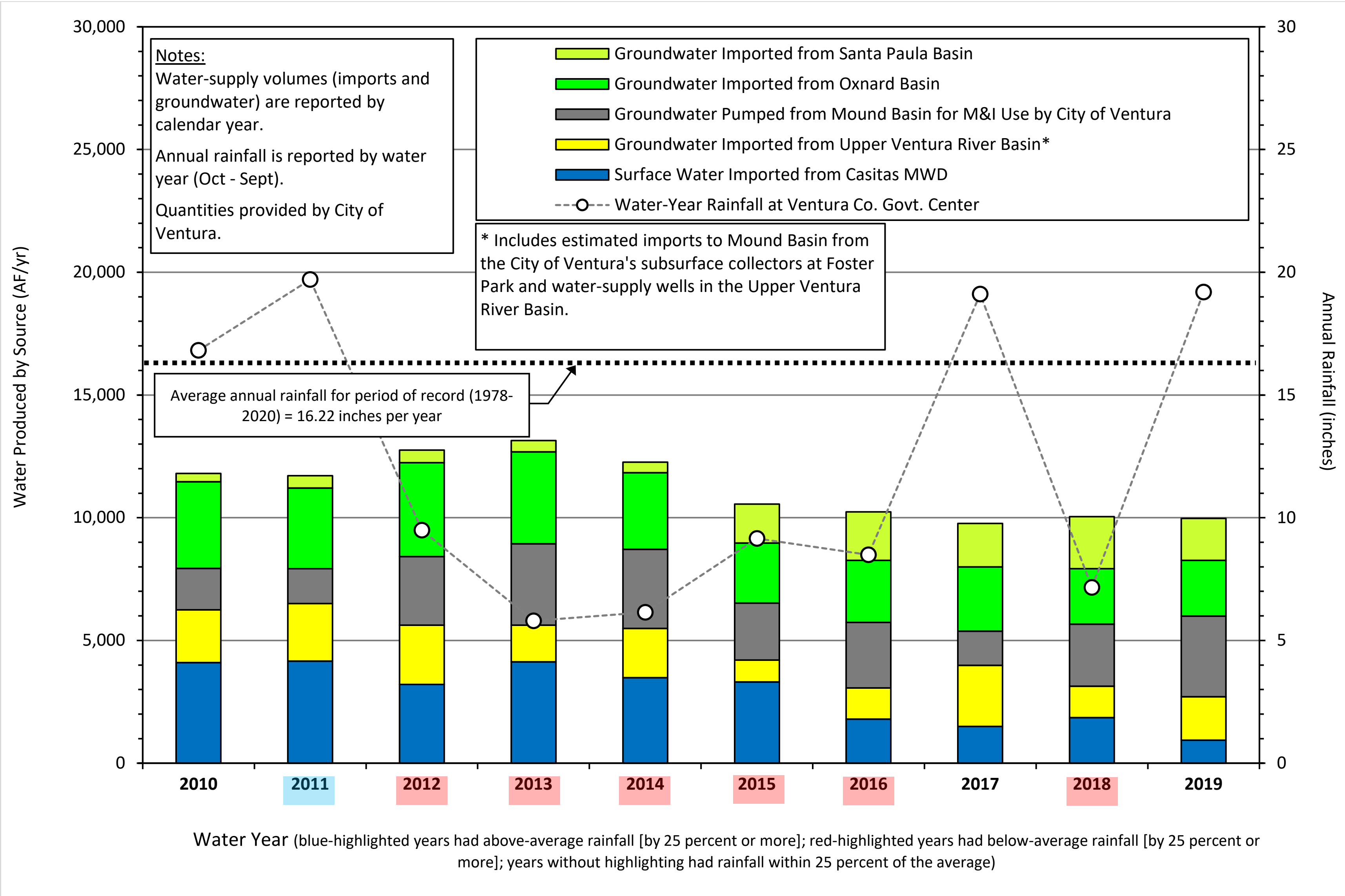


Figure 3.3-04 City of Ventura 10-Year Historical Surface Water Deliveries and Groundwater Production (acre-feet per year).

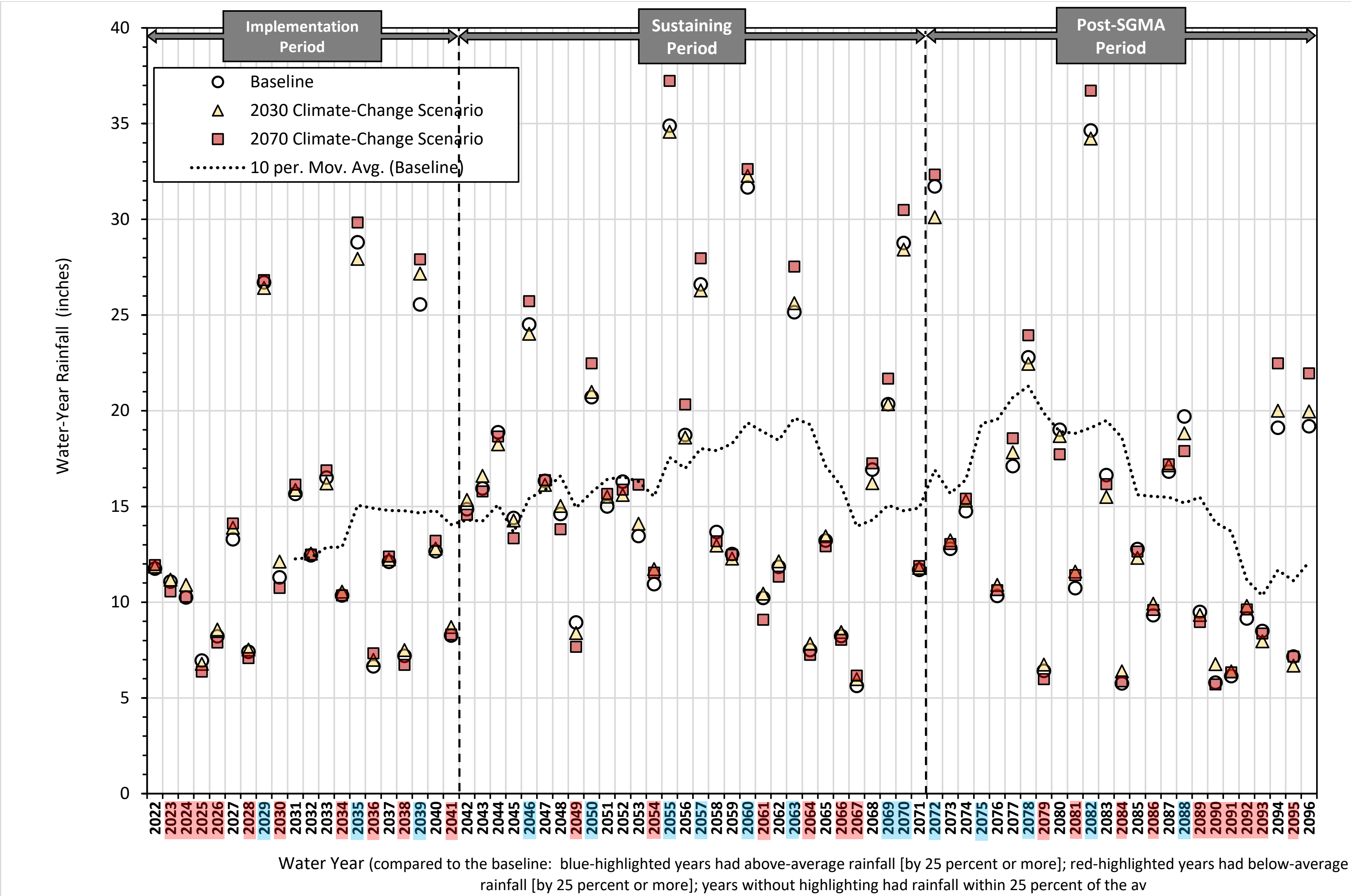


Figure 3.3-05 Projected Annual Rainfall Rates Assumed under Future Baseline, the 2030 Climate Change Scenario, and the 2070 Climate Change Scenario.

MoundBasin

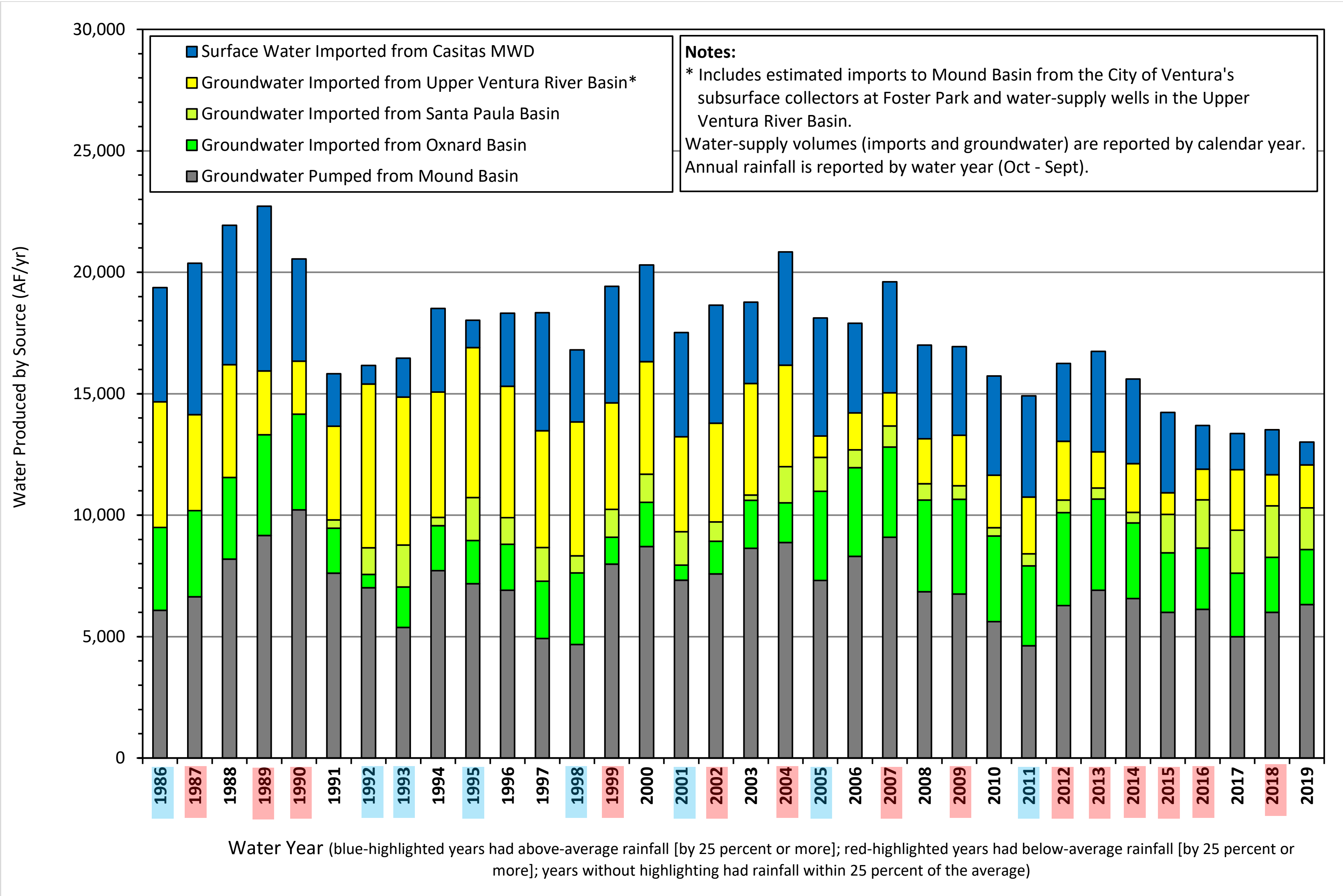


Figure 3.3-06 Long-Term Historical Surface Water Deliveries and Groundwater Production (acre-feet per year).

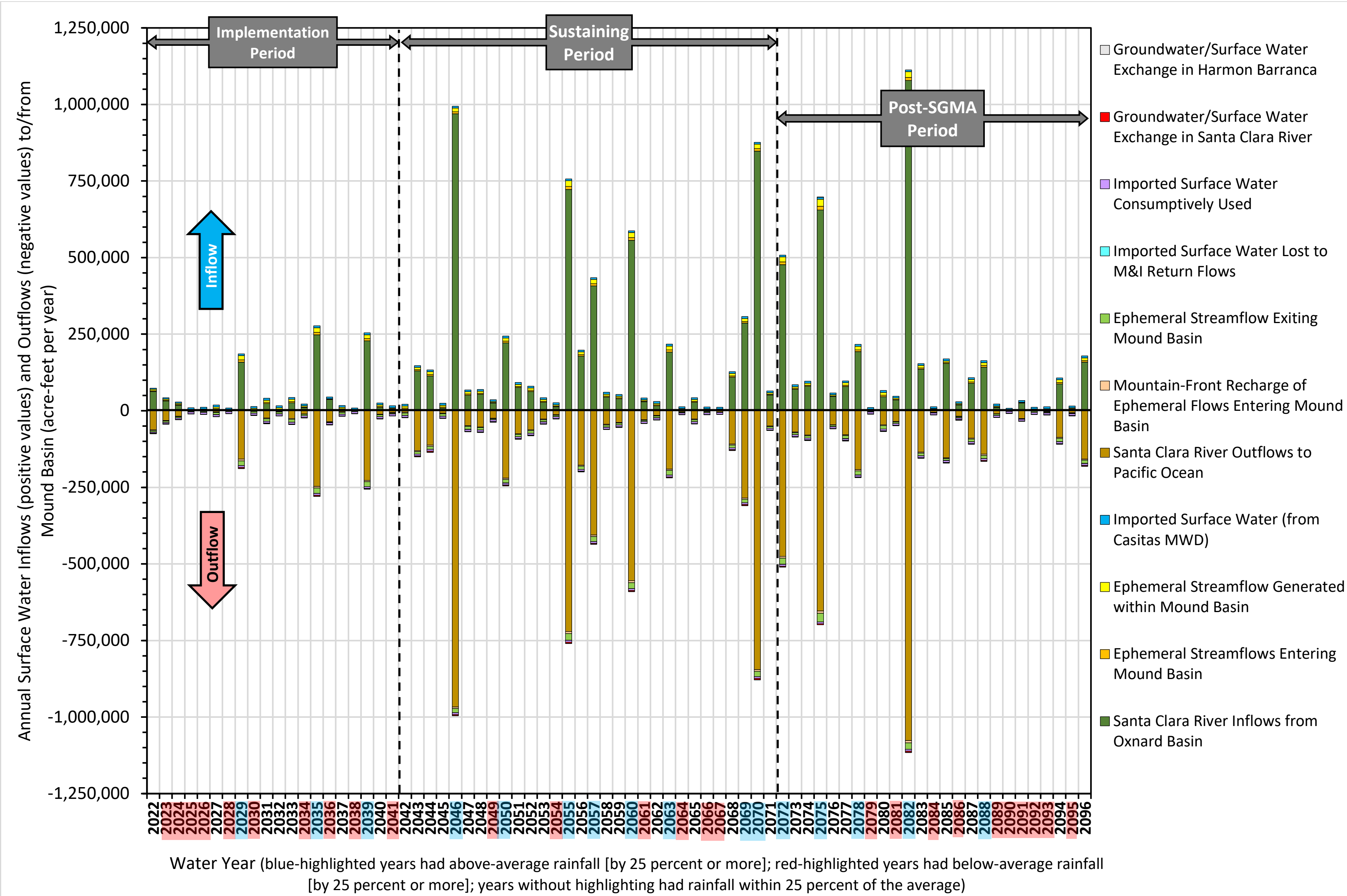


Figure 3.3-07 Baseline Projected Annual Surface Water Inflows (positive values) and Outflows (negative values) to/from Mound Basin (acre-feet per year).

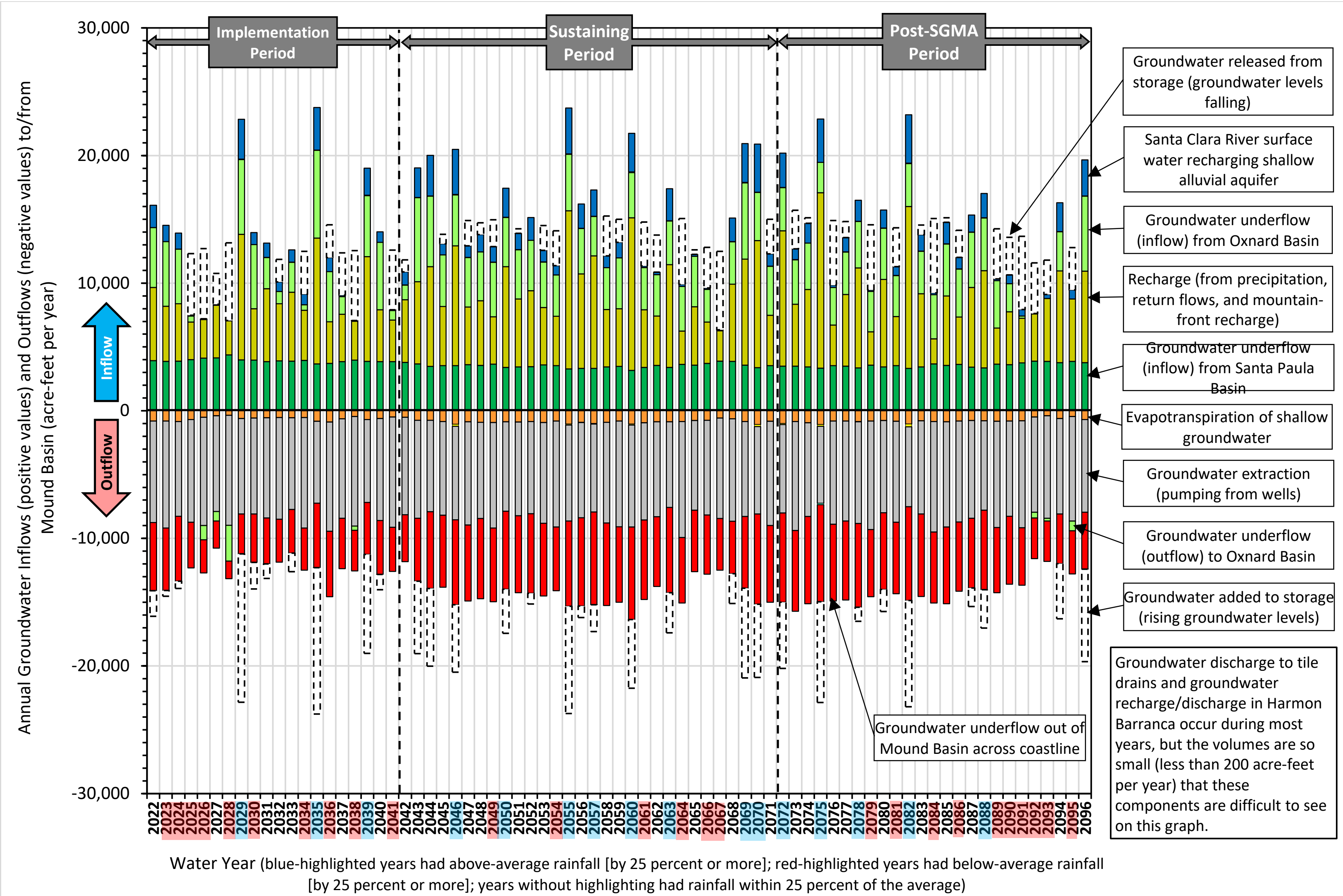


Figure 3.3-08 Baseline Projected Change in Groundwater in Storage (acre-feet) and Water Year Extraction Volumes (acre-feet).

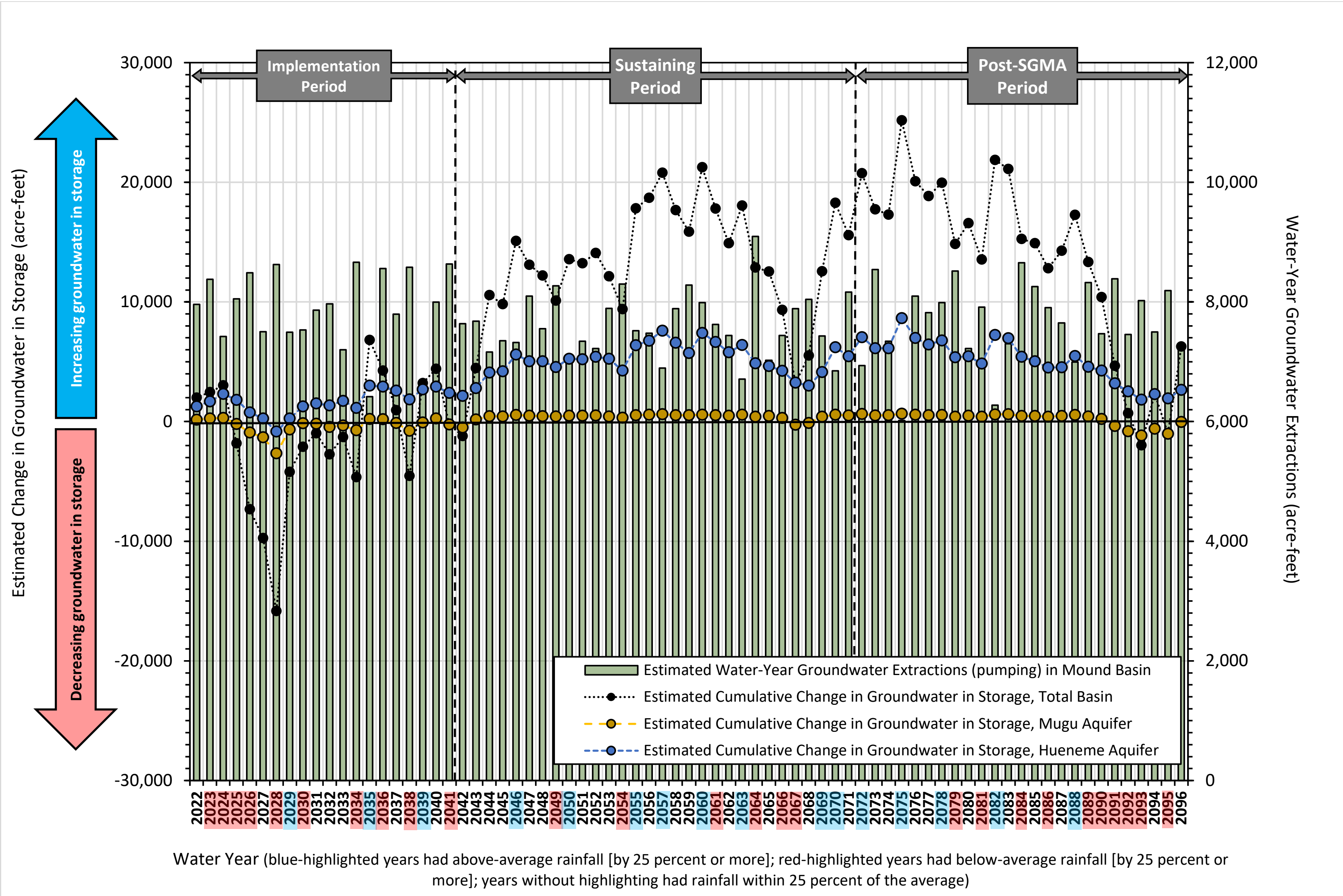


Figure 3.3-09 Projected Baseline Change in Groundwater in Storage (acre-feet) and Water Year Extraction Volumes (acre-feet).

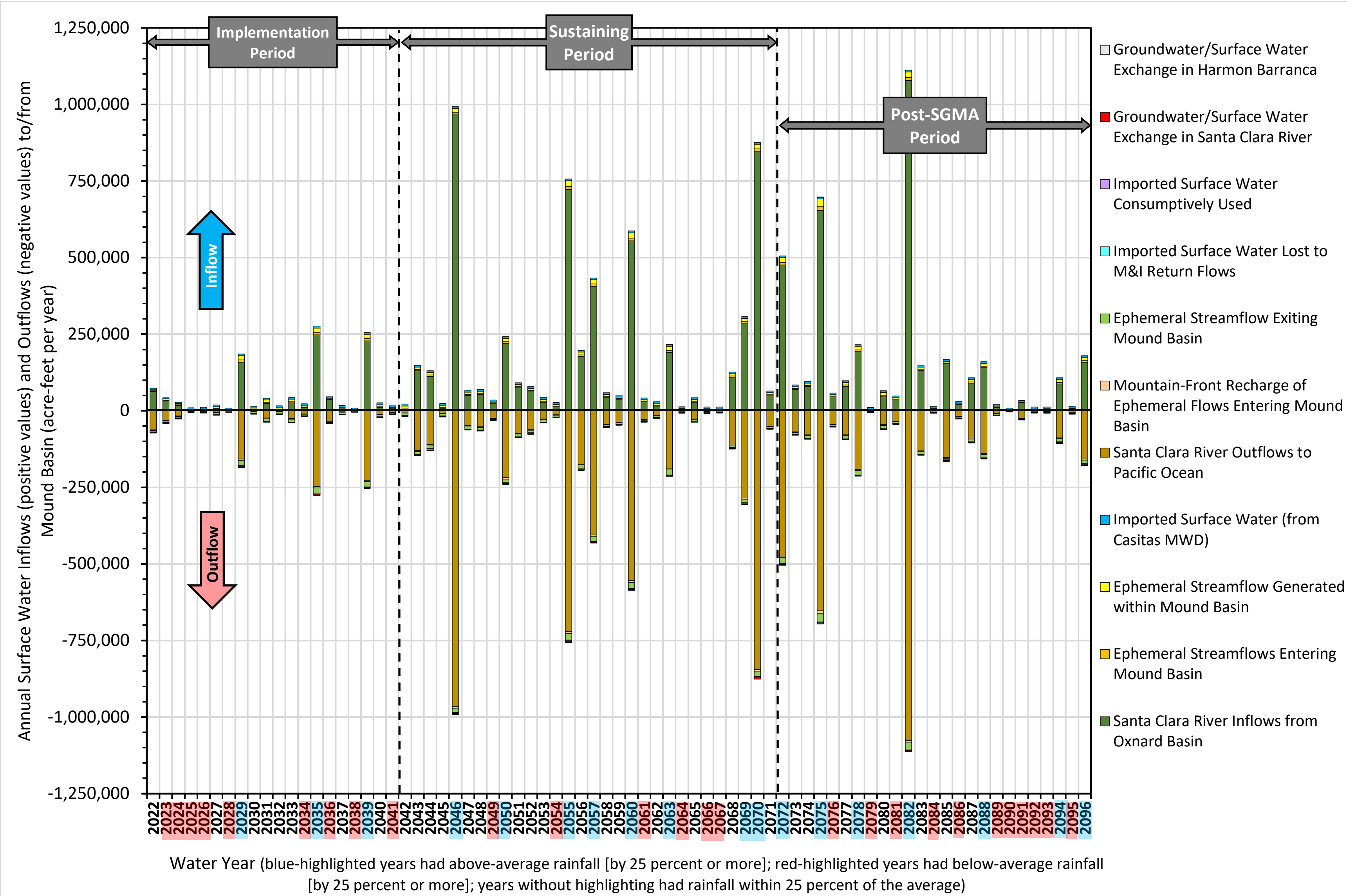


Figure 3.3-10 Projected Surface Water Budget Components under the 2030 Climate Change Scenario.

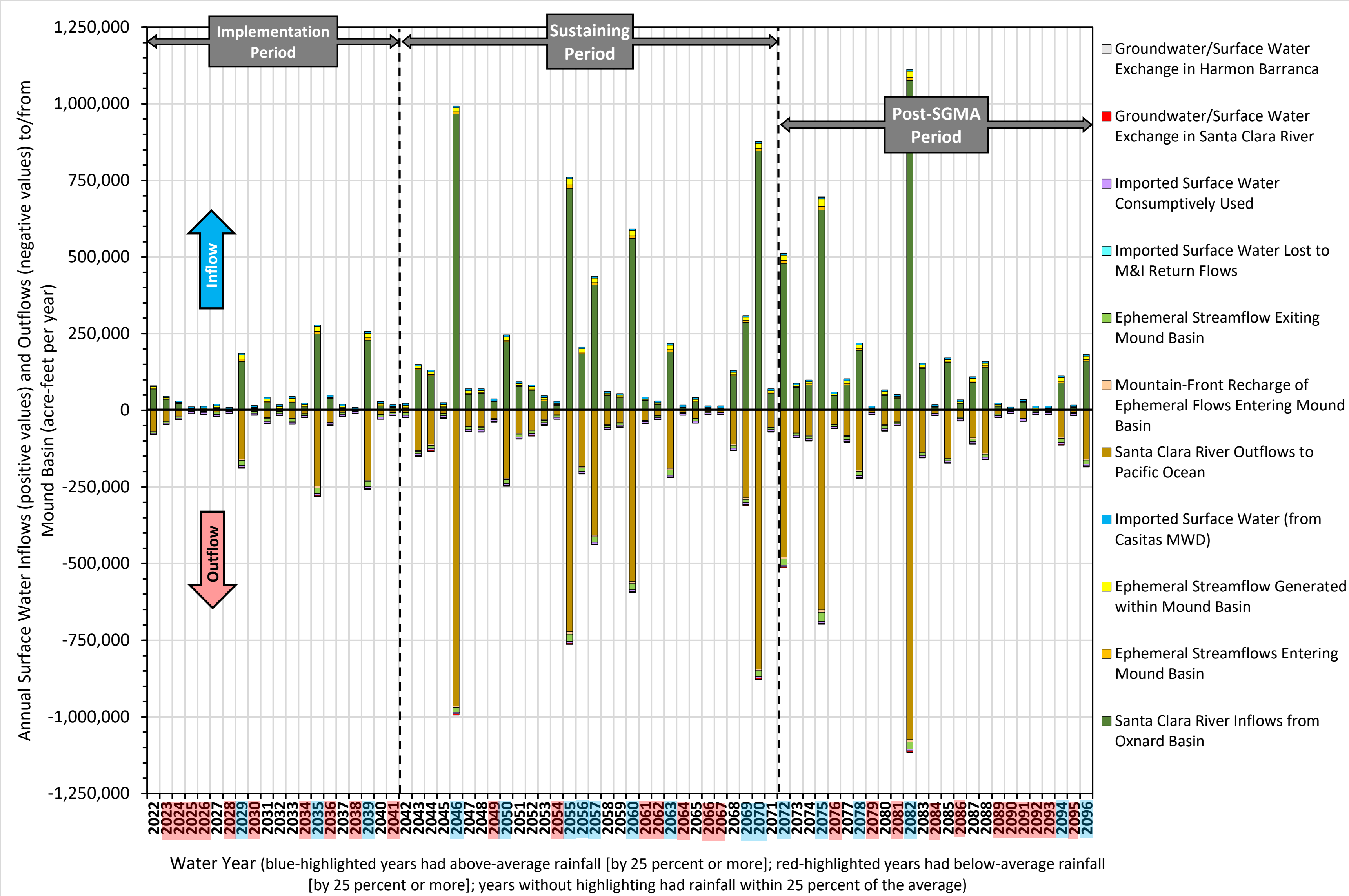


Figure 3.3-11 Projected Surface Water Budget Components under the 2070 Climate Change Scenario.

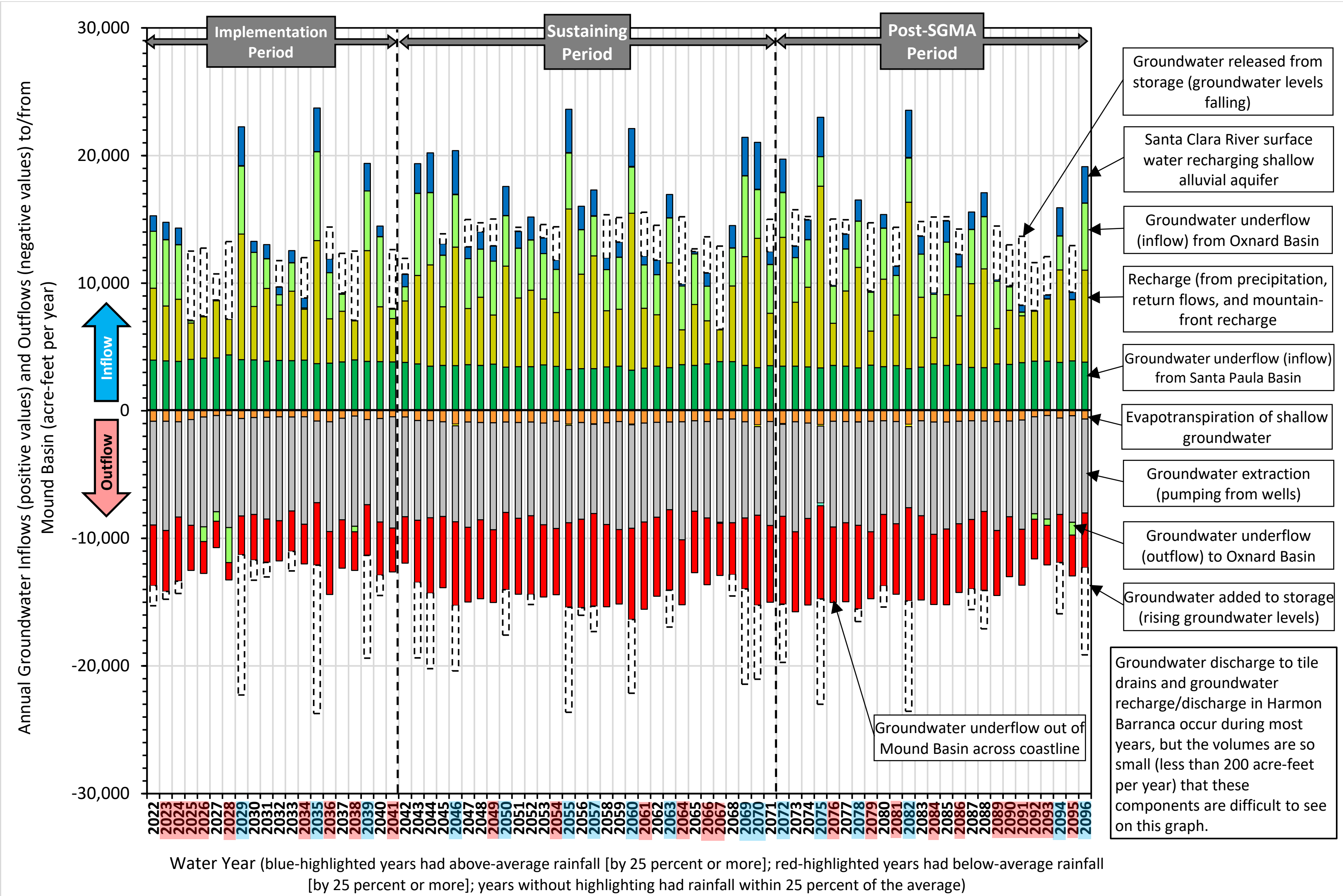


Figure 3.3-12 Projected Groundwater Budget Components under the 2030 Climate Change Scenario.

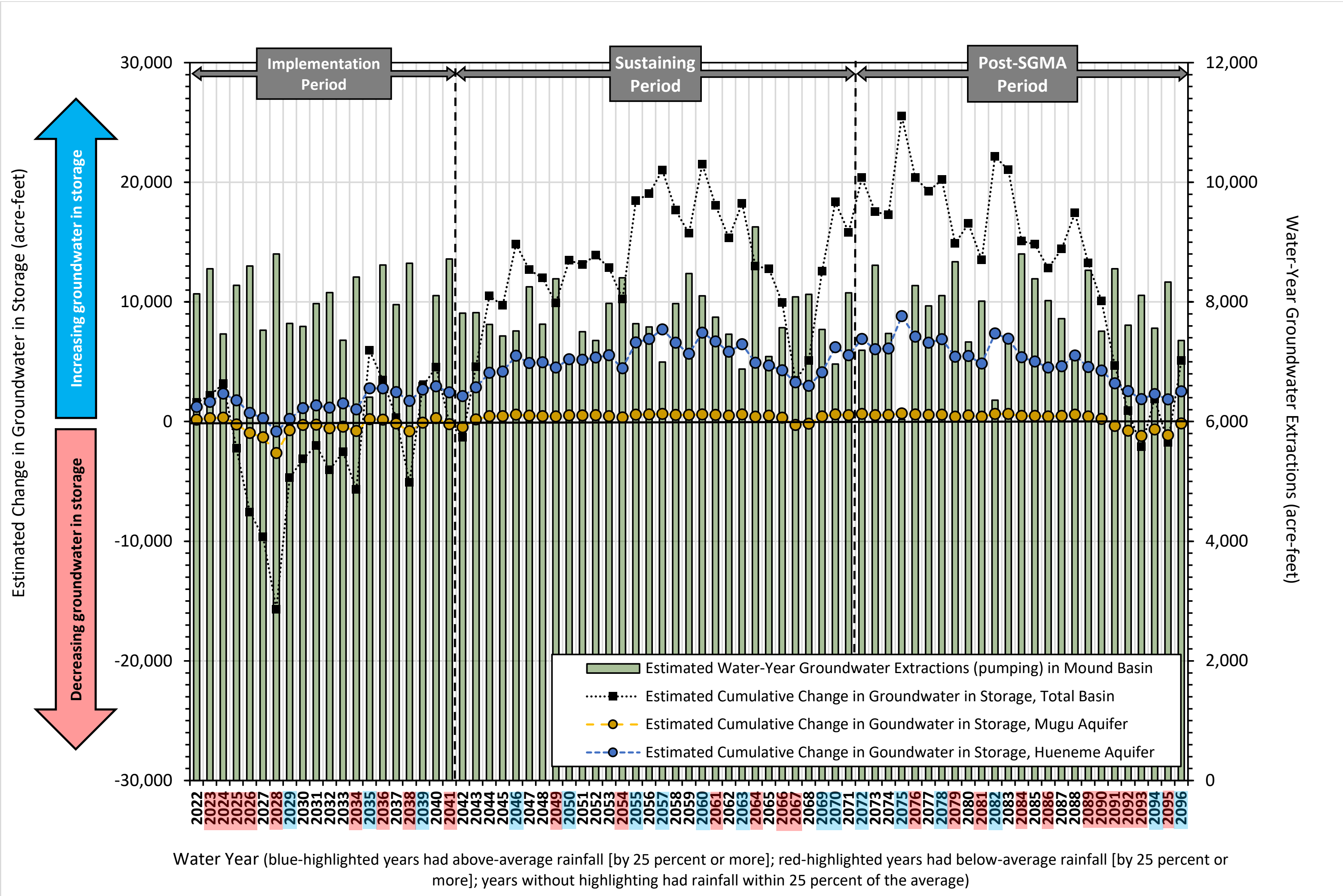


Figure 3.3-13 Projected Change in Groundwater Storage and Water Year Extraction Volumes under the 2030 Climate Change Scenario.

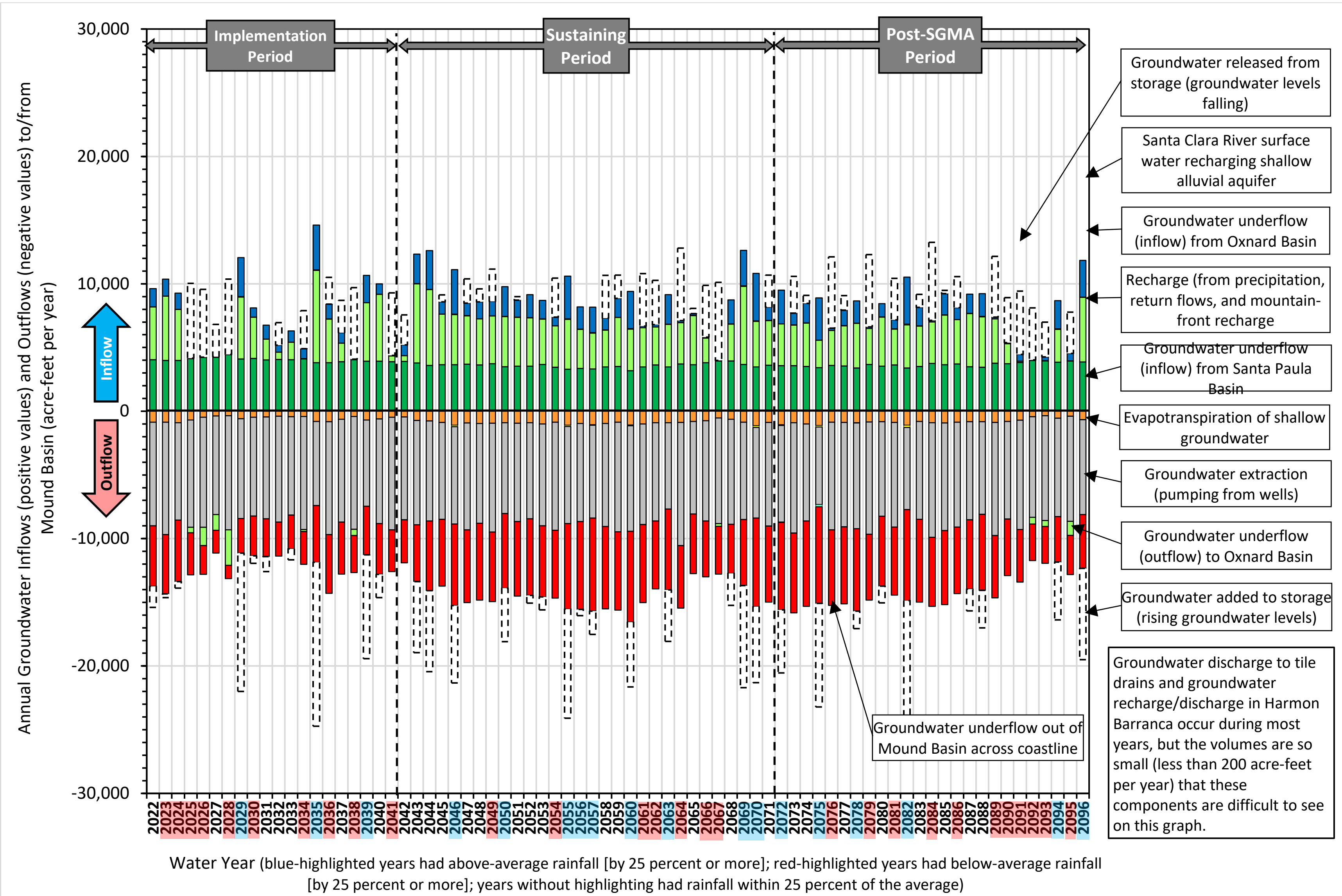


Figure 3.3-14 Projected Groundwater Budget Components under the 2070 Climate Change Scenario.

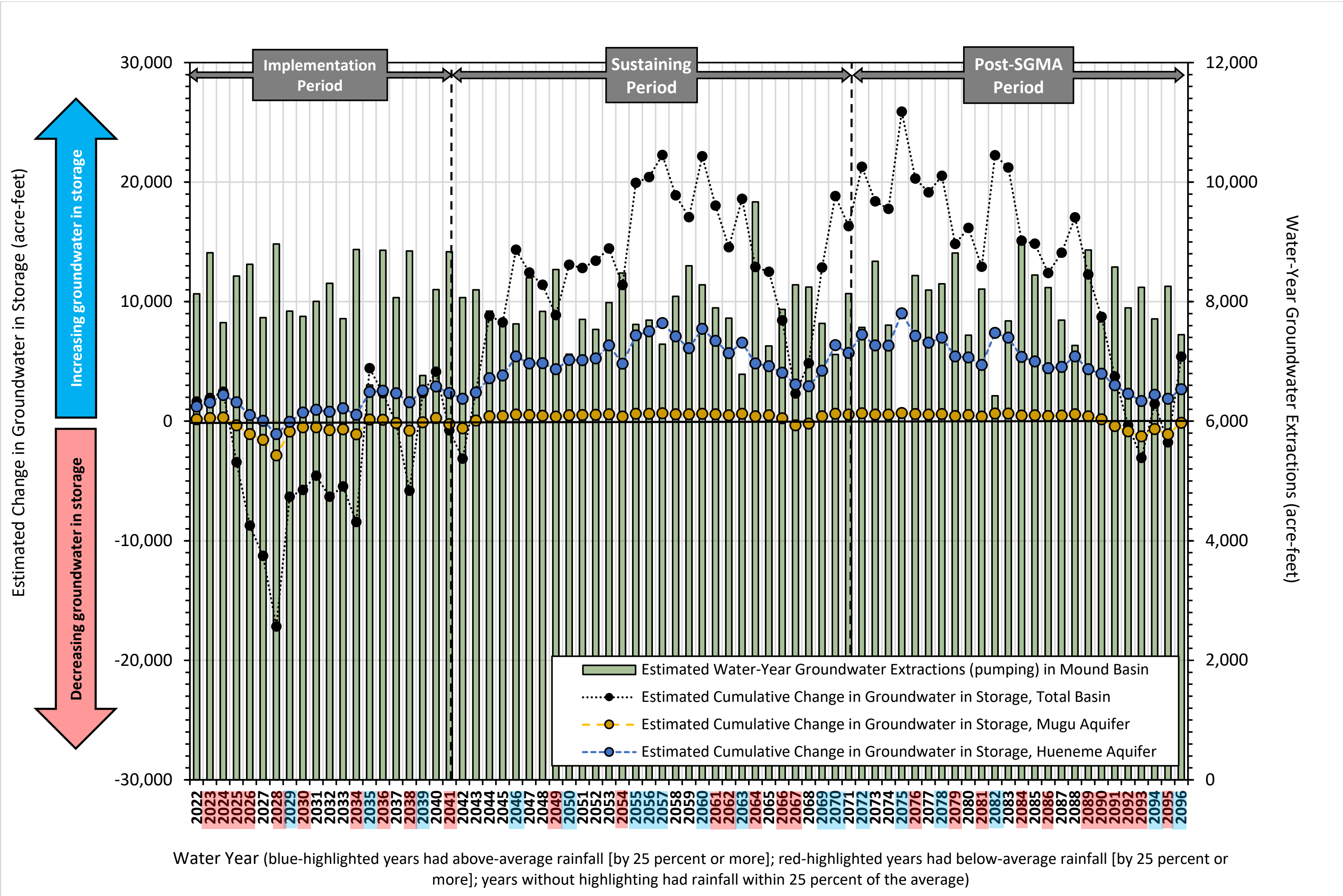


Figure 3.3-15 Projected Change in Groundwater Storage and Water Year Extraction Volumes under the 2070 Climate Change Scenario.

Figures

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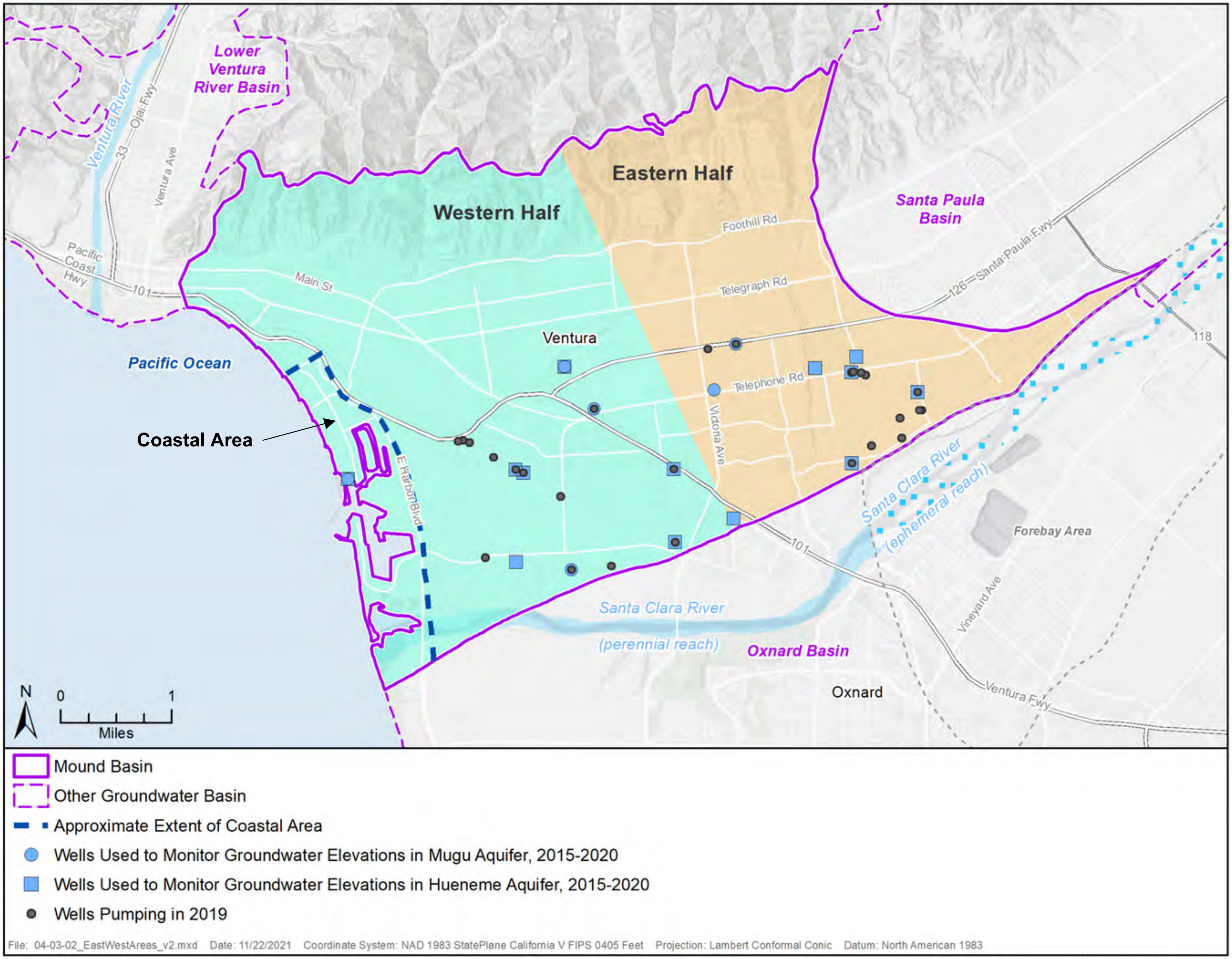


Figure 4.1-01 Mound Basin Eastern Half, Western Half, and Coastal Areas.

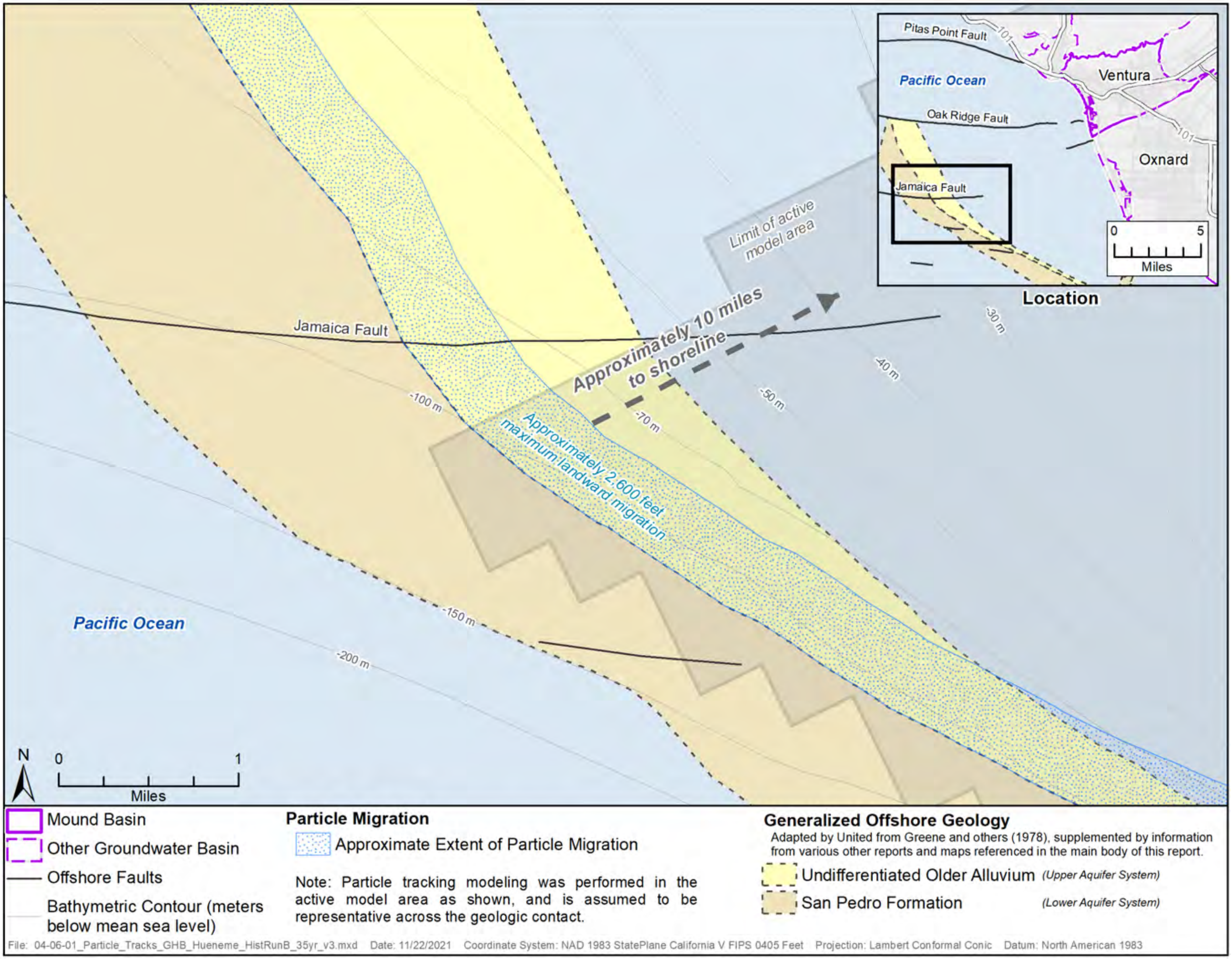


Figure 4.6-01 Estimated Historical Extent of Landward Seawater Movement in the Hueneme Aquifer.

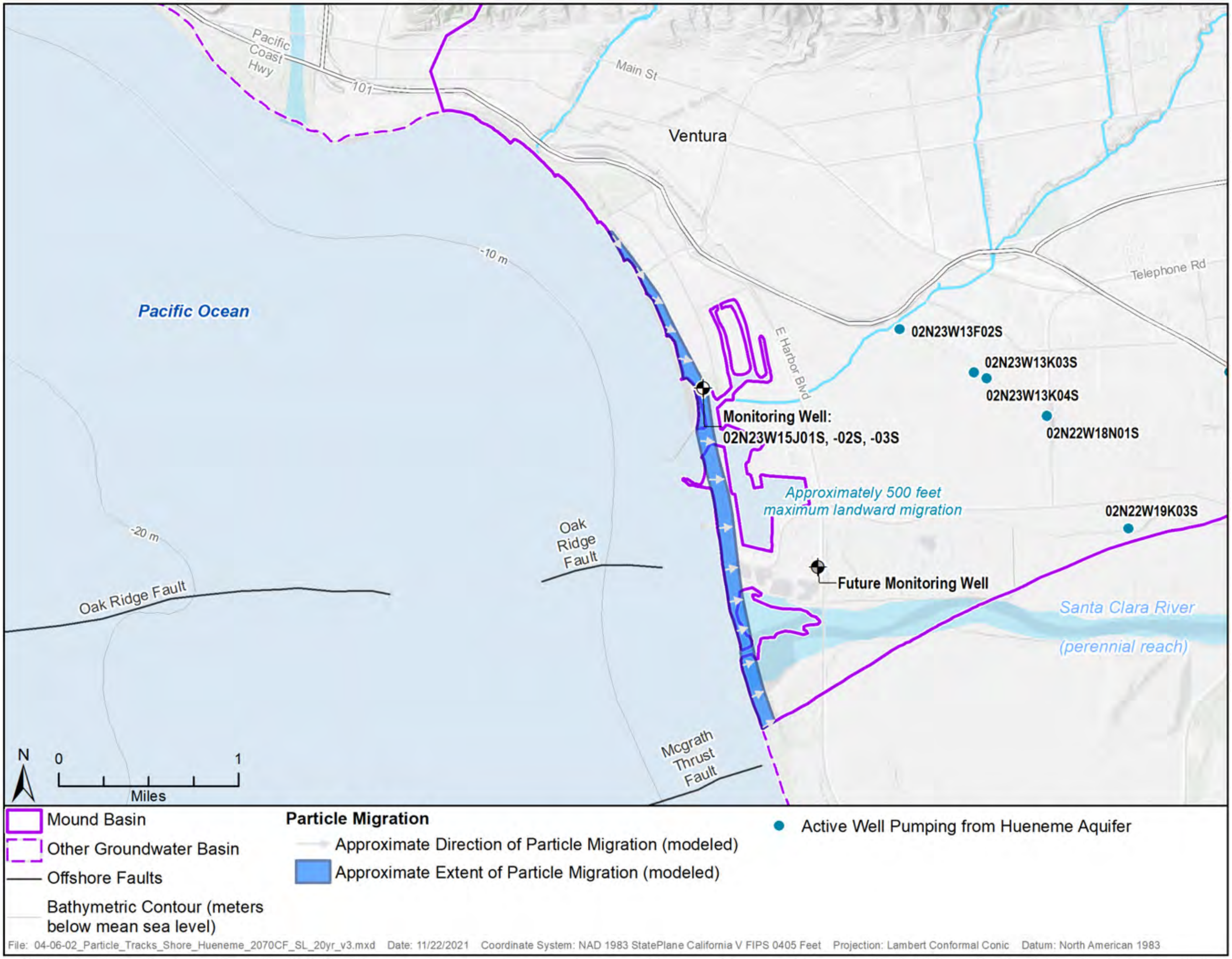


Figure 4.6-02 Estimated Landward Movement of Groundwater During 20-Year GSP Implementation Period (with 2070 Climate Change and Sea Level Rise).

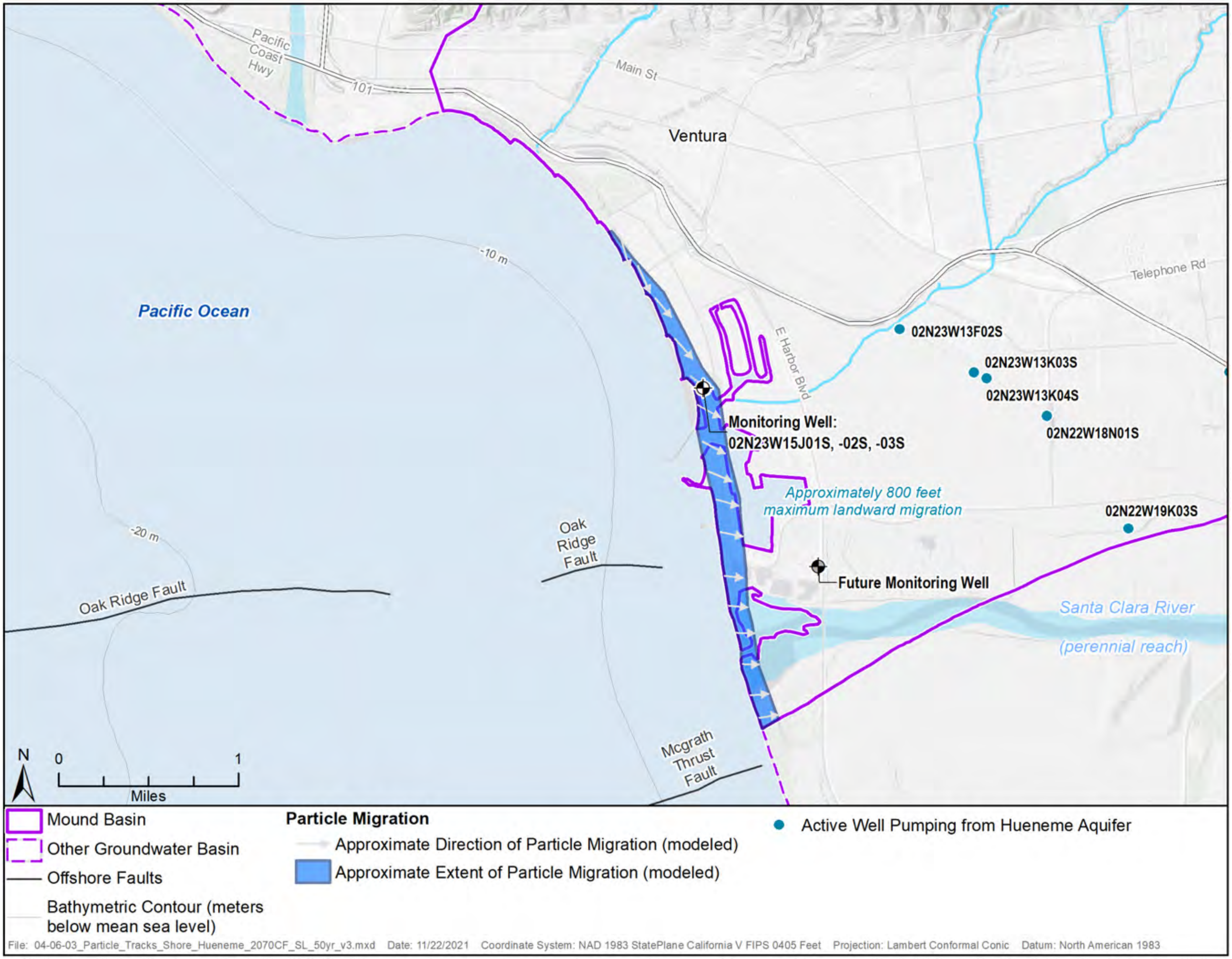


Figure 4.6-03 Estimated Landward Movement of Groundwater During 50-Year SGMA Planning Period (with 2070 Climate Change and Sea Level Rise).

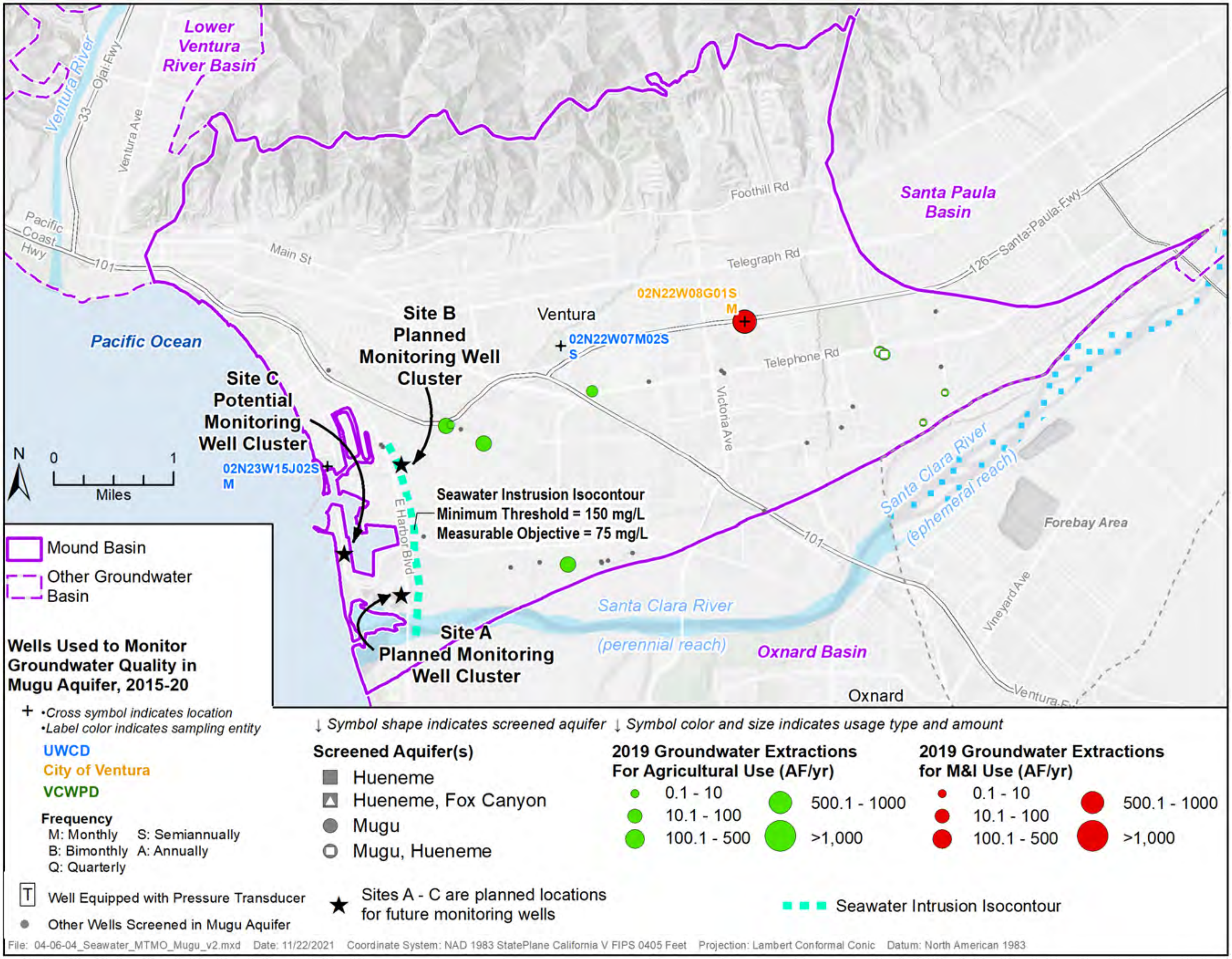


Figure 4.6-04 Map Showing Seawater Intrusion Minimum Threshold and Measurable Objective, Mugu Aquifer.

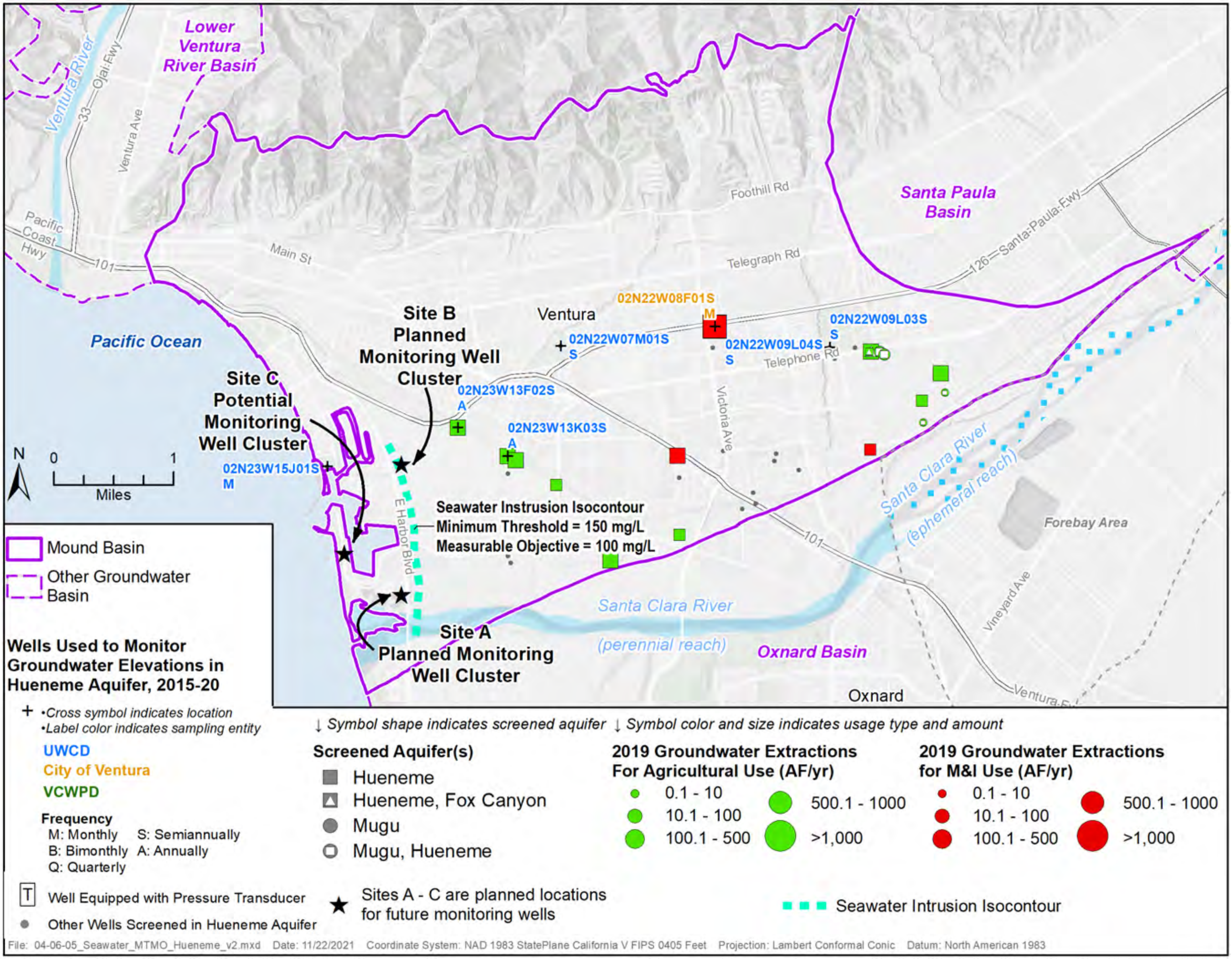


Figure 4.6-05 Map Showing Seawater Intrusion Minimum Threshold and Measurable Objective, Hueneme Aquifer.

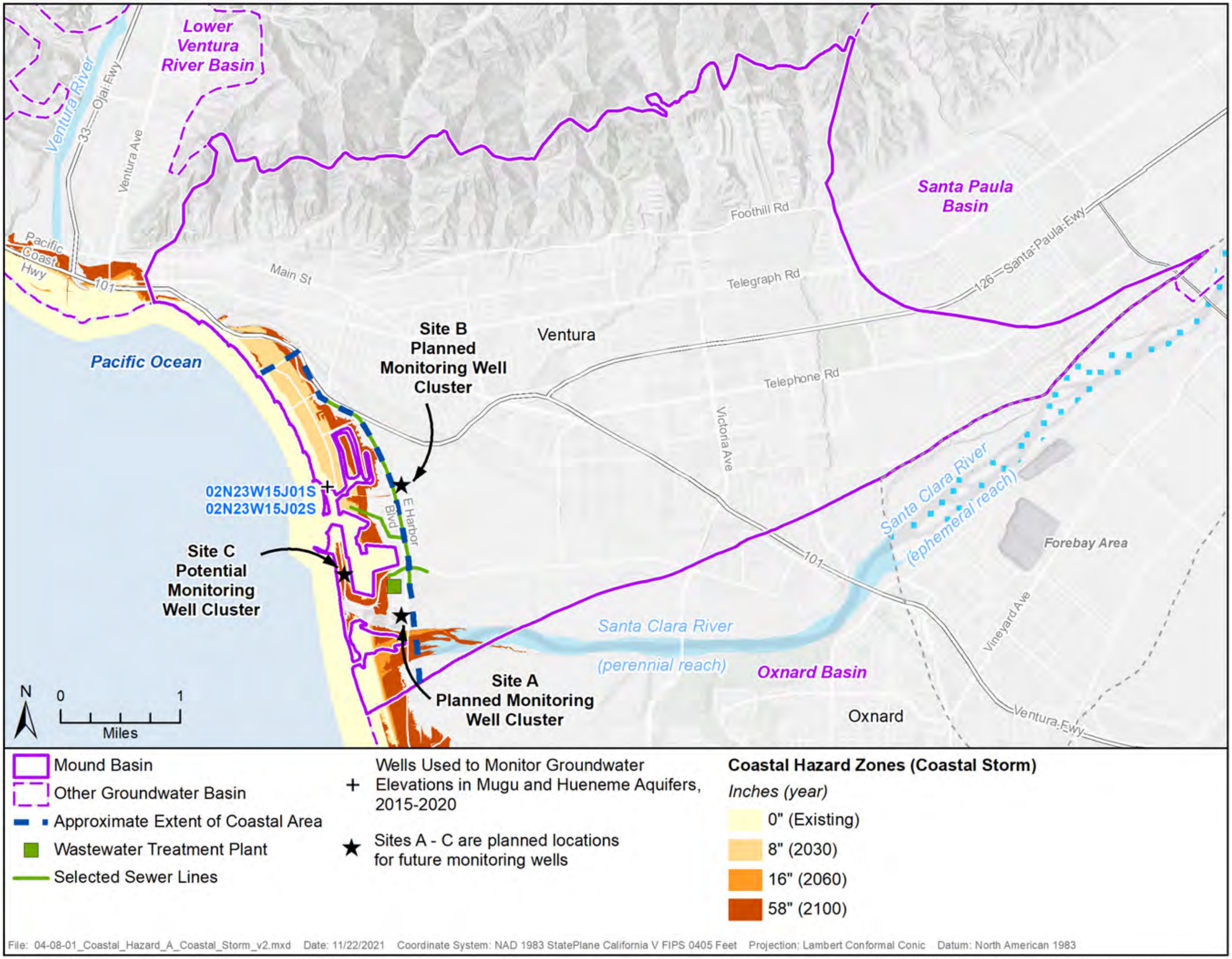


Figure 4.8-01a Seal Level Rise Associated with Coastal Storm Hazard.

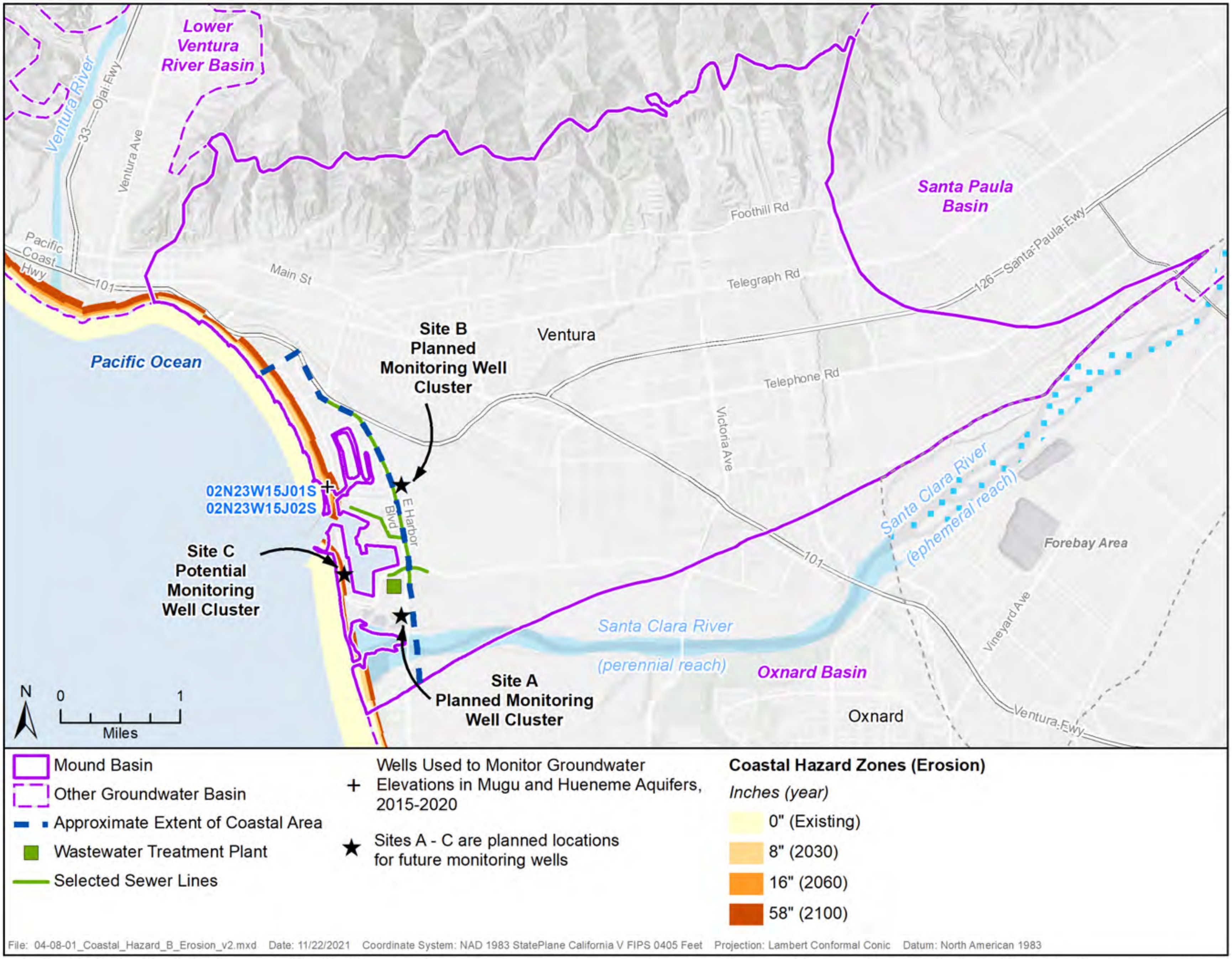


Figure 4.8-01b Sea Level Rise Associated with Coastal Erosion Hazard.

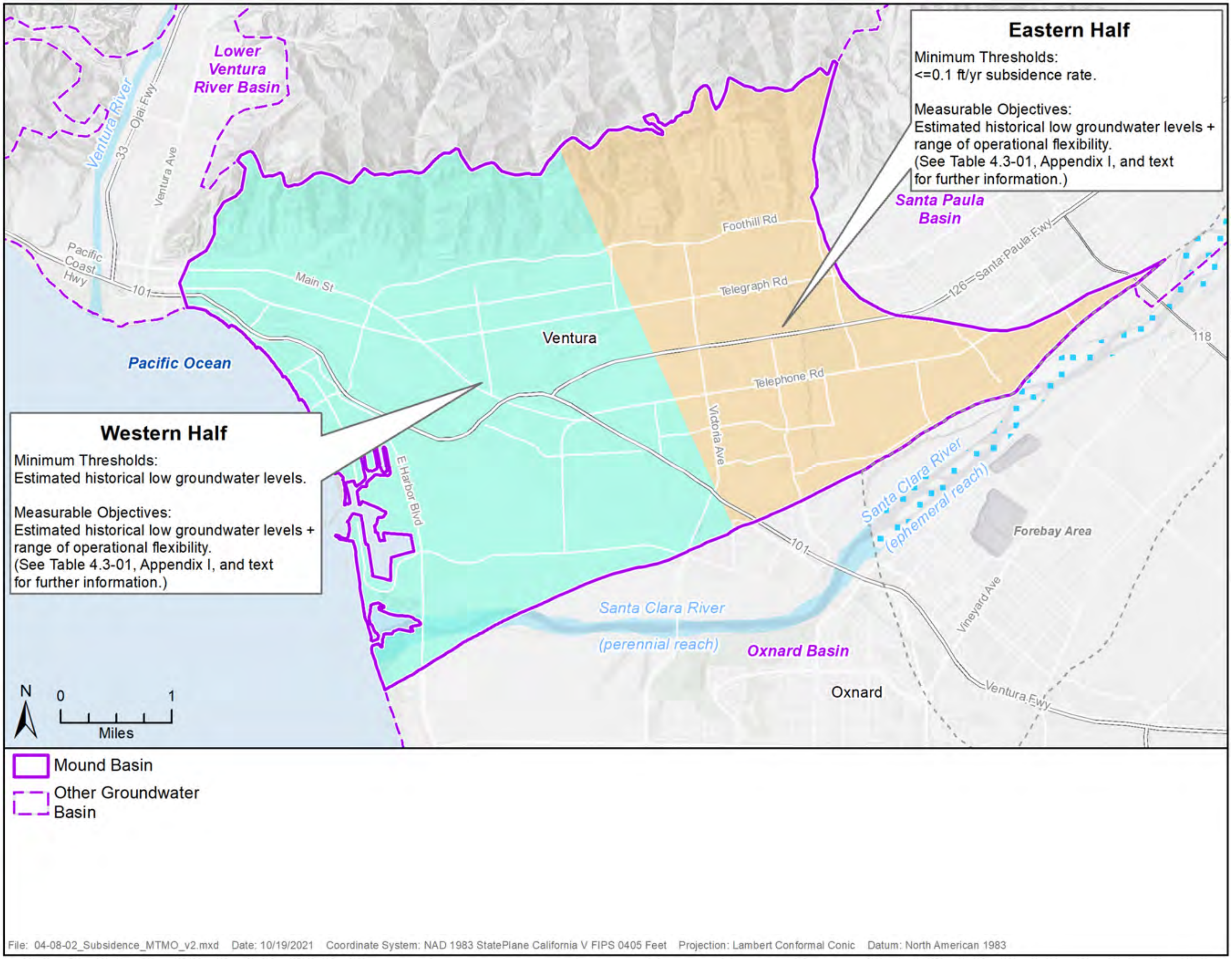


Figure 4.8-02 Map Showing Land Subsidence Minimum Thresholds and Measurable Objectives.

Figures

Section 5

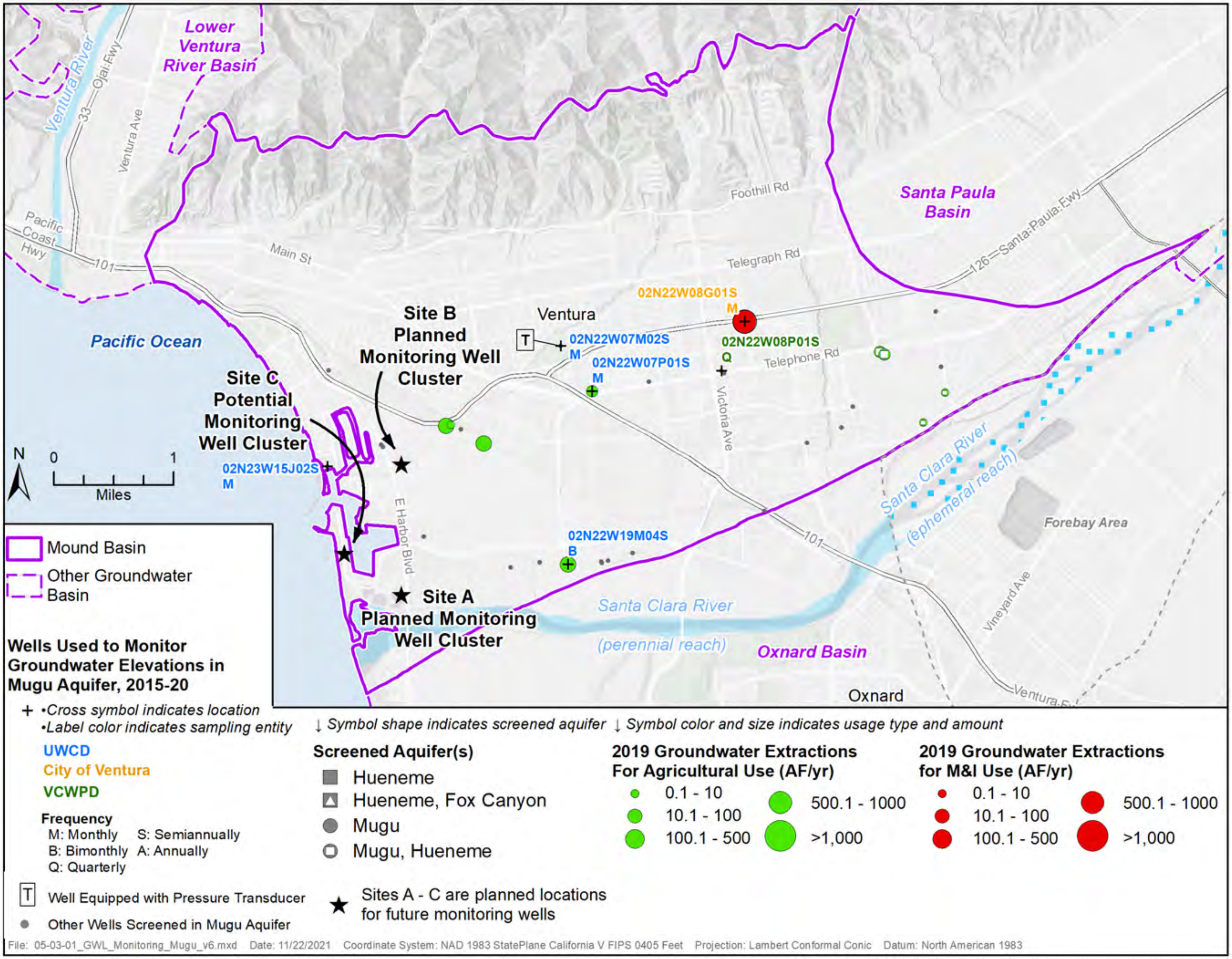


Figure 5.3-01 Map Showing the Groundwater Elevation Monitoring Network in the Mugu Aquifer of Mound Basin.

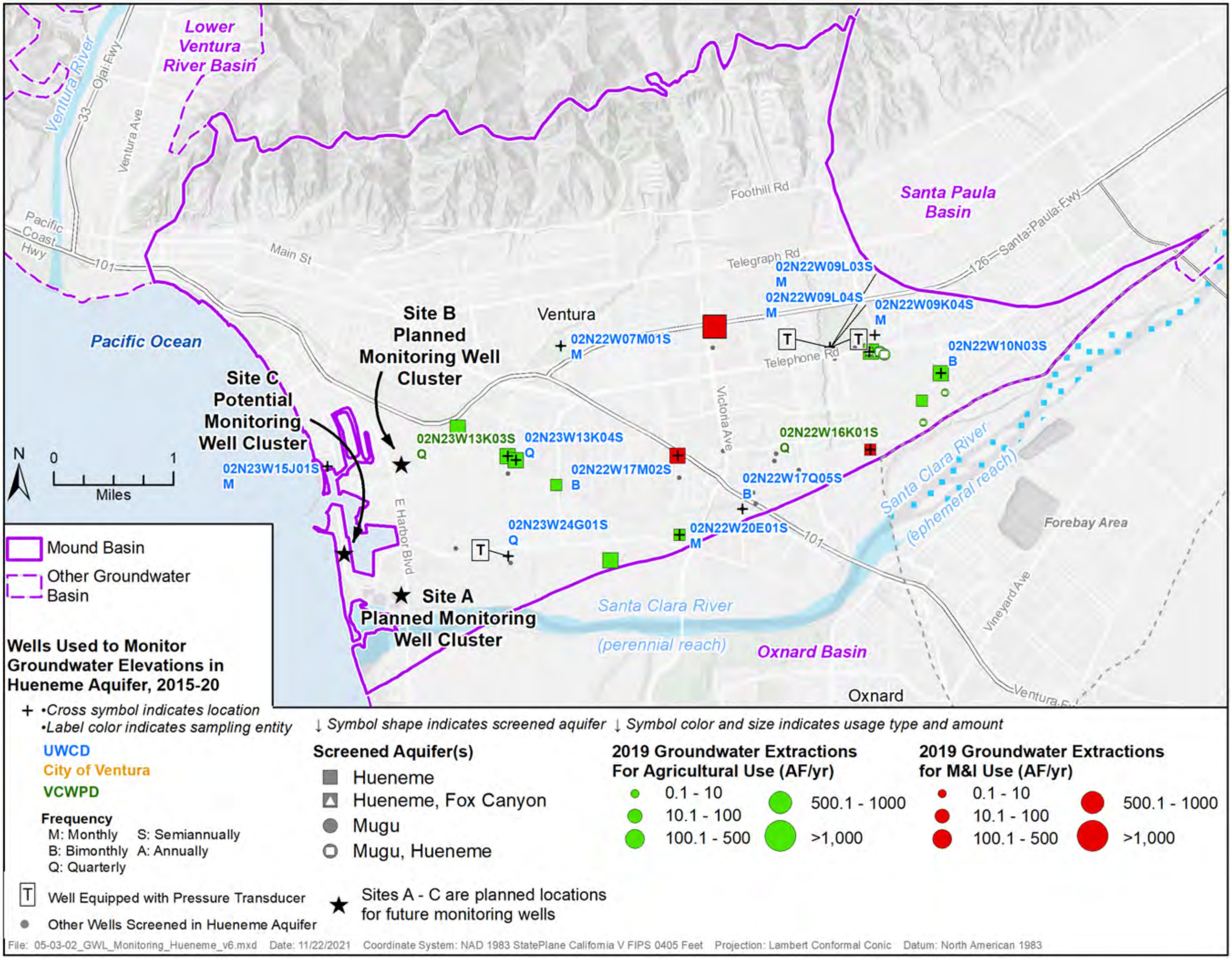


Figure 5.3-02 Map Showing the Groundwater Elevation Monitoring Network in the Hueneme Aquifer of Mound Basin.

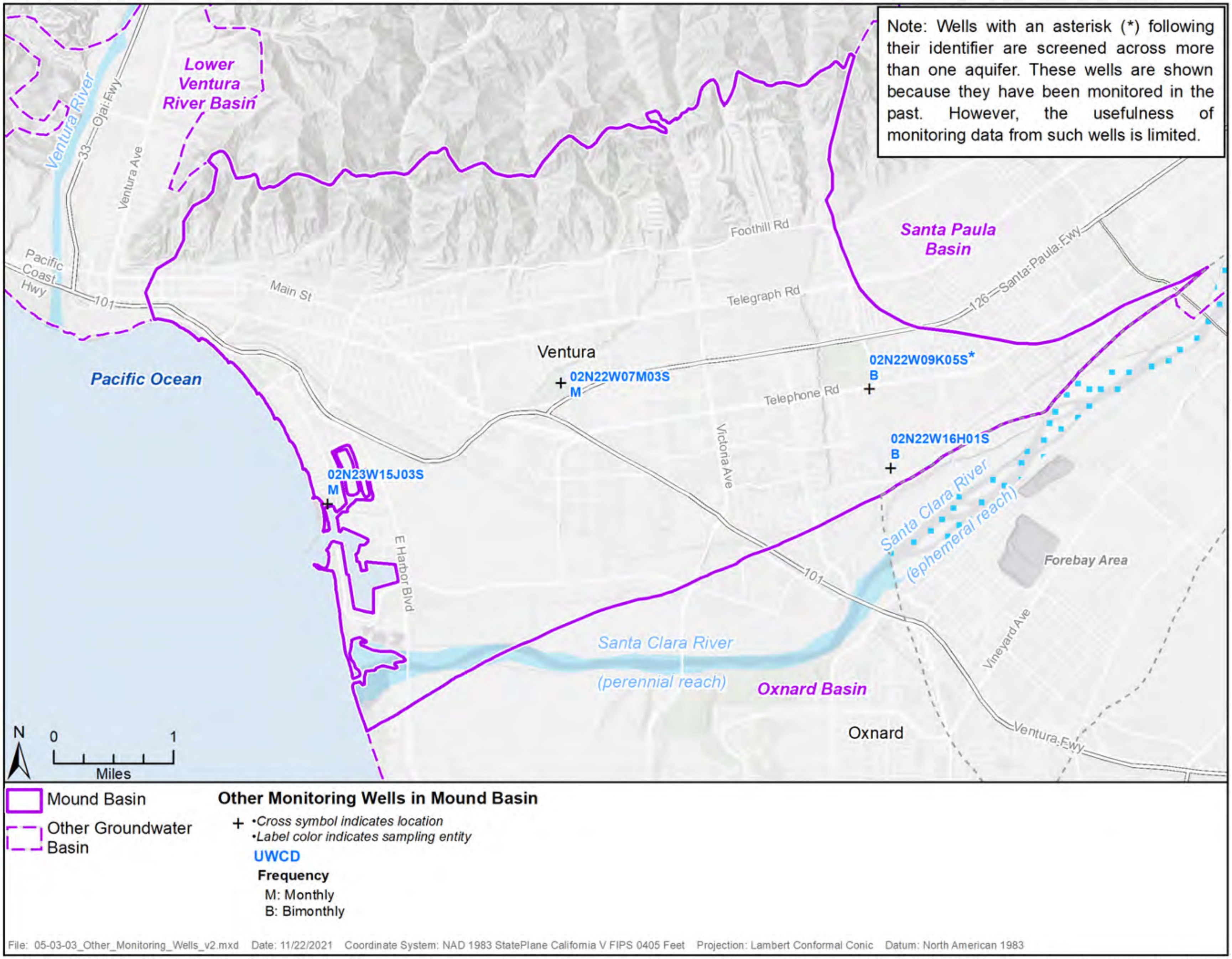


Figure 5.3-03 Map Showing Other Monitoring Wells in Mound Basin.

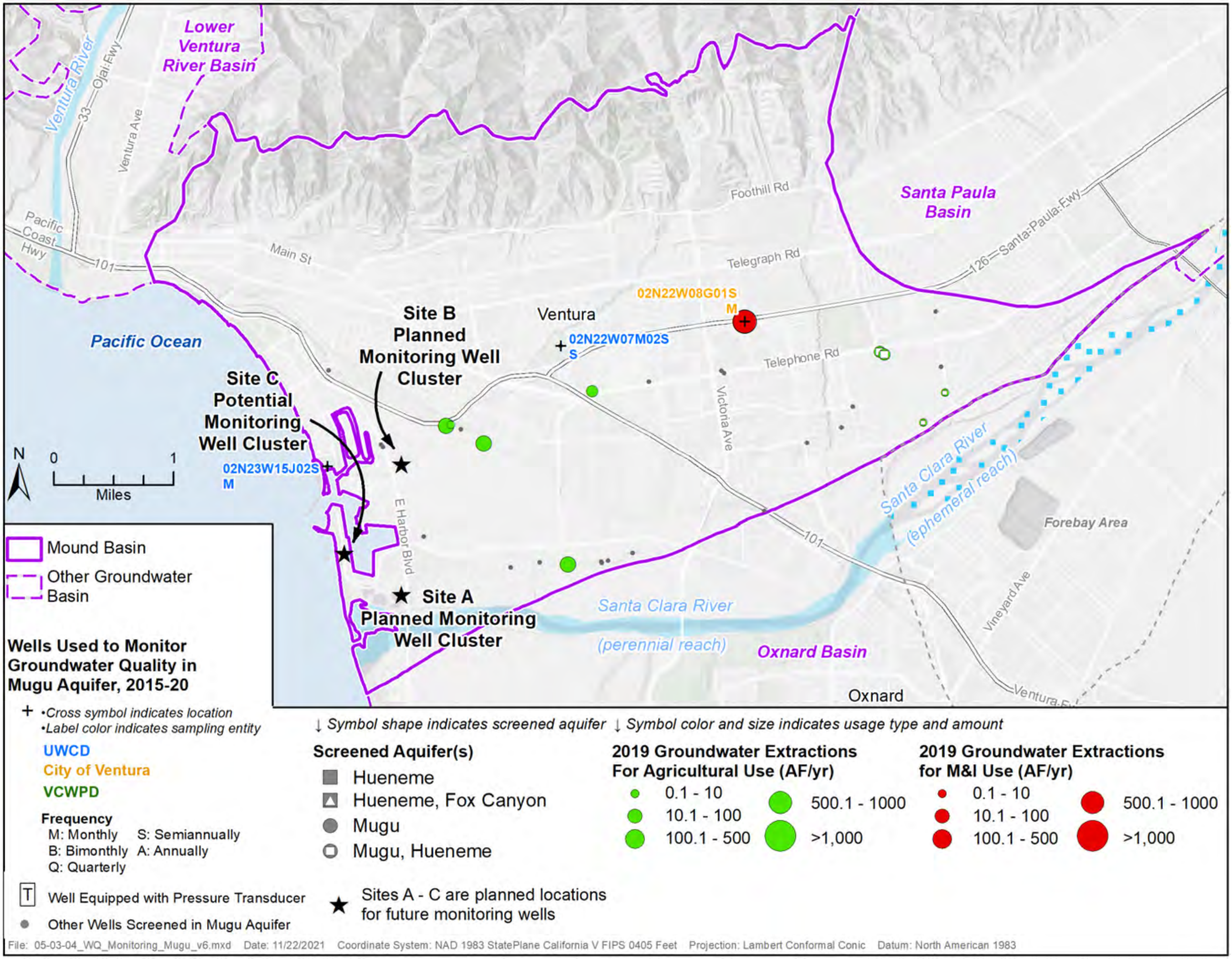


Figure 5.3-04 Map Showing the Groundwater Quality and Seawater Intrusion Monitoring Networks in the Mugu Aquifer of Mound Basin.

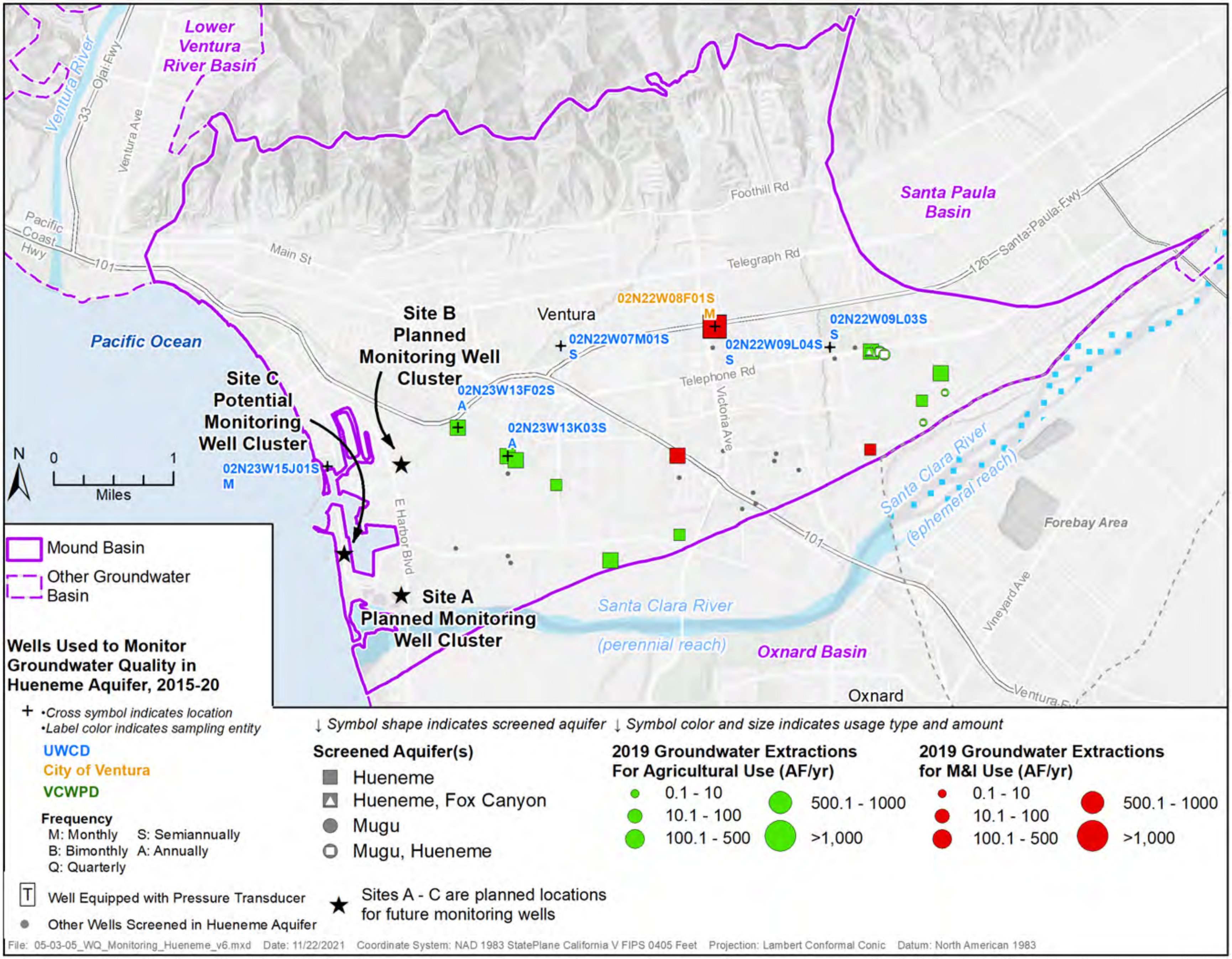


Figure 5.3-05 Map Showing the Groundwater Quality and Seawater Intrusion Monitoring Networks in the Hueneme Aquifer of Mound Basin.

Figure

Section 6

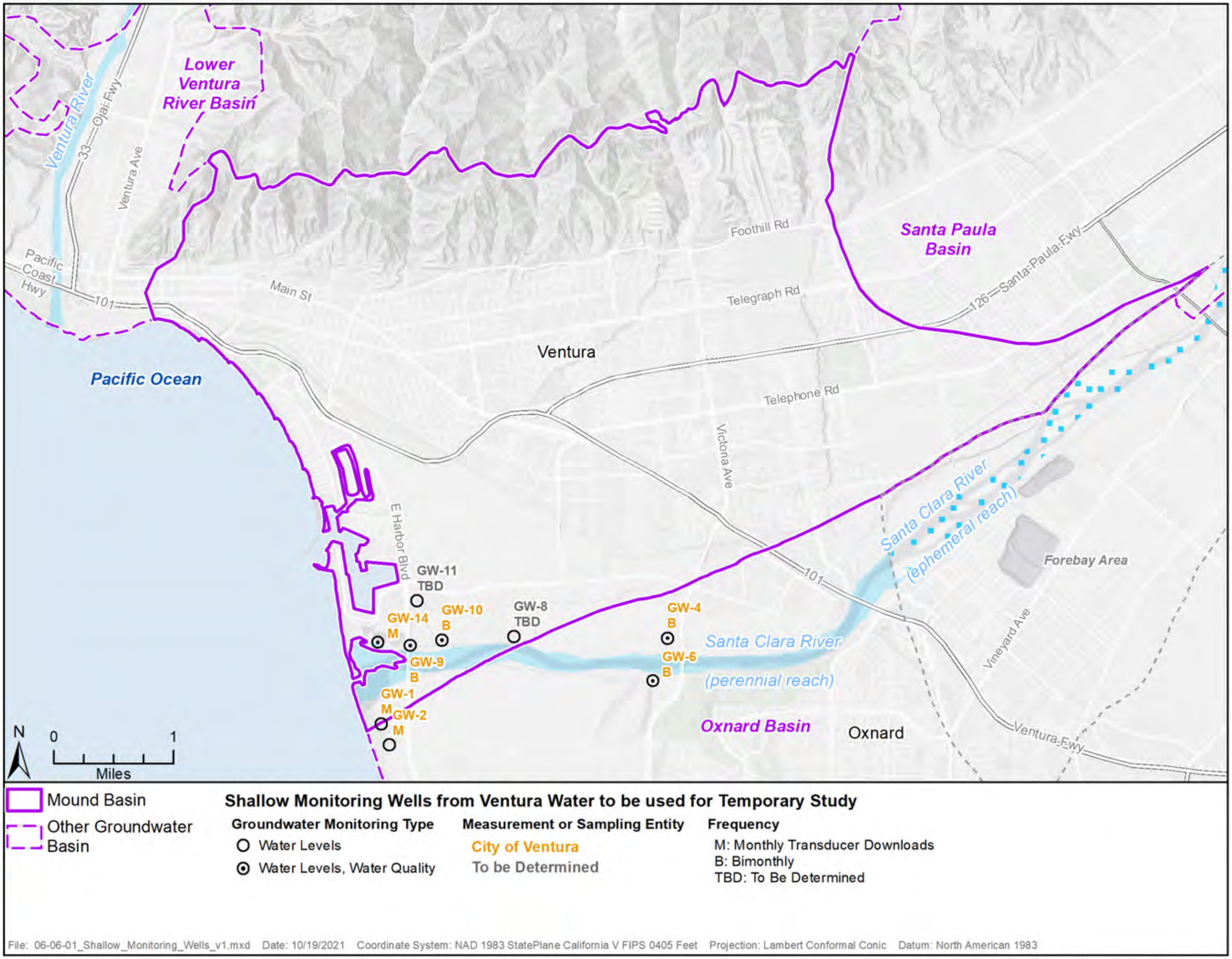


Figure 6.6-01 Monitoring Locations for Interim Shallow Groundwater Data Collection Project.

Tables

Tables

Section 2

Table 2.2-01 Water Resources Monitoring Programs Relevant to the Mound Basin GSP.

Program	Agency	Parameter(s)	Description	Reference
United Groundwater Extraction Reporting	United Water Conservation District	Groundwater Extraction	Semi-annual self-reporting of groundwater extractions records for two 6-month periods (January 1 through June 30 and July 1 through December 31)	California Water Code Sections 74500-74554
United Groundwater Monitoring Program	United Water Conservation District	Groundwater Levels Groundwater Quality	Districtwide groundwater monitoring program	https://www.unitedwater.org/key-documents/#groundwater-conditions
Countywide Groundwater Monitoring Program	Ventura County Watershed Protection District	Groundwater Levels Groundwater Quality	Countywide groundwater monitoring program	https://s29422.pcdn.co/wp-content/uploads/2018/08/2015-Annual-Report-Final-Reduced.pdf
Division of Drinking Water Compliance Monitoring	City of Ventura (Ventura Water)	Groundwater Quality	Ventura Water monitors the quality of groundwater from its municipal wells in the Mound Basin.	https://www.cityofventura.ca.gov/DocumentCenter/View/21807/2020-Consumer-Confidence-Report
California Statewide Groundwater Elevation Monitoring (CASGEM)	Ventura County Watershed Protection District	Groundwater Levels	VCWPD is the CASGEM monitoring entity for the Ventura County. Data is compiled from the Countywide Groundwater Monitoring Program and cooperative entities.	https://water.ca.gov/Programs/Groundwater-Management/Groundwater-Elevation-Monitoring--CASGEM
Groundwater Ambient Monitoring and Assessment Program (GAMA)	State Water Resources Control Board	Groundwater Quality	SWRCB Program implemented in 2000 (modified by Assembly Bill 599 in 2001) to monitor and assess groundwater basins throughout the state.	https://www.waterboards.ca.gov/water_issues/programs/gama/
GeoTracker	State Water Resources Control Board	Groundwater Quality	Records for contamination remediation sites.	https://geotracker.waterboards.ca.gov/
Lower Santa Clara River Salt and Nutrient Management Plan (SNMP)	Los Angeles Regional Water Quality Control Board and regulated entities	Groundwater Quality	Monitoring program for plan implementation of the SNMP to meet the requirements of the Recycled Water Policy (SWRCB Resolution 2009-0011). Monitoring program relies primarily on existing monitoring programs listed on other of this table.	https://www.waterboards.ca.gov/losangeles/water_issues/programs/salt_and_nutrient_management/docs/lscr/3_FinalLSCRSNMP_pg38-376.pdf
Countywide Precipitation Monitoring	Ventura County Watershed Protection District	Precipitation	Countywide rainfall monitoring program (3 active stations located within Mound Basin See Figure 3.1-01)	https://www.vcwatershed.net/hydrodata/
Countywide Stream Flow Monitoring	Ventura County Watershed Protection District	Stream flow	Countywide stream flow monitoring program (4 stations located within Mound Basin – See Figure 3.1-01)	https://www.vcwatershed.net/hydrodata/
Countywide Evaporation Monitoring	Ventura County Watershed Protection District	Evaporation	Countywide evaporation monitoring program (no stations located within Mound Basin, but data is useful for estimating conditions in the Basin)	https://www.vcwatershed.net/hydrodata/
California Irrigation Management Information System (CIMIS)	California Department of Water Resources	Weather Station (multiple parameters)	Statewide weather station network (no stations located within Mound Basin, but data is useful for estimating conditions in the Basin)	https://cimis.water.ca.gov/
National Water Information System	United States Geologic Survey	Groundwater Levels Groundwater Quality Stream Flow Spring Flow	Countrywide monitoring network (no sites are located within Mound Basin, but data is relevant for regional context)	https://maps.waterdata.usgs.gov/mapper/index.html

Table 2.2-02 Water Resources Management Programs Relevant to the Mound Basin GSP.

Program	Agency	Parameter(s)	Description	Reference
City of Ventura Urban Water Management Plan	City of Ventura (Ventura Water)	Water Supply	Planning tool that generally guides the actions related to water supply issues for the Ventura Water service area.	https://www.cityofventura.ca.gov/DocumentCenter/View/5623/2015-Urban-Water-Management-Plan-Main-Text
Casitas Municipal Water District Urban Water Management Plan	Casitas Municipal Water District	Water Supply	Planning tool that generally guides the actions related to water supply issues for the Casitas Municipal Water District service area.	https://www.casitaswater.org/home/showpublisheddocument/163/636896291075730000
Integrated Regional Water Management (IRWM) Program and Plan	Watershed Coalition of Ventura County (WCVC)	Water Supply Groundwater Levels Groundwater Levels Surface Water Quality	Initiated with Proposition 50 in 2006, the program provides competitive grant funds for projects and studies in accordance with a comprehensive IRWM Plan.	http://wcvc.ventura.org/ http://www.scrwatershed.org/
Freeman Diversion and Related Facilities	United Water Conservation District	Groundwater Recharge	Diversion of Santa Clara River flood flows for managed aquifer groundwater recharge and direct water deliveries in-lieu of groundwater pumping in the adjacent Oxnard Subbasin. Although these water management activities occur in the adjacent Oxnard Basin, groundwater levels benefits are realized in the Mound Basin.	https://www.unitedwater.org/about-us/#facilities-strategies
Lower Santa Clara River Salt and Nutrient Management Plan (SNMP)	Los Angeles Regional Water Quality Control Board and regulated entities	Groundwater Quality	Plan to meet the requirements of the Recycled Water Policy (SWRCB Resolution 2009-0011).	https://www.waterboards.ca.gov/losangeles/water_issues/programs/salt_and_nutrient_management/docs/lscr/3_FinalLSCRSNMP_pg38-376.pdf
Ventura County Stormwater Quality Monitoring Program	Ventura County Watershed Protection District and City Partners	Surface Water Quality	Program meets the requirements of the Ventura County Stormwater Permits. Includes water quality sampling, watershed assessments, business inspections, and pollution prevention programs.	http://www.vcstormwater.org/
VCAILG Water Quality Management Plan	Los Angeles Regional Water Quality Control Board and regulated entities. Program is managed by the Ventura County Farm Bureau	Surface Water Quality Groundwater Quality	VCAILG's Water Quality Management Plan (WQMP) serves as the roadmap to meet local water quality standards and goals. These plans are prepared and submitted to the Los Angeles Regional Water Quality Control Board (Regional Board) to comply with the agricultural conditional waiver of waste discharge requirements. The plan addresses measurement and control of discharges from irrigated farmland to protect surface water quality.	http://www.farmbureauvc.com/issues/water-issues/water-quality/vcailg

Tables

Section 3

Table 3.1-01 Summary of Hydraulic Parameters for Mound Basin Hydrostratigraphic Units.

Hydrostratigraphic Unit (aquifer or aquitard)	Horizontal Hydraulic Conductivity (feet per day)	Vertical Hydraulic Conductivity (feet per day)	Specific Yield (percent)	Storage Coefficient (unitless)
Shallow Alluvial Deposits	200	20	15	N/A
Fine-grained Pleistocene deposits	0.01	0.001	5	0.001
Mugu Aquifer	100	10	15	0.001
Mugu-Hueneme aquitard	0.01	0.001	5	0.0005
Hueneme Aquifer	20	2	10	0.0005
Hueneme-Fox Canyon aquitard	0.1	0.01	5	0.0005
Fox Canyon Aquifer-main	10	1	10	0.0005
Fox Canyon upper-basal aquitard	0.1	0.01	5	0.0005
Fox Canyon Aquifer – basal	10	1	10	0.0005

Notes:
N/A = Not applicable

Table 3.1-02 Aquifers and Pumping Rates for Active Water Supply Wells in Mound Basin During 2019.

State Well Identification Number	Reported Groundwater Use	Year Well Constructed	Depth of Screened Interval(s) (feet bgs)[b]	Aquifers Screened	Groundwater Pumped in 2019 for Agricultural Use[b] (acre-feet)	Groundwater Pumped in 2019 for Municipal and Industrial Use[b] (acre-feet)	Total Groundwater Pumped in 2019[b] (acre-feet)
02N22W07P01S	Agriculture	2000	460-580	Mugu	28	0	28
02N22W08G01S	M&I	2000	580-650	Mugu[c]	0	1,740	1,740
02N22W19M04S	Agriculture	2004	343-493	Mugu	155	0	155
02N23W13E01S	Agriculture	1983	523-1123	Mugu	2	0	2
02N23W13G01S	Agriculture	2010	360-860	Mugu	470	0	470
02N23W14H01S	Agriculture	2016	407-717, 877-977, 1077-1137	Mugu	293	0	293
02N22W09K01S	Agriculture	---	236-336	Mugu & Hueneme	51	0	51
02N22W09K08S	Agriculture	2010	224-284, 304-324, 404-465	Mugu & Hueneme	73	0	73
02N22W10N02S	Agriculture	1947	200-251, 279-354	Mugu & Hueneme	9	0	9
02N22W15E02S	Agriculture	2014	120-320	Mugu & Hueneme	1	0	1
02N22W08F01S	M&I	1994	580-640, 900-940, 1060-1180	Hueneme	0	1,546	1,546
02N22W10N03S	Agriculture	2002	200-280	Hueneme	115	0	115
02N23W13F02S	Agriculture	1990	521-982	Hueneme[d]	279	0	279
02N22W15D02S	Agriculture	1973	227-379	Hueneme	74	0	74
02N22W16K01S	M&I	1934	292-345	Hueneme	0	28	28
02N22W17M02S	M&I	2001	550-850	Hueneme	0	133	133
02N22W18N01S	Agriculture	1957	660-696, 804-876, 912-1020, 1056-1200	Hueneme	25	0	25
02N22W19K03S	Agriculture	2007	450-470, 490-510, 560-600	Hueneme	107	0	107
02N22W20E01S	Agriculture	1991	462-592, 612-723, 737-818	Hueneme	91	0	91

State Well Identification Number	Reported Groundwater Use	Year Well Constructed	Depth of Screened Interval(s) (feet bgs)[b]	Aquifers Screened	Groundwater Pumped in 2019 for Agricultural Use[b] (acre-feet)	Groundwater Pumped in 2019 for Municipal and Industrial Use[b] (acre-feet)	Total Groundwater Pumped in 2019[b] (acre-feet)
02N23W13K03S	Agriculture	1977	800-1200	Hueneme	251	0	251
02N23W13K04S	Agriculture	1981	800-1200	Hueneme	187	0	187
02N22W09K05S	Agriculture	1975	625-1455	Hueneme & Fox Canyon	8	0	8
02N22W09K07S	Agriculture	2003	640-1440	Hueneme & Fox Canyon	183	0	183
02N22W10N04S	Agriculture	2017(?)	---	unknown[e]	336	0	336
02N22W16H01S	Agriculture	---	---	unknown[e]	135	0	135
02N23W24F01S	Agriculture	---	---	unknown[e]	2	0	2
				Totals:	***2,873***	***3,446***	***6,319***

Notes:

"---" = Not reported.

M&I = Municipal and industrial.

a feet bgs = Feet below ground surface, reported by driller (updated by video survey by United Water Conservation District in some wells).

b Reported by owner to United Water Conservation District for calendar year 2019.

c This well may be partially screened in the Hueneme Aquifer; however, groundwater extracted from this well likely is derived primarily from the Mugu Aquifer.

d This well is screened primarily in the Hueneme Aquifer with a small length of its screen in the Mugu Aquifer. Sample results from this well appear to be consistent with sample results from other wells screened in the Hueneme Aquifer, indicating that groundwater extracted from this well is derived primarily from the Hueneme Aquifer.

e Agricultural water-supply wells with unknown screen depths are assumed in United's (2021) groundwater model to be constructed to extract groundwater from the shallowest principal aquifer, which is the Mugu Aquifer in the area of this well.

Table 3.1-03 Groundwater Quality Objectives for Mound Basin.

Constituent	Groundwater Quality Objective (Unconfined Aquifers)	Groundwater Quality Objective (Confined Aquifers)
TDS (mg/L)	3,000	1,200
Sulfate (mg/L)	1,000	600
Chloride (mg/L)	500	150
Boron (mg/L)	N/A	1.0

Notes:
N/A = not applicable.
TDS = total dissolved solids.

Table 3.2-01 Vertical Hydraulic Gradients Calculated at Clustered Monitoring Wells in Mound Basin.

Location	Well IDs	Screened Intervals	Screened Aquifers	Data Record Time Period	Minimum Vertical Gradient (ft/ft)	Maximum Vertical Gradient (ft/ft)	Average Vertical Gradient (ft/ft)
Marina Park	02N23W15J03S, 02N23W15J02S	170-240, 480-660	fine-grained Pleistocene deposits, Mugu	1995-2019	0.009	0.120	0.075
	02N23W15J02S, 02N23W15J01S	480-660, 970-1070	Mugu, Hueneme	1995-2019	-0.020	0.033	0.008
Camino Real Park	02N22W07M03S, 02N22W07M02S	210-280, 710-780	fine-grained Pleistocene deposits, Mugu	1995-2019	0.219	0.325	0.276
	02N22W07M02S, 02N22W07M01S	710-780, 1200-1280	Mugu, Hueneme	1995-2019	-0.028	0.043	0.008
Community Water Park, Kimball Rd.	02N22W09L04S, 02N22W09L03S	480-510, 890-950	Hueneme, Hueneme	2008-2019	-0.018	0.070	0.038

Note:
A positive vertical gradient value represents downward flow; a negative vertical gradient value represents an upward flow.

Table 3.3-01 Summary of Data Sources for Water Budget Components.

Water Budget Component	Data Source or Estimation Method
Directly measured components:	
Precipitation (i.e., rainfall)	• Historical and current: Precipitation data for Ventura County Government Center and other rain gauges in Ventura County collected and maintained by Ventura County Watershed Protection District (VCWPD) at https://www.vcwatershed.net/hydrodata/. • Projected: VCWPD precipitation data as noted above (assume repeat of water year 1945-2019 rainfall amounts), modified in accordance with central-tendency climate-change precipitation factors for 2030 and 2070, as recommended by California Department of Water Resources (2018).
Surface water imports	• Historical and current: Annual volumes of surface water from Casitas MWD used within City of Ventura reported by Ventura Water (2020a), scaled proportionally to percentage of Ventura Water's service area in Mound Basin. • Projected: Planned surface-water imports to City of Ventura (Ventura Water, 2020b), scaled proportionally to percentage of Ventura Water's service area in Mound Basin.
Groundwater imports	• Historical and current: Annual or long-term average volumes of groundwater imported by agricultural users and Ventura Water (described in Section 3.1.1.3), scaled proportionally to percentage of application area within Mound Basin (Alta MWC, 2020; FICO, 2017a; Ventura Water, 2020a). • Projected: Planned long-term average groundwater imports to City of Ventura (Ventura Water, 2020b), scaled proportionally to percentage of Ventura Water's service area in Mound Basin. Application of imported groundwater by Alta MWC and FICO assumed to remain constant over the long-term average.
Groundwater extractions (pumping)	• Historical and current: Groundwater extraction reported by users to United semiannually (for periods January 1-June 30 and July 1 through December 31 of each year), with monthly pumping estimated from semiannual totals based on monthly rainfall. • Projected: United groundwater extraction data as noted above (assume repeat of water year 1945-2019 rainfall amounts), modified in accordance with central-tendency climate-change evapotranspiration factors for 2030 and 2070, as recommended by California Department of Water Resources (2018).
Components estimated using related data:	
Ephemeral stream flows entering and exiting Mound Basin in barrancas	• Historical, current, and projected: Annual streamflows reported by VCWPD (https://www.vcwatershed.net/hydrodata/) for Arundell Barranca from 1986 through 2006 were correlated to rainfall at Ventura County Government Center (described above), and extrapolated to the remainder of Mound Basin (described further in Section 3.3) based on historical, current, and projected annual rainfall.
Surface flows entering and exiting Mound Basin in Santa Clara River	• Historical, current, and projected: Estimated based on past and assumed future rainfall in the Santa Clara River watershed, based on surface-water and groundwater modeling conducted by United (2021a, 2021b, and 2021c).

Water Budget Component	Data Source or Estimation Method
Components estimated by groundwater flow modeling:	
Interaction (exchanges) of groundwater and surface water within Mound Basin	• Historical, current, and projected: Calculated for the Santa Clara River and Harmon Barranca by United's groundwater flow model based on factors including river stage, groundwater elevation, and hydraulic parameters within and directly below the riverbed (United, 2021a, 2021b, and 2021c). River stage and surface flows in the Santa Clara River are a function of rainfall throughout the Santa Clara River watershed, as noted above.
Recharge (including infiltration of precipitation, agricultural and M&I return flows, and mountain-front)	• Historical, current, and projected: Infiltration of precipitation and mountain-front recharge were estimated based on model calibration as a function of monthly rainfall (United, 2021a, 2021b, and 2021c). M&I and agricultural return flows were also estimated based on model calibration, but are a function of water applied to farmland or used for M&I purposes, as described further in Section 3.3. The volume of water applied to farmland in the future was modified in accordance with central-tendency climate-change evapotranspiration factors for 2030 and 2070, as recommended by California Department of Water Resources (2018).
Direct evapotranspiration (ET) of groundwater in aquifers	• Historical, current, and projected: Significant rates of ET directly from aquifers in Mound Basin area assumed to occur solely along the Santa Clara River, and are calculated by United's groundwater flow model based on factors including maximum ET rate, ET extinction depth, and, groundwater elevations (United, 2021a, 2021b, and 2021c). Future maximum ET rates were modified in accordance with central-tendency climate-change evapotranspiration factors for 2030 and 2070, as recommended by California Department of Water Resources (2018).
Discharge of shallow groundwater to tile drains	• Historical, current, and projected: Where tile drains are present (southern Mound Basin), rates of discharge were calculated by United's groundwater flow model based on factors including drain depth, hydraulic parameters of the drains, and groundwater elevations in the Shallow Alluvial Deposits (United, 2021a, 2021b, and 2021c).
Groundwater underflow into or out of Mound Basin (from adjacent basins or offshore)	• Historical, current, and projected: Calculated by United's groundwater flow model based on aquifer parameters (most notably transmissivity) and hydraulic gradients between Mound Basin and adjacent basins or offshore areas (United, 2021a, 2021b, and 2021c).
Vertical groundwater flow between aquifers (and other HSUs) within Mound Basin	• Historical, current, and projected: Calculated by United's groundwater flow model based on aquifer parameters (most notably vertical conductance) and vertical hydraulic gradients between each aquifer and aquitard within Mound Basin (United, 2021a, 2021b, and 2021c).

Table 3.3-02 Mound Basin Surface Water Inflows and Outflows by Water Year, Historical and Current Periods.

				Surface Water Gains and Inflows (acre-feet per year)				Surface Water Losses and Outflows (acre-feet per year)					Surface Water Inflow and Outflow Components (acre-feet per year)[g]		Summary (acre-feet per year)		
Water Year	Annual Rainfall at Ventura County Govt. Center (inches)	Water-Year Type Based on Local Rainfall[a]	California Dept. of Water Resources "Water Year Type"[b]	Santa Clara River at Boundary Between Oxnard and Mound Basins	Ephemeral Streamflow Entering Mound Basin from Northern Foothills[c]	Ephemeral Streamflow Generated Within Mound Basin in Response to Rainfall[c]	Imported Surface Water (from Casitas MWD)[d]	Santa Clara River at Pacific Ocean[e]	Mountain-Front Recharge of Surface Flows in Ephemeral Streams in Northern Mound Basin[e]	Ephemeral Streams, Barrancas, and Storm Drain Discharges Exiting Mound Basin[c]	Fate of Imported Surface Water (from Casitas MWD)		Groundwater/ Surface Water Exchange in the Santa Clara River[e]	Groundwater/ Surface Water Exchange in Harmon Barranca[e]	Sum of Inflows	Sum of Outflows	Difference[h]
											M&I Return Flows[e]	Consumptive Use[f]					
Historical period (water years 1985 through 2015)																	
1986	25.15	Above Average	Above Normal	157,512	6,814	12,828	4,706	-158,857	-4,036	-15,606	-235	-4,470	244	-30	182,103	-183,234	-1,131
1987	7.50	Below Average	Dry	1,287	1,170	2,202	6,229	-3,044	-622	-2,750	-311	-5,918	363	0	11,251	-12,645	-1,394
1988	13.22	Near Average	Dry	24,862	2,999	5,646	5,740	-26,229	-1,872	-6,772	-287	-5,453	221	-6	39,468	-40,619	-1,152
1989	8.23	Below Average	Dry	1,403	1,403	2,642	6,780	-2,805	-1,081	-2,964	-339	-6,441	527	-4	12,755	-13,634	-879
1990	5.62	Below Average	Critical	1,577	569	1,070	4,217	-2,901	-578	-1,061	-211	-4,006	217	0	7,650	-8,757	-1,107
1991	16.92	Near Average	Dry	79,289	4,182	7,873	2,162	-80,387	-3,029	-9,026	-108	-2,054	-112	-23	93,506	-94,740	-1,233
1992	20.34	Above Average	Wet	251,991	5,276	9,932	768	-252,632	-4,035	-11,173	-38	-730	-896	-26	267,967	-269,530	-1,562
1993	28.76	Above Average	Wet	831,337	7,969	15,001	1,607	-830,609	-5,115	-17,854	-80	-1,526	-2,402	-40	855,913	-857,627	-1,714
1994	11.68	Near Average	Above Normal	48,785	2,507	4,719	3,440	-50,028	-1,468	-5,757	-172	-3,268	844	-9	60,294	-60,702	-408
1995	31.72	Above Average	Wet	427,824	8,915	16,783	1,126	-428,589	-5,808	-19,890	-56	-1,070	-1,500	-8	454,648	-456,921	-2,273
1996	12.79	Near Average	Above Normal	56,652	2,862	5,387	3,005	-58,198	-1,981	-6,267	-150	-2,855	923	-11	68,828	-69,462	-634
1997	14.75	Near Average	Below Normal	79,380	3,488	6,567	4,855	-81,048	-2,762	-7,293	-243	-4,612	431	-15	94,721	-95,973	-1,251
1998	42.54	Above Average	Wet	671,093	12,375	23,296	2,972	-671,626	-7,531	-28,140	-149	-2,823	-2,148	142	709,878	-712,417	-2,539
1999	10.33	Below Average	Wet	35,400	2,075	3,906	4,806	-36,943	-984	-4,997	-240	-4,566	819	-2	47,005	-47,731	-726
2000	17.11	Near Average	Dry	53,289	4,243	7,987	3,985	-55,147	-2,619	-9,612	-199	-3,786	915	-18	70,420	-71,381	-961
2001	22.79	Above Average	Above Normal	151,353	6,059	11,407	4,297	-153,137	-4,021	-13,445	-215	-4,082	172	-29	173,288	-174,928	-1,641
2002	6.41	Below Average	Critical	1,001	821	1,546	4,867	-3,002	-690	-1,677	-243	-4,623	375	-3	8,611	-10,239	-1,628
2003	19.00	Near Average	Below Normal	50,124	4,847	9,125	3,354	-51,683	-3,446	-10,527	-168	-3,187	987	-20	68,438	-69,030	-593
2004	10.73	Below Average	Below Normal	27,751	2,203	4,147	4,666	-29,289	-1,549	-4,801	-233	-4,433	842	-8	39,609	-40,312	-703
2005	34.64	Above Average	Wet	1,024,362	9,849	18,540	4,859	-1,024,403	-7,132	-21,258	-243	-4,616	-2,934	-55	1,057,610	-1,060,640	-3,030
2006	16.64	Near Average	Wet	151,093	4,093	7,704	3,686	-152,133	-2,671	-9,126	-184	-3,502	-3	-12	166,576	-167,631	-1,055
2007	5.75	Below Average	Critical	1,867	610	1,149	4,575	-3,728	-331	-1,428	-229	-4,346	511	0	8,711	-10,062	-1,351
2008	12.77	Near Average	Critical	151,068	2,855	5,375	3,864	-152,501	-2,646	-5,583	-193	-3,671	266	-17	163,429	-164,613	-1,184
2009	9.32	Below Average	Below Normal	25,903	1,752	3,298	3,659	-27,394	-1,404	-3,645	-183	-3,476	856	-5	35,468	-36,107	-639
2010	16.82	Near Average	Above Normal	91,609	4,150	7,813	4,093	-92,623	-2,992	-8,971	-205	-3,888	299	-15	107,964	-108,694	-729
2011	19.70	Above Average	Wet	161,886	5,071	9,547	4,160	-162,851	-3,555	-11,062	-208	-3,952	-161	-21	180,664	-181,811	-1,148
2012	9.49	Below Average	Below Normal	10,630	1,806	3,400	3,203	-11,917	-806	-4,401	-160	-3,043	451	0	19,490	-20,326	-836
2013	5.80	Below Average	Critical	34	626	1,179	4,133	-1,445	-483	-1,322	-207	-3,927	298	0	6,270	-7,384	-1,114
2014	6.14	Below Average	Critical	18,733	735	1,383	3,482	-19,991	-703	-1,416	-174	-3,308	259	-3	24,592	-25,595	-1,003
2015	9.15	Below Average	Critical	2,391	1,697	3,196	3,311	-3,543	-819	-4,074	-166	-3,145	156	-3	10,750	-11,750	-999
Average:	*15.73*			*153,050*	*3,801*	*7,155*	*3,887*	*-154,289*	*-2,559*	*-8,397*	*-194*	*-3,692*	*27*	*-8*	*168,263*	*-169,483*	*-1,221*

				Surface Water Gains and Inflows (acre-feet per year)				Surface Water Losses and Outflows (acre-feet per year)					Surface Water Inflow and Outflow Components (acre-feet per year)[g]		Summary (acre-feet per year)		
Water Year	Annual Rainfall at Ventura County Govt. Center (inches)	Water-Year Type Based on Local Rainfall[a]	California Dept. of Water Resources "Water Year Type"[b]	Santa Clara River at Boundary Between Oxnard and Mound Basins	Ephemeral Streamflow Entering Mound Basin from Northern Foothills[c]	Ephemeral Streamflow Generated Within Mound Basin in Response to Rainfall[c]	Imported Surface Water (from Casitas MWD)[d]	Santa Clara River at Pacific Ocean[e]	Mountain-Front Recharge of Surface Flows in Ephemeral Streams in Northern Mound Basin[e]	Ephemeral Streams, Barrancas, and Storm Drain Discharges Exiting Mound Basin[c]	Fate of Imported Surface Water (from Casitas MWD): M&I Return Flows[e]	Fate of Imported Surface Water (from Casitas MWD): Consumptive Use[f]	Groundwater/ Surface Water Exchange in the Santa Clara River[e]	Groundwater/ Surface Water Exchange in Harmon Barranca[e]	Sum of Inflows	Sum of Outflows	Difference[h]
Current period (water years 2016 through 2019)																	
2016	8.49	Below Average	Critical	2,651	1,486	2,798	1,799	-3,739	-1,259	-3,026	-90	-1,709	167	-5	8,902	-9,828	-926
2017	19.11	Near Average	Below Normal	88,032	4,883	9,191	1,494	-88,693	-3,555	-10,519	-75	-1,419	-256	-24	103,600	-104,541	-941
2018	7.16	Below Average	Dry	6,837	1,061	1,998	1,855	-7,888	-1,300	-1,759	-93	-1,762	196	-7	11,947	-12,809	-862
2019	19.19	Near Average	not listed	167,440	4,908	9,240	937	-167,724	-3,151	-10,997	-47	-890	-1,188	-19	182,525	-184,015	-1,491
Average:	*13.49*			*66,240*	*3,085*	*5,807*	*1,521*	*-67,011*	*-2,316*	*-6,575*	*-76*	*-1,445*	*-270*	*-14*	*76,743*	*-77,798*	*-1,055*
Average 1986-2019:	***15.46***			***142,837***	***3,717***	***6,996***	***3,609***	***-144,021***	***-2,530***	***-8,182***	***-180***	***-3,428***	***-8***	***-9***	***157,496***	***-158,697***	***-1,201***

Notes:

Positive values represent inflows or gains of surface-water flows in Mound Basin, and negative numbers represent outflows or losses of surface-water flows in Mound Basin.

a See Section 3.3 for an explanation of how water-year types were classified in this GSP.

b The California Department of Water Resources classification approach is described in Section 3.3.

c Inflows of ephemeral surface water to Mound Basin are estimated based on an empirical relationship between measured streamflow in Arundell Barranca and annual (water year) rainfall measured at Ventura County Government Center, applied to the watershed areas of streams (barrancas) within Mound Basin and upstream from Mound Basin (in stream channels that flow across the basin's northern boundary). Outflows are assumed equal to inflows across the northern basin boundary plus surface flows generated by rainfall within Mound Basin, minus mountain-front recharge of inflows immediately south of the northern boundary of Mound Basin."

d The annual volume of imported surface water from Casitas MWD to Mound Basin is estimated by multiplying the total volume of Ventura Water's Casitas MWD imports by the fraction of Ventura Water's service area that is within Mound Basin.

e Estimated using United's (2021a) groundwater flow model or resulting from model calibration.

f "Consumptive use" represents loss of imported surface water from Casitas MWD to evaporation and wastewater discharges after M&I use, and in this table is equal to imported surface water (from Casitas MWD) minus M&I return flows.

g These components can comprise either net gains or losses of surface water from streams within Mound Basin, depending on hydrogeologic conditions that vary over time.

h Inflows and outflows of surface water in Mound Basin should be equal, resulting in a difference of zero. Although the long-term average difference is less than 1 percent of the long-term average inflows or outflows, indicating good overall agreement, the apparent difference between inflows and outflows is larger during years with above-average rainfall. This likely is a result of minor deviations of actual streamflow in Arundell Barranca in a given water year compared to the empirical relationship developed to estimate basinwide ephemeral flows across the basin."

Mound Basin
GROUNDWATER SUSTAINABILITY AGENCY

Table 3.3-03 Mound Basin Groundwater Inflows and Outflows by Water Year, Historical and Current Periods.

				Groundwater Inflows (acre-feet per year)		Groundwater Outflows (acre-feet per year)			Groundwater Inflow and Outflow Components (acre-feet per year)[e]					Summary (acre-feet per year)				All Aquifers Combined				Mugu Aquifer				Hueneme Aquifer			
Water Year	Annual Rainfall at Ventura County Govt. Center (inches)	Water-Year Type Based on Local Rainfall[a]	California Department of Water Resources "Water Year Type"[b]	Areal Recharge (includes infiltration of precipitation, agricultural return flows, and M&I return flows)	Mountain-Front Recharge	Evapo-transpiration[c]	Groundwater Extraction (pumping from wells)	Discharge of Groundwater to Tile Drains[d]	Groundwater/ Surface Water Interaction in the Santa Clara River[f]	Groundwater/ Surface Water Interaction in Harmon Barranca[g]	Groundwater Underflow to/from Santa Paula Basin	Groundwater Underflow to/from Oxnard Basin	Groundwater Underflow to/from Offshore (south and west of the coastline)	Sum of Inflows	Sum of Outflows	Groundwater Released from Storage per Water Year[h]	Groundwater Released from Storage Between Seasonal Highs[i]	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Cumulative Change in Storage per Water Year	Water-Year Pumping for Change in Storage Graph	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Annual Change in Storage per Water Year	Cumulative Change in Storage per Water Year	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Annual Change in Storage per Water Year	Cumulative Change in Storage per Water Year
Historical period (water years 1985 through 2015)																													
1986	25.15	Above Average	Above Normal	4,880	4,036	-1,171	-6,452	-31	-244	30	4,603	-1,105	-2,341	13,548	-11,345	-2,203	-294	294	294	2,203	6,452	-530	-530	-135	-135	2,302	2,302	859	859
1987	7.50	Below Average	Dry	2,775	622	-1,391	-7,204	-109	-363	0	4,609	-7,166	-91	8,007	-16,324	8,317	4,794	-4,794	-4,500	-6,114	7,204	-385	-914	-1,234	-1,369	-1,723	579	-1,834	-975
1988	13.22	Near Average	Dry	3,525	1,872	-1,515	-7,381	-131	-221	6	4,723	-5,392	536	10,662	-14,639	3,978	7,129	-7,129	-11,629	-10,091	7,381	-1,416	-2,331	-849	-2,217	-1,968	-1,389	-1,283	-2,258
1989	8.23	Below Average	Dry	3,034	1,081	-1,025	-8,267	-14	-527	4	4,985	-7,075	834	9,939	-16,908	6,969	5,299	-5,299	-16,928	-17,060	8,267	-1,097	-3,428	-1,612	-3,829	-1,463	-2,853	-1,744	-4,002
1990	5.62	Below Average	Critical	2,623	578	-1,090	-10,511	-23	-217	0	5,379	-9,091	2,913	11,492	-20,932	9,439	9,004	-9,004	-25,932	-26,499	10,511	-2,139	-5,567	-2,340	-6,169	-2,483	-5,336	-2,519	-6,521
1991	16.92	Near Average	Dry	3,990	3,029	-1,089	-8,595	-14	112	23	5,309	-4,527	2,105	14,568	-14,225	-367	2,803	-2,803	-28,735	-26,132	8,595	-1,687	-7,254	-185	-6,354	364	-4,972	-98	-6,619
1992	20.34	Above Average	Wet	4,339	4,035	-1,133	-7,662	-41	896	26	4,820	7,575	-67	21,692	-8,903	-12,833	-9,228	9,228	-19,506	-13,299	7,662	2,821	-4,433	4,708	-1,647	1,043	-3,929	2,097	-4,522
1993	28.76	Above Average	Wet	5,214	5,115	-1,637	-5,118	-223	2,402	40	4,112	8,054	-3,013	24,937	-9,990	-14,946	-18,265	18,265	-1,241	1,647	5,118	4,163	-270	1,977	330	3,622	-307	3,471	-1,051
1994	11.68	Near Average	Above Normal	3,208	1,468	-1,292	-7,469	-29	-844	9	4,299	420	-1,152	9,403	-10,785	1,382	-1,177	1,177	-64	265	7,469	314	45	-193	138	150	-157	-73	-1,123
1995	31.72	Above Average	Wet	6,006	5,808	-1,690	-7,468	-176	1,500	8	4,141	5,501	-3,787	22,965	-13,121	-9,841	-7,756	7,756	7,692	10,106	7,468	284	329	627	765	2,589	2,433	1,852	729
1996	12.79	Near Average	Above Normal	3,654	1,981	-1,201	-7,912	-27	-923	11	4,078	932	-2,527	10,655	-12,590	1,935	-641	641	8,334	8,172	7,912	134	463	-118	647	-491	1,941	-264	465
1997	14.75	Near Average	Below Normal	3,957	2,762	-1,114	-5,585	-18	-431	15	3,898	88	-3,188	10,721	-10,335	-386	96	-96	8,237	8,558	5,585	-180	283	-185	461	-196	1,745	634	1,099
1998	42.54	Above Average	Wet	7,033	7,531	-2,037	-4,273	-232	2,148	-142	3,814	2,393	-5,345	22,918	-12,029	-10,886	-8,253	8,253	16,491	19,444	4,273	93	376	503	964	3,681	5,425	2,845	3,944
1999	10.33	Below Average	Wet	2,984	984	-1,507	-7,576	-88	-819	2	3,970	419	-2,444	8,359	-12,434	4,076	1,834	-1,834	14,657	15,368	7,576	164	540	-111	853	-2,016	3,409	-1,339	2,605
2000	17.11	Near Average	Dry	4,143	2,619	-1,321	-8,789	-81	-915	18	4,064	-1,057	-2,427	10,843	-14,590	3,747	3,869	-3,869	10,789	11,621	8,789	-451	89	-475	378	-351	3,058	-1,402	1,203
2001	22.79	Above Average	Above Normal	4,738	4,021	-1,283	-8,512	-36	-172	29	3,997	3,066	-3,127	15,851	-13,130	-2,720	-3,094	3,094	13,883	14,341	8,512	133	222	231	609	639	3,697	418	1,622
2002	6.41	Below Average	Critical	2,536	690	-1,593	-7,714	-168	-375	3	4,196	-2,569	-1,190	7,425	-13,609	6,185	4,697	-4,697	9,186	8,157	7,714	-117	105	-543	66	-2,415	1,282	-1,232	390
2003	19.00	Near Average	Below Normal	4,252	3,446	-1,155	-7,916	-20	-987	20	4,242	24	-2,271	11,984	-12,349	365	3,071	-3,071	6,115	7,792	7,916	-674	-569	-197	-131	54	1,336	-427	-37
2004	10.73	Below Average	Below Normal	3,233	1,549	-1,035	-9,792	-5	-842	8	4,315	-1,418	-1,180	9,105	-14,272	5,167	3,514	-3,514	2,600	2,625	9,792	-366	-935	-819	-951	-1,256	79	-850	-887
2005	34.64	Above Average	Wet	6,021	7,132	-1,769	-6,468	-280	2,934	55	4,014	6,978	-4,919	27,133	-13,437	-13,695	-12,191	12,191	14,791	16,320	6,468	947	12	1,698	747	3,370	3,449	1,966	1,079
2006	16.64	Near Average	Wet	3,747	2,671	-1,327	-7,845	-27	3	12	4,190	1,661	-3,408	12,285	-12,606	322	1,345	-1,345	13,446	15,998	7,845	354	366	61	808	-1,752	1,697	-231	847
2007	5.75	Below Average	Critical	2,677	331	-1,474	-9,454	-103	-511	0	4,482	-3,478	-690	7,490	-15,710	8,182	4,908	-4,908	8,538	7,816	9,454	-295	71	-793	15	-1,571	126	-1,291	-443
2008	12.77	Near Average	Critical	3,501	2,646	-1,345	-7,962	-100	-266	17	4,424	246	-1,797	10,835	-11,470	636	1,184	-1,184	7,354	7,180	7,962	-341	-270	-12	3	8	134	-514	-957
2009	9.32	Below Average	Below Normal	2,960	1,404	-1,099	-7,254	-26	-856	5	4,513	-2,540	-1,026	8,882	-12,800	3,919	4,463	-4,463	2,891	3,262	7,254	-349	-619	-530	-528	-897	-764	-416	-1,373
2010	16.82	Near Average	Above Normal	3,914	2,992	-1,094	-6,812	-14	-299	15	4,329	-1,285	-1,431	11,250	-10,937	-482	1,858	-1,858	1,033	3,744	6,812	-740	-1,359	-192	-719	223	-541	71	-1,302
2011	19.70	Above Average	Wet	3,930	3,555	-1,139	-4,898	-15	161	21	4,123	4,709	-2,837	16,499	-8,889	-7,610	-6,103	6,103	7,136	11,354	4,898	826	-533	1,138	419	1,365	824	1,447	145

				Groundwater Inflows (acre-feet per year)		Groundwater Outflows (acre-feet per year)			Groundwater Inflow and Outflow Components (acre-feet per year)[e]					Summary (acre-feet per year)				All Aquifers Combined				Mugu Aquifer				Hueneme Aquifer			
Water Year	Annual Rainfall at Ventura County Govt. Center (inches)	Water-Year Type Based on Local Rainfall[a]	California Department of Water Resources "Water Year Type"[b]	Areal Recharge (includes infiltration of precipitation, agricultural return flows, and M&I return flows)	Mountain-Front Recharge	Evapo-transpiration[c]	Groundwater Extraction (pumping from wells)	Discharge of Groundwater to Tile Drains[d]	Groundwater/ Surface Water Interaction in the Santa Clara River[f]	Groundwater/ Surface Water Interaction in Harmon Barranca[g]	Groundwater Underflow to/from Santa Paula Basin	Groundwater Underflow to/from Oxnard Basin	Groundwater Underflow to/from Offshore (south and west of the coastline)	Sum of Inflows	Sum of Outflows	Groundwater Released from Storage per Water Year[h]	Groundwater Released from Storage Between Seasonal Highs[i]	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Cumulative Change in Storage per Water Year	Water-Year Pumping for Change in Storage Graph	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Annual Change in Storage per Water Year	Cumulative Change in Storage per Water Year	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Annual Change in Storage per Water Year	Cumulative Change in Storage per Water Year
2012	9.49	Below Average	Below Normal	2,700	806	-1,319	-6,351	-63	-451	0	4,367	-3,799	-906	7,873	-12,889	5,016	1,389	-1,389	5,747	6,338	6,351	351	-181	-537	-118	-732	92	-640	-495
2013	5.80	Below Average	Critical	2,316	483	-1,481	-6,544	-132	-298	0	4,664	-6,425	212	7,675	-14,880	7,205	6,760	-6,760	-1,014	-867	6,544	-1,005	-1,186	-1,563	-1,681	-1,094	-1,002	-1,037	-1,531
2014	6.14	Below Average	Critical	2,560	703	-1,288	-7,876	-67	-259	3	4,902	-8,784	1,337	9,504	-18,274	8,770	8,316	-8,316	-9,330	-9,637	7,876	-2,309	-3,495	-2,482	-4,163	-1,576	-2,579	-2,082	-3,613
2015	9.15	Below Average	Critical	2,330	819	-824	-6,084	-5	-156	3	4,862	-5,832	460	8,475	-12,899	4,424	6,837	-6,837	-16,166	-14,061	6,084	-1,647	-5,142	-1,088	-5,251	-1,565	-4,144	-518	-4,132
Average:	*15.73*			*3,759*	*2,559*	*-1,315*	*-7,391*	*-77*	*-27*	*8*	*4,414*	*-983*	*-1,426*	*12,766*	*-13,243*	*469*	*539*												
Current period (water years 2016 through 2019)																													
2016	8.49	Below Average	Critical	2,500	1,259	-765	-6,736	0	-167	5	4,755	-8,031	2,255	10,773	-15,700	4,927	3,459	-3,459	-19,625	-18,988	6,736	-1,258	-6,399	-1,452	-6,703	-349	-4,493	-1,253	-5,385
2017	19.11	Near Average	Below Normal	3,928	3,555	-935	-5,214	-6	256	24	4,650	-4,473	1,021	13,434	-10,627	-2,807	-1,064	1,064	-18,561	-16,181	5,214	-315	-6,714	247	-6,456	531	-3,961	757	-4,628
2018	7.16	Below Average	Dry	2,623	1,300	-809	-6,848	0	-196	7	4,806	-7,249	2,293	11,029	-15,102	4,074	3,051	-3,051	-21,613	-20,254	6,848	-800	-7,514	-1,275	-7,731	-458	-4,419	-638	-5,266
2019	19.19	Near Average	not listed	3,856	3,151	-1,015	-7,242	-13	1,188	19	4,777	610	274	13,875	-8,270	-5,605	-2,775	2,775	-18,838	-14,649	7,242	485	-7,029	2,452	-5,279	562	-3,857	240	-5,026
Average:	*13.49*			*3,227*	*2,316*	*-881*	*-6,510*	*-5*	*270*	*14*	*4,747*	*-4,786*	*1,461*	*12,278*	*-12,425*	*147*	*668*												
Average 1986-2019:	***15.46***			***3,697***	***2,530***	***-1,264***	***-7,288***	***-68***	***8***	***9***	***4,453***	***-1,430***	***-1,086***	***12,708***	***-13,147***	***431***	***554***												

Notes:

N/A = Not applicable

Positive values represent inflows to the Mound Basin, and negative numbers represent outflows from the basin

a See Section 3.3 for an explanation of how water-year types were classified in this report.

b The California Department of Water Resources classification approach is described in Section 3.3.

c The Shallow Alluvial Deposits is modeled to be the sole hydrostratigraphic unit in Mound Basin with saturated conditions consistently shallow enough to be significantly affected by evapotranspiration.

d Tile drains are only known or suspected to be present in the Shallow Alluvial Deposits in Mound Basin.

e These components can comprise either net inflows to or outflows from each aquifer, depending on hydrogeologic conditions that vary over time (e.g., hydraulic gradients).

f Within Mound Basin, the sole hydrostratigraphic unit known or suspected to be in direct hydraulic communication with the Santa Clara River is the Shallow Alluvial Deposits.

g United (2021) modeled Harmon Barranca using MODFLOW's "Stream package," as described in Section 3.3 of this report, allowing the model to simulate direct hydraulic communication with the Shallow Alluvial Deposits, as well as with the fine-grained Pleistocene deposits.

h Water-year changes in storage are calculated from October 1 of the preceding calendar year to September 30 of the indicated year. Positive values for groundwater released from storage represent inflows to the basin, same as all other components on this table.

However, specific to this parameter, inflow of groundwater from storage is associated with declining groundwater levels (or potentiometric heads) in the basin. Negative values are associated with increasing groundwater-levels (or potentiometric heads), as a result of groundwater being ""added to storage.

i Represents change in groundwater storage between April 1 of the preceding year and March 30 of the indicated year; groundwater levels are commonly at their highest in spring.

MoundBasin
GROUNDWATER SUSTAINABILITY AGENCY

Table 3.3-04 Mound Basin Average Groundwater Inflows and Outflows by Aquifer, Historical and Current Periods.

	Groundwater Inflows (acre-feet per year)		Groundwater Outflows (acre-feet per year)			Groundwater Inflow and Outflow Components (acre-feet per year)[a]							Summary (acre-feet per year)		
Aquifer	Areal Recharge (includes infiltration of precipitation, agricultural return flows, and M&I return flows)	Mountain-Front Recharge	Evapo-transpiration[b]	Groundwater Extraction	Discharge of Groundwater to Tile Drains[c]	Groundwater/ Surface Water Interaction in the Santa Clara River[d]	Groundwater/ Surface Water Interaction in Harmon Barranca[e]	Groundwater Underflow to/from Santa Paula Basin	Groundwater Underflow to/from Oxnard Basin	Groundwater Underflow to/from Offshore (south and west of the coastline)	Vertical Groundwater Flow to/from the Overlying Aquifer	Vertical Groundwater Flow to/from the Underlying Aquifer	Sum of Inflows	Sum of Outflows	Groundwater Released from Storage[f]
Averages during historical period (water years 1986 through 2015)															
Shallow Alluvial Deposits	2,970	0	-1,315	0	-77	-27	103	-1	1,641	-1,768	N/A	-1,553	4,714	-4,740	26
Fine-grained Pleistocene deposits[g]	203	0	N/A	-22	N/A	N/A	110	7	960	4	1,553	-2,655	2,836	-2,677	-159
Mugu Aquifer	0	0	N/A	-1,917	N/A	N/A	0	312	320	-142	2,655	-1,404	3,287	-3,462	175
Hueneme Aquifer[h]	587	2,559	N/A	-5,255	N/A	N/A	-205	2,253	-2,299	496	1,404	312	7,612	-7,758	138
Fox Canyon Aquifer[i]	0	0	N/A	-198	N/A	N/A	0	1,842	-1,605	-16	-312	N/A	1,842	-2,131	289
Basin Total:	***3,759***	***2,559***	***-1,315***	***-7,391***	***-77***	***-27***	***8***	***4,414***	***-983***	***-1,426***	***5,299***	***-5,299***	***20,291***	***-20,768***	***469***
Averages during current period (water years 2016 through 2019)															
Shallow Alluvial Deposits	2,579	0	-881	0	-5	270	44	0	1,028	-1,215	N/A	-1,609	3,922	-3,710	-213
Fine-grained Pleistocene deposits[g]	151	0	N/A	-11	N/A	N/A	144	3	-76	130	1,609	-2,219	2,036	-2,306	269
Mugu Aquifer	0	0	N/A	-2,046	N/A	N/A	0	344	-1,109	1,486	2,219	-902	4,050	-4,057	7
Hueneme Aquifer[h]	497	2,316	N/A	-4,236	N/A	N/A	-175	2,413	-2,721	901	902	-120	7,029	-7,252	224
Fox Canyon Aquifer[i]	0	0	N/A	-217	N/A	N/A	0	1,987	-1,909	159	120	N/A	2,266	-2,126	-140
Basin Total:	***3,227***	***2,316***	***-881***	***-6,510***	***-5***	***270***	***14***	***4,747***	***-4,786***	***1,461***	***4,850***	***-4,850***	***19,303***	***-19,450***	***147***

Notes:

N/A = Not applicable

Positive values represent inflows to an aquifer; negative numbers represent outflows from an aquifer.

a These components can comprise either net inflows to or outflows from each aquifer, depending on hydrogeologic conditions that vary over time (e.g., hydraulic gradients).

b The Shallow Alluvial Deposits is the sole hydrostratigraphic unit in Mound Basin with saturated conditions consistently shallow enough to be significantly affected by evapotranspiration.

c Tile drains are only known or suspected to be present in the Shallow Alluvial Deposits in Mound Basin.

d Within Mound Basin, the sole hydrostratigraphic unit known or suspected to be in direct hydraulic communication with the Santa Clara River is the Shallow Alluvial Deposits.

e United (2021) modeled Harmon Barranca using MODFLOW's "Stream package," as described in Section 3.3 of this report, allowing the model to simulate direct hydraulic communication with the Shallow Alluvial Deposits and the fine-grained Pleistocene deposits.

f Positive values for groundwater released from storage represent inflows to an aquifer, same as all other components on this page. Inflow of groundwater from storage is associated with declining groundwater levels (or potentiometric heads) in that aquifer. Negative values are associated with increasing groundwater-levels (or potentiometric-heads), as a result of groundwater being "added to storage."

g Although the fine-grained Pleistocene deposits in Mound Basin are not considered a principal aquifer due to their low hydraulic conductivity, they have a substantial thickness and are stratigraphically adjacent to the Oxnard Aquifer in the Oxnard Basin (see Section 3.1 for more information). The fine-grained Pleistocene deposits are included in this table for completeness in depicting the groundwater budget for Mound Basin

h To provide a complete and balanced water budget (the sum of water-budget components for all units should be zero), the values shown in this row include both the Hueneme Aquifer and the overlying Mugu-Hueneme aquitard, which is thin and has low hydraulic conductivity. For these reasons, inflows and outflows from the aquitard are small compared to those from the aquifer.

i To provide a complete and balanced water budget (the sum of water-budget components for all units should be zero), the values shown in this row include the Fox Canyon Aquifer (main and basal) and the overlying and intervening aquitards, which are thin and have low hydraulic conductivity. For these reasons, inflows and outflows from the aquitards are small compared to those from the aquifer.

Table 3.3-05 Imports of Casitas MWD Surface Water to Mound Basin by City of Ventura, 2010-2019.

Water Year	Annual Rainfall at Ventura County Govt. Center (inches)	Water-Year Type Based on Local Rainfall[a]	Estimated Available Supply of Casitas MWD Surface Water[a] (acre-feet)	Source	Actual Imports of Casitas MWD Surface Water[b] (acre-feet)	Difference Between Planned and Actual Imports (acre-feet)	Difference Between Planned and Actual Imports (percent)
2010	16.82	Near Average	6,000	2010 UWMP	5,994	-6	0%
2011	19.70	Above Average	6,000	2010 UWMP	6,092	92	2%
2012	9.49	Below Average	6,000	2010 UWMP	4,690	-1,310	-22%
2013	5.80	Below Average	6,000	2010 UWMP	6,053	53	1%
2014	6.14	Below Average	6,000	2010 UWMP	5,099	-901	-15%
2015	9.15	Below Average	6,000	2010 UWMP	4,848	-1,152	-19%
2016	8.49	Below Average	4,593	2015 UWMP	2,634	-1,959	-43%
2017	19.11	Near Average	5,741	2015 UWMP	2,188	-3,553	-62%
2018	7.16	Below Average	5,741	2015 UWMP	2,716	-3,025	-53%
2019	19.19	Near Average	5,741	2015 UWMP	1,372	-4,369	-76%
Average:	*12.11*		*5,782*		*4,169*	-1,613	-29%

Notes:

a Assumed based on City of Ventura's 2010 and 2015 Urban Water Management Plans (Kennedy/Jenks Consultants, 2011; 2016).

b Includes all Casitas MWD imports by the City of Ventura for use within their service area, not just Mound Basin (Ventura Water, 2020a).

Table 3.3-06 Mound Basin Projected Surface Water Inflows and Outflows by Water Year, Future Baseline Conditions.

			Surface Water Gains and Inflows (acre-feet per year)				Surface Water Losses and Outflows (acre-feet per year)					Surface Water Inflow and Outflow Components (acre-feet per year)[g]		Summary (acre-feet per year)		
Projected Water Year	Analogous Historical Water Year[a]	Assumed Annual Rainfall at Ventura County Govt. Center (inches)[b]	Santa Clara River at Boundary Between Oxnard and Mound Basins	Ephemeral Streamflow Entering Mound Basin from Northern Foothills[c]	Ephemeral Streamflow Generated Within Mound Basin in Response to Rainfall[c]	Imported Surface Water (from Casitas MWD)[d]	Santa Clara River at Pacific Ocean[e]	Mountain-Front Recharge of Surface Flows in Ephemeral Streams in Northern Mound Basin[e]	Ephemeral Streams, Barrancas, and Storm Drain Discharges Exiting Mound Basin[c]	Fate of Imported Surface Water (from Casitas MWD): M&I Return Flows[e]	Fate of Imported Surface Water (from Casitas MWD): Consumptive Use[f]	Groundwater/ Surface Water Exchange in the Santa Clara River within Mound Basin[e]	Groundwater/ Surface Water Exchange in Harmon Barranca[e]	Sum of Inflows	Sum of Outflows	Difference[h]
Implementation Period (water years 2022 through 2041)																
2022	1945	11.75	62,783	2,529	4,761	3,362	-61,973	-2,710	-4,580	-168	-3,194	-1,746	-14	73,435	-74,385	-950
2023	1946	11.07	32,202	2,311	4,351	4,000	-31,740	-1,789	-4,874	-200	-3,800	-1,276	-8	42,865	-43,687	-822
2024	1947	10.24	18,361	2,046	3,852	4,000	-17,732	-1,805	-4,093	-200	-3,800	-1,244	-11	28,259	-28,885	-626
2025	1948	6.95	1,150	994	1,871	5,816	-1,120	-788	-2,077	-291	-5,525	-47	-2	9,831	-9,850	-19
2026	1949	8.22	1,580	1,400	2,636	5,816	-1,549	-744	-3,291	-291	-5,525	-44	0	11,432	-11,444	-12
2027	1950	13.28	3,964	3,018	5,682	5,816	-3,912	-1,433	-7,267	-291	-5,525	-63	-6	18,480	-18,497	-17
2028	1951	7.40	0	1,138	2,142	5,816	0	-527	-2,753	-291	-5,525	-16	0	9,096	-9,112	-16
2029	1952	26.70	159,051	7,310	13,761	5,816	-158,176	-5,084	-15,986	-291	-5,525	-3,116	-34	185,938	-188,213	-2,276
2030	1953	11.30	984	2,385	4,490	5,977	-969	-1,485	-5,390	-299	-5,678	-949	-6	13,836	-14,776	-940
2031	1954	15.65	23,856	3,776	7,109	5,977	-23,592	-2,517	-8,368	-299	-5,678	-1,135	-13	40,718	-41,601	-883
2032	1955	12.45	2,150	2,753	5,182	5,977	-2,110	-1,607	-6,328	-299	-5,678	-753	-6	16,062	-16,780	-719
2033	1956	16.50	25,845	4,048	7,620	5,977	-25,646	-2,213	-9,455	-299	-5,678	-955	-13	43,490	-44,259	-769
2034	1957	10.35	10,347	2,081	3,918	5,977	-10,241	-1,394	-4,605	-299	-5,678	-823	-5	22,323	-23,045	-721
2035	1958	28.80	248,105	7,981	15,025	5,977	-246,776	-5,226	-17,781	-299	-5,678	-3,334	-33	277,088	-279,126	-2,038
2036	1959	6.65	36,601	898	1,691	5,977	-36,294	-1,200	-1,388	-299	-5,678	-1,101	-4	45,166	-45,965	-798
2037	1960	12.10	3,618	2,641	4,971	5,977	-3,530	-1,163	-6,450	-299	-5,678	-102	-4	17,207	-17,225	-18
2038	1961	7.20	0	1,074	2,022	5,977	0	-984	-2,112	-299	-5,678	-39	-5	9,073	-9,117	-44
2039	1962	25.55	228,317	6,942	13,068	5,977	-227,574	-4,111	-15,899	-299	-5,678	-2,130	-29	254,304	-255,719	-1,415
2040	1963	12.65	11,665	2,817	5,303	5,977	-11,544	-1,512	-6,607	-299	-5,678	-815	-8	25,761	-26,463	-702
2041	1964	8.25	6,124	1,410	2,654	5,977	-6,035	-938	-3,125	-299	-5,678	-47	-2	16,165	-16,123	41
Average:		*13.15*	*43,835*	*2,978*	*5,605*	*5,608*	*-43,526*	*-1,961*	*-6,622*	*-280*	*-5,328*	*-987*	*-10*	*58,026*	*-58,714*	*-687*
Sustaining Period (water years 2042 through 2071)																
2042	1965	14.85	5,286	3,520	6,627	5,977	-5,218	-2,036	-8,111	-299	-5,678	-1,030	-12	21,410	-22,385	-974
2043	1966	15.94	130,499	3,869	7,283	5,977	-130,004	-3,057	-8,095	-299	-5,678	-2,313	-20	147,628	-149,466	-1,838
2044	1967	18.88	113,441	4,809	9,053	5,977	-111,974	-4,078	-9,784	-299	-5,678	-3,189	-20	133,280	-135,022	-1,741
2045	1968	14.40	8,670	3,376	6,356	5,977	-8,028	-1,727	-8,005	-299	-5,678	-855	-10	24,379	-24,602	-223
2046	1969	24.50	969,376	6,606	12,436	5,977	-966,843	-5,039	-14,003	-299	-5,678	-3,536	-38	994,396	-995,436	-1,040
2047	1970	16.34	50,488	3,997	7,524	5,977	-49,264	-1,759	-9,762	-299	-5,678	-909	-7	67,985	-67,678	307
2048	1971	14.61	54,000	3,444	6,482	5,977	-52,955	-2,232	-7,694	-299	-5,678	-1,354	-14	69,903	-70,226	-323
2049	1972	8.94	25,593	1,630	3,069	5,977	-24,864	-1,431	-3,269	-299	-5,678	-1,229	-10	36,269	-36,779	-510
2050	1973	20.71	221,954	5,394	10,155	5,977	-220,473	-4,073	-11,475	-299	-5,678	-2,278	-24	243,480	-244,300	-820
2051	1974	15.00	76,002	3,568	6,717	5,977	-74,892	-2,318	-7,967	-299	-5,678	-1,288	-14	92,265	-92,457	-193
2052	1975	16.30	63,069	3,984	7,500	5,977	-61,908	-2,803	-8,680	-299	-5,678	-1,777	-15	80,530	-81,161	-631
2053	1976	13.46	27,920	3,076	5,790	5,977	-27,362	-1,812	-7,054	-299	-5,678	-915	-10	42,763	-43,131	-368
2054	1977	10.94	13,374	2,270	4,273	5,977	-13,206	-1,413	-5,130	-299	-5,678	-714	-6	25,894	-26,445	-551

			Surface Water Gains and Inflows (acre-feet per year)				Surface Water Losses and Outflows (acre-feet per year)					Surface Water Inflow and Outflow Components (acre-feet per year)[g]		Summary (acre-feet per year)		
Projected Water Year	Analogous Historical Water Year[a]	Assumed Annual Rainfall at Ventura County Govt. Center (inches)[b]	Santa Clara River at Boundary Between Oxnard and Mound Basins	Ephemeral Streamflow Entering Mound Basin from Northern Foothills[c]	Ephemeral Streamflow Generated Within Mound Basin in Response to Rainfall[c]	Imported Surface Water (from Casitas MWD)[d]	Santa Clara River at Pacific Ocean[e]	Mountain-Front Recharge of Surface Flows in Ephemeral Streams in Northern Mound Basin[e]	Ephemeral Streams, Barrancas, and Storm Drain Discharges Exiting Mound Basin[c]	Fate of Imported Surface Water (from Casitas MWD): M&I Return Flows[e]	Fate of Imported Surface Water (from Casitas MWD): Consumptive Use[f]	Groundwater/ Surface Water Exchange in the Santa Clara River within Mound Basin[e]	Groundwater/ Surface Water Exchange in Harmon Barranca[e]	Sum of Inflows	Sum of Outflows	Difference[h]
2055	1978	34.88	722,655	9,926	18,685	5,977	-720,778	-6,712	-21,899	-299	-5,678	-3,595	-49	757,242	-759,009	-1,767
2056	1979	18.73	178,691	4,761	8,963	5,977	-177,421	-3,566	-10,158	-299	-5,678	-1,897	-21	198,392	-199,040	-648
2057	1980	26.60	407,422	7,278	13,700	5,977	-406,176	-4,366	-16,612	-299	-5,678	-2,052	-34	434,377	-435,216	-840
2058	1981	13.66	45,299	3,140	5,911	5,977	-44,448	-1,804	-7,246	-299	-5,678	-920	-9	60,326	-60,403	-78
2059	1982	12.51	39,451	2,772	5,218	5,977	-38,471	-1,786	-6,204	-299	-5,678	-1,215	-6	53,418	-53,660	-241
2060	1983	31.66	556,293	8,896	16,747	5,977	-555,004	-6,311	-19,332	-299	-5,678	-3,027	-42	587,912	-589,692	-1,780
2061	1984	10.22	29,799	2,040	3,840	5,977	-29,199	-1,849	-4,031	-299	-5,678	-120	-9	41,656	-41,185	471
2062	1985	11.84	16,759	2,558	4,815	5,977	-15,787	-1,353	-6,019	-299	-5,678	-193	-5	30,108	-29,335	774
2063	1986	25.15	191,726	6,814	12,828	5,977	-190,665	-3,879	-15,763	-299	-5,678	-2,520	-25	217,345	-218,828	-1,483
2064	1987	7.50	3,862	1,170	2,202	5,977	-3,299	-521	-2,851	-299	-5,678	-156	0	13,211	-12,804	407
2065	1988	13.22	28,139	2,999	5,646	5,977	-27,371	-1,755	-6,890	-299	-5,678	-165	-4	42,761	-42,162	599
2066	1989	8.23	2,223	1,403	2,642	5,977	-2,101	-1,026	-3,019	-299	-5,678	-97	-5	12,245	-12,225	20
2067	1990	5.62	4,102	569	1,070	5,977	-4,015	-610	-1,029	-299	-5,678	-56	0	11,718	-11,687	32
2068	1991	16.92	109,595	4,182	7,873	5,977	-109,124	-2,886	-9,169	-299	-5,678	-1,845	-23	127,627	-129,024	-1,397
2069	1992	20.34	286,136	5,276	9,932	5,977	-284,791	-4,250	-10,958	-299	-5,678	-3,059	-28	307,321	-309,062	-1,741
2070	1993	28.76	847,789	7,969	15,001	5,977	-845,234	-5,409	-17,561	-299	-5,678	-3,754	-35	876,735	-877,970	-1,235
2071	1994	11.68	51,294	2,507	4,719	5,977	-50,031	-1,468	-5,757	-299	-5,678	-958	-7	64,496	-64,199	298
Average:		*16.75*	*176,030*	*4,127*	*7,768*	*5,977*	*-175,030*	*-2,778*	*-9,118*	*-299*	*-5,678*	*-1,567*	*-17*	*193,902*	*-194,486*	*-584*
Post-SGMA period (water years 2072 through 2096)																
2072	1995	31.72	476,805	8,915	16,783	5,977	-475,316	-5,580	-20,118	-299	-5,678	-2,689	-30	508,480	-509,708	-1,229
2073	1996	12.79	70,704	2,862	5,387	5,977	-69,962	-1,966	-6,282	-299	-5,678	-857	-11	84,930	-85,055	-125
2074	1997	14.75	80,131	3,488	6,567	5,977	-79,142	-2,831	-7,224	-299	-5,678	-1,533	-15	96,163	-96,722	-559
2075	1998	42.54	655,150	12,375	23,296	5,977	-653,802	-7,413	-28,259	-299	-5,678	-3,388	127	696,925	-698,838	-1,914
2076	1999	10.33	46,493	2,075	3,906	5,977	-45,918	-834	-5,147	-299	-5,678	-169	-1	58,451	-58,046	404
2077	2000	17.11	79,537	4,243	7,987	5,977	-78,750	-2,410	-9,820	-299	-5,678	-1,128	-15	97,745	-98,101	-356
2078	2001	22.79	193,162	6,059	11,407	5,977	-192,366	-3,931	-13,535	-299	-5,678	-1,632	-24	216,606	-217,466	-860
2079	2002	6.41	2,201	821	1,546	5,977	-1,826	-584	-1,783	-299	-5,678	-101	-2	10,545	-10,274	271
2080	2003	19.00	46,105	4,847	9,125	5,977	-45,450	-3,129	-10,844	-299	-5,678	-1,429	-17	66,055	-66,846	-791
2081	2004	10.73	35,344	2,203	4,147	5,977	-34,978	-1,490	-4,860	-299	-5,678	-688	-7	47,671	-48,000	-329
2082	2005	34.64	1,078,780	9,849	18,540	5,977	-1,077,144	-6,996	-21,394	-299	-5,678	-3,791	-51	1,113,146	-1,115,352	-2,206
2083	2006	16.64	136,241	4,093	7,704	5,977	-135,390	-2,654	-9,143	-299	-5,678	-1,294	-13	154,015	-154,471	-456
2084	2007	5.75	5,738	610	1,149	5,977	-5,135	-183	-1,576	-299	-5,678	-135	0	13,474	-13,006	469
2085	2008	12.77	154,943	2,855	5,375	5,977	-153,952	-2,485	-5,745	-299	-5,678	-1,687	-14	169,150	-169,860	-710
2086	2009	9.32	18,549	1,752	3,298	5,977	-18,020	-1,353	-3,697	-299	-5,678	-915	-5	29,575	-29,966	-391
2087	2010	16.82	89,966	4,150	7,813	5,977	-89,285	-2,916	-9,048	-299	-5,678	-1,336	-13	107,906	-108,574	-668
2088	2011	19.70	142,654	5,071	9,547	5,977	-141,629	-3,742	-10,876	-299	-5,678	-1,900	-23	163,249	-164,147	-898
2089	2012	9.49	10,710	1,806	3,400	5,977	-10,119	-624	-4,583	-299	-5,678	-123	0	21,893	-21,425	469
2090	2013	5.80	325	626	1,179	5,977	-49	-1,559	-246	-299	-5,678	-677	-9	8,107	-8,516	-409

			Surface Water Gains and Inflows (acre-feet per year)				Surface Water Losses and Outflows (acre-feet per year)					Surface Water Inflow and Outflow Components (acre-feet per year)[g]		Summary (acre-feet per year)		
										Fate of Imported Surface Water (from Casitas MWD)						
Projected Water Year	Analogous Historical Water Year[a]	Assumed Annual Rainfall at Ventura County Govt. Center (inches)[b]	Santa Clara River at Boundary Between Oxnard and Mound Basins	Ephemeral Streamflow Entering Mound Basin from Northern Foothills[c]	Ephemeral Streamflow Generated Within Mound Basin in Response to Rainfall[c]	Imported Surface Water (from Casitas MWD)[d]	Santa Clara River at Pacific Ocean[e]	Mountain-Front Recharge of Surface Flows in Ephemeral Streams in Northern Mound Basin[e]	Ephemeral Streams, Barrancas, and Storm Drain Discharges Exiting Mound Basin[c]	M&I Return Flows[e]	Consumptive Use[f]	Groundwater/ Surface Water Exchange in the Santa Clara River within Mound Basin[e]	Groundwater/ Surface Water Exchange in Harmon Barranca[e]	Sum of Inflows	Sum of Outflows	Difference[h]
2091	2014	6.14	25,475	735	1,383	5,977	-25,336	-1,245	-873	-299	-5,678	-501	-4	33,570	-33,936	-366
2092	2015	9.15	605	1,697	3,196	5,977	-597	-1,185	-3,708	-299	-5,678	-38	-3	11,475	-11,508	-33
2093	2016	8.49	2,492	1,486	2,798	5,977	-2,447	-1,980	-2,304	-299	-5,678	-312	-10	12,753	-13,031	-277
2094	2017	19.11	87,303	4,883	9,191	5,977	-86,819	-3,571	-10,503	-299	-5,678	-2,259	-20	107,354	-109,148	-1,794
2095	2018	7.16	6,421	1,061	1,998	5,977	-6,334	-1,950	-1,109	-299	-5,678	-699	-8	15,457	-16,076	-619
2096	2019	19.19	158,890	4,908	9,240	5,977	-157,961	-3,571	-10,577	-299	-5,678	-2,832	-20	179,015	-180,937	-1,923
Average:		*15.53*	*144,189*	*3,739*	*7,038*	*5,977*	*-143,509*	*-2,647*	*-8,130*	*-299*	*-5,678*	*-1,284*	*-8*	*160,948*	*-161,560*	*-612*
Average 2022-2096:		***15.38***	***130,164***	***3,691***	***6,948***	***5,879***	***-129,455***	***-2,517***	***-8,123***	***-294***	***-5,585***	***-1,318***	***-12***	***146,684***	***-147,305***	***-621***

Notes

Positive values represent inflows or gains of surface-water flows in Mound Basin, and negative numbers represent outflows or losses of surface-water flows in Mound Basin.

a See Section 3.3 for an explanation of how water-year types were classified in this report.

b The California Department of Water Resources classification approach is described in Section 3.3.

c Inflows of ephemeral surface water to Mound Basin are projected based on an empirical relationship between measured streamflow in Arundell Barranca and annual (water year) rainfall measured at Ventura County Government Center, applied to the watershed areas of streams (barrancas) within Mound Basin and upstream from Mound Basin (in stream channels that flow across the basin's northern boundary). Outflows are assumed equal to inflows across the northern basin boundary plus surface flows generated by rainfall within Mound Basin, minus mountain-front recharge of inflows immediately south of the northern boundary of Mound Basin.

d Projected imports are from Ventura Water, 2020b.

e Estimated using United's (2021a) groundwater flow model or resulting from model calibration.

f "Consumptive use" represents loss of imported surface water from Casitas MWD to evaporation and wastewater discharges after M&I use, and in this table is equal to imported surface water (from Casitas MWD) minus M&I return flows.

g These components can comprise either net gains or losses of surface water from streams within Mound Basin, depending on hydrogeologic conditions that vary over time.

h Inflows and outflows of surface water in Mound Basin should be equal, resulting in a difference of zero. Although the long-term average difference is less than 1 percent of the long-term average inflows or outflows, indicating good overall agreement, the apparent difference between inflows and outflows is larger during years with above-average rainfall. This likely is a result of minor deviations of actual streamflow in Arundell Barranca in a given water year compared to the empirical relationship developed to estimate basinwide ephemeral flows across the basin.

Table 3.3-07 Mound Basin Projected Groundwater Inflows and Outflows by Water Year, Future Baseline Conditions.

			Groundwater Inflows (acre-feet per year)		Groundwater Outflows (acre-feet per year)			Groundwater Inflow and Outflow Components (acre-feet per year)[e]					Summary (acre-feet per year)			All Aquifers Combined			Mugu Aquifer				Hueneme Aquifer			
Projected Water Year	Analogous Historical Water Year[a]	Assumed Annual Rainfall at Ventura County Govt. Center (inches)[b]	Areal Recharge (includes infiltration of precipitation, agricultural return flows, and M&I return flows)	Mountain-Front Recharge	Evapo-transpiration[c]	Groundwater Extraction (pumping from wells)	Discharge of Groundwater to Tile Drains[d]	Groundwater/ Surface Water Interaction in the Santa Clara River[f]	Groundwater/ Surface Water Interaction in Harmon Barranca[g]	Groundwater Underflow to/from Santa Paula Basin	Groundwater Underflow to/from Oxnard Basin	Groundwater Underflow to/from Offshore (south and west of the coastline)	Sum of Inflows	Sum of Outflows	Groundwater Released from Storage per Water Year[h]	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Cumulative Change in Storage per Water Year	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Annual Change in Storage per Water Year	Cumulative Change in Storage per Water Year	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Annual Change in Storage per Water Year	Cumulative Change in Storage per Water Year
Implementation Period (water years 2022 through 2041)																										
2022	1945	11.75	3,007	2,710	-801	-7,961	0	1,746	14	3,936	4,695	-5,345	16,109	-14,107	-2,002	3,978	3,978	2,002	605	605	158	158	1,768	1,768	1,266	1,266
2023	1946	11.07	2,525	1,789	-804	-8,377	0	1,276	8	3,874	5,068	-4,906	14,540	-14,088	-452	65	4,042	2,454	74	679	103	261	133	1,901	425	1,691
2024	1947	10.24	2,702	1,805	-847	-7,424	0	1,244	11	3,883	4,273	-5,075	13,917	-13,347	-571	400	4,442	3,024	35	714	36	297	189	2,090	613	2,304
2025	1948	6.95	2,159	788	-685	-8,052	0	47	2	4,002	475	-3,582	7,473	-12,320	4,847	-3,532	911	-1,822	-209	505	-499	-202	11	2,101	-490	1,814
2026	1949	8.22	2,286	744	-508	-8,487	0	44	0	4,125	-1,123	-2,582	7,199	-12,699	5,501	-4,830	-3,919	-7,323	-681	-175	-703	-906	-782	1,319	-1,048	766
2027	1950	13.28	2,689	1,433	-387	-7,501	0	63	6	4,149	-753	-2,120	8,340	-10,762	2,422	-2,996	-6,916	-9,745	-451	-626	-401	-1,306	-721	598	-501	265
2028	1951	7.40	2,147	527	-350	-8,627	0	16	0	4,380	-2,813	-1,367	7,070	-13,157	6,086	-6,125	-13,041	-15,831	-1,012	-1,638	-1,340	-2,646	-988	-391	-1,096	-831
2029	1952	26.70	4,765	5,084	-601	-7,496	0	3,116	34	3,986	5,848	-3,114	22,834	-11,211	-11,623	7,445	-5,596	-4,208	516	-1,122	1,988	-657	1,687	1,296	1,085	253
2030	1953	11.30	2,541	1,485	-566	-7,532	0	949	6	3,961	5,029	-3,779	13,972	-11,878	-2,094	5,298	-298	-2,114	1,455	334	516	-142	-571	725	1,003	1,256
2031	1954	15.65	3,202	2,517	-549	-7,863	0	1,135	13	3,852	2,429	-3,592	13,147	-12,005	-1,142	1,345	1,047	-973	-123	211	-30	-172	1,660	2,385	261	1,518
2032	1955	12.45	2,871	1,607	-539	-7,966	0	753	6	3,904	958	-3,362	10,099	-11,868	1,769	-2,956	-1,909	-2,742	-232	-21	-290	-462	-1,023	1,362	-165	1,353
2033	1956	16.50	3,180	2,213	-545	-7,200	0	955	13	3,890	2,352	-3,401	12,603	-11,146	-1,457	949	-960	-1,285	-66	-88	128	-334	213	1,575	376	1,729
2034	1957	10.35	2,519	1,394	-535	-8,665	0	823	5	3,957	436	-3,290	9,133	-12,489	3,356	-933	-1,893	-4,641	-70	-158	-380	-714	-4	1,572	-584	1,145
2035	1958	28.80	4,642	5,226	-820	-6,415	-10	3,334	33	3,673	6,858	-5,052	23,766	-12,297	-11,469	5,410	3,517	6,828	132	-26	923	209	1,808	3,379	1,866	3,011
2036	1959	6.65	2,070	1,200	-877	-8,560	0	1,101	4	3,711	3,920	-5,136	12,006	-14,574	2,567	3,279	6,795	4,261	719	693	-11	198	-439	2,940	-99	2,912
2037	1960	12.10	2,557	1,163	-637	-7,795	0	102	4	3,845	1,381	-3,932	9,050	-12,364	3,314	-3,152	3,643	947	-163	531	-323	-125	-95	2,845	-324	2,588
2038	1961	7.20	2,072	984	-451	-8,579	0	39	5	3,965	-346	-3,165	7,064	-12,541	5,477	-5,125	-1,482	-4,530	-564	-33	-632	-757	-890	1,955	-734	1,853
2039	1962	25.55	4,103	4,111	-678	-6,502	0	2,130	29	3,865	4,772	-4,078	19,010	-11,257	-7,753	5,449	3,967	3,223	58	25	692	-65	1,643	3,598	844	2,697
2040	1963	12.65	2,559	1,512	-612	-7,995	0	815	8	3,843	5,279	-4,218	14,017	-12,825	-1,191	227	4,194	4,415	455	480	319	254	-655	2,942	215	2,912
2041	1964	8.25	2,322	938	-489	-8,634	0	47	2	3,850	748	-3,458	7,906	-12,581	4,675	-1,851	2,343	-261	-65	415	-505	-252	-355	2,587	-521	2,392
Average:		*13.15*	*2,846*	*1,961*	*-614*	*-7,882*	*-1*	*987*	*10*	*3,933*	*2,474*	*-3,728*	*12,463*	*-12,476*	*13*											
Sustaining Period (water years 2042 through 2071)																										
2042	1965	14.85	2,870	2,036	-511	-7,637	0	1,030	12	3,788	1,151	-3,678	10,888	-11,825	937	-3,882	-1,539	-1,198	-461	-46	-233	-485	-671	1,916	-245	2,147
2043	1966	15.94	3,390	3,057	-751	-7,680	0	2,313	20	3,675	6,577	-4,927	19,032	-13,357	-5,675	8,051	6,512	4,477	563	517	655	170	1,035	2,952	656	2,803
2044	1967	18.88	3,729	4,078	-756	-7,162	0	3,189	20	3,479	5,524	-6,013	20,020	-13,931	-6,089	3,890	10,402	10,566	299	815	281	451	1,120	4,071	1,287	4,089
2045	1968	14.40	2,897	1,727	-837	-7,351	0	855	10	3,541	4,049	-5,638	13,079	-13,825	746	1,922	12,324	9,819	115	930	-14	437	598	4,669	110	4,199
2046	1969	24.50	4,333	5,039	-1,056	-7,323	-157	3,536	38	3,542	3,991	-6,665	20,479	-15,201	-5,278	5,971	18,294	15,098	155	1,085	118	555	2,138	6,807	1,403	5,602
2047	1970	16.34	2,760	1,759	-859	-8,097	0	909	7	3,606	3,881	-5,952	12,922	-14,908	1,985	-2,020	16,274	13,112	-81	1,004	-62	493	-595	6,212	-568	5,034
2048	1971	14.61	2,832	2,232	-897	-7,554	0	1,354	14	3,561	3,822	-6,269	13,814	-14,720	906	-1,544	14,730	12,206	-88	916	-40	454	-758	5,454	5	5,039
2049	1972	8.94	2,282	1,431	-920	-8,271	0	1,229	10	3,646	4,270	-5,774	12,868	-14,965	2,097	-2,432	12,298	10,109	-52	864	-28	425	-753	4,701	-477	4,562
2050	1973	20.71	3,814	4,073	-868	-6,995	-4	2,278	24	3,400	3,853	-6,113	17,442	-13,980	-3,462	4,416	16,714	13,572	134	998	74	499	2,004	6,705	680	5,242
2051	1974	15.00	3,002	2,318	-885	-7,344	0	1,288	14	3,444	3,847	-6,025	13,914	-14,254	340	-800	15,914	13,231	-9	989	2	501	-739	5,966	-31	5,211
2052	1975	16.30	3,133	2,803	-848	-7,220	0	1,777	15	3,463	3,950	-6,222	15,141	-14,289	-851	328	16,242	14,082	-21	968	12	513	270	6,236	196	5,407
2053	1976	13.46	2,677	1,812	-931	-7,893	0	915	10	3,602	3,559	-5,687	12,576	-14,510	1,934	-3,342	12,900	12,148	-115	853	-78	435	-1,224	5,012	-159	5,248
2054	1977	10.94	2,465	1,413	-806	-8,297	0	714	6	3,529	3,237	-5,002	11,363	-14,106	2,742	-1,622	11,278	9,406	-99	753	-121	314	-617	4,395	-992	4,256
2055	1978	34.88	5,698	6,712	-1,033	-7,517	-91	3,595	49	3,270	4,404	-6,679	23,727	-15,320	-8,407	9,111	20,389	17,813	302	1,055	227	541	3,796	8,191	2,123	6,379
2056	1979	18.73	3,840	3,566	-904	-7,479	-11	1,897	21	3,323	3,547	-6,911	16,193	-15,305	-888	2,223	22,613	18,701	-2	1,053	36	578	241	8,431	375	6,755
2057	1980	26.60	4,443	4,366	-994	-6,893	-52	2,052	34	3,320	3,085	-7,271	17,300	-15,209	-2,090	2,425	25,037	20,791	109	1,163	40	618	942	9,373	842	7,596
2058	1981	13.66	2,693	1,804	-905	-7,890	0	920	9	3,441	3,276	-6,474	12,143	-15,269	3,126	-3,966	21,071	17,666	-136	1,026	-87	531	-1,396	7,978	-1,007	6,590
2059	1982	12.51	2,721	1,786	-814	-8,282	0	1,215	6	3,484	3,988	-5,906	13,201	-15,001	1,801	-3,139	17,933	15,865	-53	973	-7	523	-1,405	6,572	-866	5,724
2060	1983	31.66	5,636	6,311	-1,043	-7,987	-79	3,027	42	3,168	3,552	-7,244	21,735	-16,352	-5,392	7,087	25,020	21,257	204	1,177	60	583	2,827	9,399	1,679	7,402
2061	1984	10.22	2,676	1,849	-941	-7,623	0	120	9	3,389	3,307	-6,232	11,349	-14,796	3,446	-4,077	20,943	17,810	-194	983	-45	538	-2,105	7,295	-747	6,655
2062	1985	11.84	2,523	1,353	-863	-7,441	0	193	5	3,550	3,242	-5,473	10,866	-13,776	2,911	-2,888	18,056	14,900	23	1,006	-45	493	-716	6,578	-871	5,784
2063	1986	25.15	4,187	3,879	-860	-6,711	-6	2,520	25	3,389	3,401	-6,678	17,402	-14,255	-3,146	2,806	20,861	18,046	49	1,055	86	579	1,129	7,707	611	6,395
2064	1987	7.50	2,097	521	-838	-9,093	0	156	0	3,634	3,489	-5,126	9,897	-15,058	5,160	-4,680	16,181	12,886	-105	950	-177	402	-2,017	5,691	-1,515	4,879
2065	1988	13.22	2,818	1,755	-772	-7,025	0	165	4	3,583	3,937	-4,817	12,262	-12,614	351	-2,214	13,967	12,534	-59	892	64	466	-766	4,924	-245	4,634

			Groundwater Inflows (acre-feet per year)		Groundwater Outflows (acre-feet per year)			Groundwater Inflow and Outflow Components (acre-feet per year)[e]					Summary (acre-feet per year)			All Aquifers Combined			Mugu Aquifer				Hueneme Aquifer			
Projected Water Year	Analogous Historical Water Year[a]	Assumed Annual Rainfall at Ventura County Govt. Center (inches)[b]	Areal Recharge (includes infiltration of precipitation, agricultural return flows, and M&I return flows)	Mountain-Front Recharge	Evapo-transpiration[c]	Groundwater Extraction (pumping from wells)	Discharge of Groundwater to Tile Drains[d]	Groundwater/ Surface Water Interaction in the Santa Clara River[f]	Groundwater/ Surface Water Interaction in Harmon Barranca[g]	Groundwater Underflow to/from Santa Paula Basin	Groundwater Underflow to/from Oxnard Basin	Groundwater Underflow to/from Offshore (south and west of the coastline)	Sum of Inflows	Sum of Outflows	Groundwater Released from Storage per Water Year[h]	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Cumulative Change in Storage per Water Year	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Annual Change in Storage per Water Year	Cumulative Change in Storage per Water Year	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Annual Change in Storage per Water Year	Cumulative Change in Storage per Water Year
2066	1989	8.23	2,221	1,026	-740	-7,439	0	97	5	3,710	2,556	-4,633	9,614	-12,812	3,198	-2,016	11,951	9,336	-70	822	-163	304	-494	4,430	-392	4,242
2067	1990	5.62	1,779	610	-566	-7,887	0	56	0	3,884	15	-4,035	6,343	-12,488	6,145	-5,557	6,394	3,191	-395	427	-577	-273	-914	3,516	-982	3,260
2068	1991	16.92	3,155	2,886	-625	-8,042	0	1,845	23	3,866	3,324	-4,105	15,100	-12,772	-2,328	-488	5,907	5,519	-422	6	166	-107	881	4,398	-246	3,015
2069	1992	20.34	4,069	4,250	-850	-7,430	-3	3,059	28	3,569	5,967	-5,619	20,943	-13,902	-7,041	8,351	14,257	12,560	696	702	514	407	1,145	5,542	1,119	4,134
2070	1993	28.76	4,556	5,409	-1,089	-6,850	-144	3,754	35	3,378	3,755	-7,072	20,887	-15,156	-5,731	8,068	22,325	18,291	466	1,168	177	584	2,274	7,817	2,072	6,205
2071	1994	11.68	2,485	1,468	-828	-8,163	0	958	7	3,538	3,828	-6,016	12,284	-15,006	2,722	-3,954	18,370	15,569	-167	1,001	-72	512	-1,543	6,274	-742	5,463
Average:		*16.75*	*3,259*	*2,778*	*-853*	*-7,619*	*-18*	*1,567*	*17*	*3,526*	*3,680*	*-5,808*	*14,826*	*-14,299*	*-528*											
Post-SGMA period (water years 2072 through 2096)																										
2072	1995	31.72	5,022	5,580	-1,006	-6,937	-74	2,689	30	3,503	3,366	-6,986	20,189	-15,002	-5,186	6,280	24,651	20,756	223	1,225	120	632	2,569	8,844	1,580	7,043
2073	1996	12.79	2,877	1,966	-841	-8,542	0	857	11	3,500	3,484	-6,333	12,694	-15,716	3,022	-3,157	21,494	17,734	-136	1,088	-115	517	-1,438	7,406	-917	6,126
2074	1997	14.75	3,230	2,831	-943	-7,342	0	1,533	15	3,440	3,630	-6,836	14,680	-15,122	442	-1,007	20,487	17,292	-98	990	12	529	-471	6,934	11	6,137
2075	1998	42.54	6,336	7,413	-1,081	-6,019	-139	3,388	-127	3,333	2,385	-7,607	22,855	-14,972	-7,882	7,658	28,145	25,174	186	1,176	124	653	3,363	10,297	2,514	8,652
2076	1999	10.33	2,337	834	-807	-8,096	0	169	1	3,543	2,948	-6,009	9,832	-14,913	5,081	-5,429	22,716	20,094	-139	1,037	-83	571	-2,575	7,722	-1,669	6,983
2077	2000	17.11	3,201	2,410	-814	-7,821	0	1,128	15	3,495	3,329	-6,183	13,578	-14,819	1,241	-1,390	21,326	18,853	33	1,070	-33	538	-329	7,393	-532	6,451
2078	2001	22.79	3,916	3,931	-843	-7,987	-15	1,632	24	3,355	3,629	-6,546	16,487	-15,390	-1,097	2,357	23,683	19,950	-13	1,058	15	553	1,186	8,579	323	6,774
2079	2002	6.41	2,027	584	-797	-8,517	0	101	2	3,579	3,166	-5,249	9,460	-14,563	5,103	-5,821	17,861	14,847	-137	921	-145	407	-2,686	5,893	-1,405	5,369
2080	2003	19.00	3,722	3,129	-765	-7,220	0	1,429	17	3,431	4,011	-6,025	15,739	-14,010	-1,730	891	18,752	16,577	30	951	91	499	397	6,290	82	5,450
2081	2004	10.73	2,361	1,490	-825	-7,914	0	688	7	3,528	3,215	-5,588	11,289	-14,327	3,038	-2,125	16,628	13,539	-72	879	-97	401	-855	5,435	-601	4,850
2082	2005	34.64	5,698	6,996	-1,049	-6,272	-208	3,791	51	3,311	3,354	-7,339	23,201	-14,868	-8,332	9,529	26,156	21,872	285	1,164	205	606	3,594	9,029	2,392	7,241
2083	2006	16.64	3,081	2,654	-782	-7,302	-12	1,294	13	3,441	3,313	-6,454	13,796	-14,551	755	-4,001	22,156	21,117	-134	1,029	7	613	-1,584	7,444	-268	6,974
2084	2007	5.75	1,789	183	-846	-8,653	0	135	0	3,672	3,443	-5,569	9,221	-15,068	5,847	-4,314	17,842	15,270	-85	944	-150	462	-1,569	5,875	-1,561	5,412
2085	2008	12.77	2,949	2,485	-861	-8,258	-3	1,687	14	3,561	4,072	-5,998	14,770	-15,120	350	148	17,990	14,919	31	975	2	464	-112	5,763	-374	5,038
2086	2009	9.32	2,374	1,353	-807	-7,905	0	915	5	3,627	3,751	-5,419	12,025	-14,131	2,106	-2,606	15,384	12,813	-89	886	-49	415	-877	4,886	-514	4,524
2087	2010	16.82	3,327	2,916	-768	-7,649	0	1,336	13	3,416	4,326	-5,460	15,334	-13,877	-1,457	1,021	16,404	14,270	4	890	47	462	433	5,319	21	4,545
2088	2011	19.70	3,882	3,742	-782	-6,996	-9	1,900	23	3,361	4,115	-6,228	17,024	-14,015	-3,009	3,906	20,310	17,279	157	1,047	96	559	1,371	6,690	943	5,488
2089	2012	9.49	2,196	624	-822	-8,323	0	123	0	3,658	3,721	-5,111	10,321	-14,256	3,935	-5,160	15,151	13,344	-131	916	-128	431	-1,861	4,828	-914	4,575
2090	2013	5.80	2,581	1,559	-806	-7,470	0	677	9	3,611	2,202	-5,307	10,640	-13,583	2,944	-1,224	13,927	10,400	-77	839	-203	228	-369	4,459	-307	4,268
2091	2014	6.14	2,244	1,245	-782	-8,388	0	501	4	3,759	176	-4,502	7,929	-13,673	5,743	-5,305	8,621	4,657	-530	308	-598	-370	-617	3,843	-1,068	3,199
2092	2015	9.15	2,513	1,185	-491	-7,454	0	38	3	3,890	-461	-3,172	7,629	-11,578	3,950	-4,625	3,996	707	-426	-118	-430	-800	-852	2,991	-675	2,524
2093	2016	8.49	2,949	1,980	-401	-8,022	0	312	10	3,866	-222	-3,165	9,117	-11,811	2,694	-2,811	1,185	-1,986	-390	-507	-365	-1,165	-354	2,636	-689	1,835
2094	2017	19.11	3,623	3,571	-600	-7,497	0	2,259	20	3,762	3,065	-3,882	16,299	-11,979	-4,320	3,827	5,011	2,333	268	-239	574	-592	959	3,596	458	2,293
2095	2018	7.16	2,936	1,950	-456	-8,188	0	699	8	3,873	-768	-3,379	9,465	-12,791	3,326	-2,411	2,600	-992	-132	-371	-433	-1,025	-501	3,094	-345	1,948
2096	2019	19.19	3,583	3,571	-679	-7,266	0	2,832	20	3,777	5,885	-4,461	19,667	-12,406	-7,261	3,788	6,388	6,269	239	-132	995	-29	670	3,765	700	2,648
Average:		*15.53*	*3,230*	*2,647*	*-786*	*-7,682*	*-18*	*1,284*	*8*	*3,572*	*2,925*	*-5,552*	*13,730*	*-14,102*	*372*											
Average 2022-2096:		***15.38***	***3,139***	***2,517***	***-767***	***-7,710***	***-14***	***1,318***	***12***	***3,650***	***3,107***	***-5,168***	***13,830***	***-13,747***	***-84***											

Notes:

N/A = Not applicable.

Positive values represent inflows to the Mound Basin negative numbers represent outflows from the basin.

a The representative historical water year used as the basis for assumptions regarding rainfall and surface flows about future years, as described in Section 3.3.

b See Section 3.3 for an explanation of how water-year types were classified in this report.

c The Shallow Alluvial Deposits is modeled to be the sole hydrostratigraphic unit in Mound Basin with saturated conditions consistently shallow enough to be significantly affected by evapotranspiration.

d Tile drains are only known or suspected to be present in the Shallow Alluvial Deposits in Mound Basin.

e These components can comprise either net inflows to or outflows from each aquifer, depending on hydrogeologic conditions that vary over time (e.g., hydraulic gradients).

f Within Mound Basin, the sole hydrostratigraphic unit known or suspected to be in direct hydraulic communication with the Santa Clara River is the Shallow Alluvial Deposits.

g United (2021) modeled Harmon Barranca using MODFLOW's ""Stream package,"" as described in Section 3.3 of this report, allowing the model to simulate direct hydraulic communication with the Shallow Alluvial Deposits, as well as with the fine-grained Pleistocene deposits.

h Water-year changes in storage are calculated from October 1 of the preceding calendar year to September 30 of the indicated year. Positive values for groundwater released from storage represent inflows to the basin, same as all other components on this table. However, specific to this parameter, inflow of groundwater from storage is associated with declining groundwater levels (or potentiometric heads) in the basin. Negative values are associated with increasing groundwater-levels (or potentiometric heads), as a result of groundwater being "added to storage."

Table 3.3-08 Mound Basin Projected Average Inflows and Outflows by Aquifer, Baseline Future Conditions.

	Groundwater Inflows (acre-feet per year)		Groundwater Outflows (acre-feet per year)			Groundwater Inflow and Outflow Components (acre-feet per year)[a]							Summary (acre-feet per year)		
Aquifer	Areal Recharge (includes infiltration of precipitation, agricultural return flows, and M&I return flows)	Mountain-Front Recharge	Evapo-transpiration[b]	Groundwater Extraction	Discharge of Groundwater to Tile Drains[c]	Groundwater/ Surface Water Interaction in the Santa Clara River[d]	Groundwater/ Surface Water Interaction in Harmon Barranca[e]	Groundwater Underflow to/from Santa Paula Basin	Groundwater Underflow to/from Oxnard Basin	Groundwater Underflow to/from Offshore (south and west of the coastline)	Vertical Groundwater Flow to/from the Overlying Aquifer	Vertical Groundwater Flow to/from the Underlying Aquifer	Sum of Inflows	Sum of Outflows	Groundwater Released from Storage[f]
Averages during Implementation Period (water years 2022 through 2041)															
Shallow Alluvial Deposits	2,269	0	-614	0	-1	987	45	0	1,145	-3,055	N/A	-923	4,446	-4,592	146
Fine-grained Pleistocene deposits[g]	139	0	N/A	-6	N/A	N/A	70	7	1,593	-77	923	-2,701	2,732	-2,783	52
Mugu Aquifer	0	0	N/A	-2,560	N/A	N/A	0	219	1,659	-918	2,701	-1,113	4,579	-4,592	13
Hueneme Aquifer[h]	438	1,961	N/A	-4,701	N/A	N/A	-105	1,972	-921	318	1,113	43	5,847	-5,727	-120
Fox Canyon Aquifer[i]	0	0	N/A	-615	N/A	N/A	0	1,734	-1,002	4	-43	N/A	1,738	-1,660	-78
Basin Total:	***2,846***	***1,961***	***-614***	***-7,882***	***-1***	***987***	***10***	***3,933***	***2,474***	***-3,728***	***4,694***	***-4,694***	***19,342***	***-19,355***	***13***
Averages during Sustaining Period (water years 2042 through 2071)															
Shallow Alluvial Deposits	2,550	0	-853	0	-18	1,567	99	0	1,565	-3,862	N/A	-963	5,781	-5,696	-85
Fine-grained Pleistocene deposits[g]	163	0	N/A	-4	N/A	N/A	131	7	1,811	-125	963	-2,746	3,075	-2,875	-200
Mugu Aquifer	0	0	N/A	-2,437	N/A	N/A	0	191	2,031	-1,598	2,746	-907	4,968	-4,943	-25
Hueneme Aquifer[h]	546	2,778	N/A	-4,570	N/A	N/A	-213	1,704	-848	-72	907	-131	5,935	-5,833	-102
Fox Canyon Aquifer[i]	0	0	N/A	-608	N/A	N/A	0	1,624	-880	-151	131	N/A	1,755	-1,639	-116
Basin Total:	***3,259***	***2,778***	***-853***	***-7,619***	***-18***	***1,567***	***17***	***3,526***	***3,680***	***-5,808***	***4,748***	***-4,748***	***21,515***	***-20,987***	***-528***
Averages during post-SGMA period (water years 2072 through 2096):															
Shallow Alluvial Deposits	2,533	0	-786	0	-18	1,284	101	0	1,522	-3,729	N/A	-975	5,440	-5,509	69
Fine-grained Pleistocene deposits[g]	163	0	N/A	-4	N/A	N/A	123	7	1,576	-115	975	-2,806	2,843	-2,925	82
Mugu Aquifer	0	0	N/A	-2,431	N/A	N/A	0	211	1,689	-1,476	2,806	-821	4,706	-4,728	22
Hueneme Aquifer[h]	535	2,647	N/A	-4,635	N/A	N/A	-216	1,728	-944	-74	821	26	5,756	-5,868	113
Fox Canyon Aquifer[i]	0	0	N/A	-612	N/A	N/A	0	1,627	-918	-159	-26	N/A	1,627	-1,714	87
Basin Total:	***3,230***	***2,647***	***-786***	***-7,682***	***-18***	***1,284***	***8***	***3,572***	***2,925***	***-5,552***	***4,576***	***-4,576***	***20,372***	***-20,743***	***372***

Notes:

N/A = Not applicable

Positive values represent inflows to an aquifer; negative numbers represent outflows from an aquifer.

a These components can comprise either net inflows to or outflows from each aquifer, depending on hydrogeologic conditions that vary over time (e.g., hydraulic gradients).

b The Shallow Alluvial Deposits is the sole hydrostratigraphic unit in Mound Basin with saturated conditions consistently shallow enough to be significantly affected by evapotranspiration.

c Tile drains are only known or suspected to be present in the Shallow Alluvial Deposits in Mound Basin.

d Within Mound Basin, the sole hydrostratigraphic unit known or suspected to be in direct hydraulic communication with the Santa Clara River is the Shallow Alluvial Deposits.

e United (2021) modeled Harmon Barranca using MODFLOW's "Stream package," as described in Section 3.3 of this report, allowing the model to simulate direct hydraulic communication with the Shallow Alluvial Deposits and the fine-grained Pleistocene deposits.

f Positive values for groundwater released from storage represent inflows to an aquifer, same as all other components on this page. Inflow of groundwater from storage is associated with declining groundwater levels (or potentiometric heads) in that aquifer. Negative values are associated with increasing groundwater-levels (or potentiometric-heads), as a result of groundwater being "added to storage."

g Although the fine-grained Pleistocene deposits in Mound Basin are not considered a principal aquifer due to their low hydraulic conductivity, they have a substantial thickness and are stratigraphically adjacent to the Oxnard Aquifer in the Oxnard Basin (see Section 3.1 for more information). The fine-grained Pleistocene deposits are included in this table for completeness in depicting the groundwater budget for Mound Basin.

h To provide a complete and balanced water budget (the sum of water-budget components for all units should be zero), the values shown in this row include both the Hueneme Aquifer and the overlying Mugu-Hueneme aquitard, which is thin and has low hydraulic conductivity. For these reasons, inflows and outflows from the aquitard are small compared to those from the aquifer.

i To provide a complete and balanced water budget (the sum of water-budget components for all units should be zero), the values shown in this row include the Fox Canyon Aquifer (main and basal) and the overlying and intervening aquitards, which are thin and have low hydraulic conductivity. For these reasons, inflows and outflows from the aquitards are small compared to those from the aquifer.

j See Section 3.3 for an explanation of how water-year types were classified in this report.

Table 3.3-09 Mound Basin Projected Surface Water Inflows and Outflows by Water Year, 2030 Climate Change and Sea Level Rise Factors.

			Surface Water Gains and Inflows (acre-feet per year)				Surface Water Losses and Outflows (acre-feet per year)					Surface Water Inflow and Outflow Components (acre-feet per year)[g]		Summary (acre-feet per year)		
										Fate of Imported Surface Water (from Casitas MWD)						
Projected Water Year	Analogous Historical Water Year[a]	Assumed Annual Rainfall at Ventura County Govt. Center (inches)[b]	Santa Clara River at Boundary Between Oxnard and Mound Basins	Ephemeral Streamflow Entering Mound Basin from Northern Foothills[c]	Ephemeral Streamflow Generated Within Mound Basin in Response to Rainfall[c]	Imported Surface Water (from Casitas MWD)[d]	Santa Clara River at Pacific Ocean[e]	Mountain-Front Recharge of Surface Flows in Ephemeral Streams in Northern Mound Basin[e]	Ephemeral Streams, Barrancas, and Storm Drain Discharges Exiting Mound Basin[c]	M&I Return Flows[e]	Consumptive Use[f]	Groundwater/ Surface Water Exchange in the Santa Clara River within Mound Basin[e]	Groundwater/ Surface Water Exchange in Harmon Barranca[e]	Sum of Inflows	Sum of Outflows	Difference[h]
Implementation Period (water years 2022 through 2041)																
2022	1945	11.86	62,752	2,565	4,828	3,362	-61,943	-2,670	-4,723	-168	-3,194	-1,209	-14	73,507	-73,920	-413
2023	1946	11.18	32,165	2,347	4,418	4,000	-31,731	-1,752	-5,013	-200	-3,800	-1,370	-8	42,930	-43,875	-944
2024	1947	10.90	17,467	2,259	4,252	4,000	-16,864	-2,009	-4,502	-200	-3,800	-1,299	-13	27,978	-28,687	-709
2025	1948	6.77	1,147	938	1,766	5,816	-1,119	-717	-1,987	-291	-5,525	-43	-2	9,667	-9,684	-17
2026	1949	8.57	1,580	1,513	2,848	5,816	-1,549	-863	-3,498	-291	-5,525	-43	0	11,757	-11,768	-12
2027	1950	13.88	3,965	3,211	6,045	5,816	-3,912	-1,603	-7,653	-291	-5,525	-63	-7	19,036	-19,054	-18
2028	1951	7.53	0	1,178	2,218	5,816	0	-546	-2,851	-291	-5,525	-15	-1	9,213	-9,229	-16
2029	1952	26.42	159,048	7,220	13,592	5,816	-158,170	-5,059	-15,753	-291	-5,525	-3,057	-34	185,677	-187,889	-2,213
2030	1953	12.12	983	2,647	4,983	5,977	-968	-1,547	-6,082	-299	-5,678	-865	-6	14,590	-15,445	-856
2031	1954	15.86	23,853	3,842	7,233	5,977	-23,589	-2,480	-8,595	-299	-5,678	-1,106	-13	40,905	-41,760	-855
2032	1955	12.53	2,148	2,780	5,233	5,977	-2,109	-1,515	-6,497	-299	-5,678	-609	-5	16,138	-16,713	-575
2033	1956	16.21	25,839	3,954	7,444	5,977	-25,641	-2,230	-9,168	-299	-5,678	-936	-13	43,214	-43,965	-750
2034	1957	10.55	10,345	2,146	4,040	5,977	-10,239	-1,462	-4,725	-299	-5,678	-780	-6	22,509	-23,189	-680
2035	1958	27.93	248,075	7,702	14,500	5,977	-246,748	-5,070	-17,132	-299	-5,678	-3,410	-31	276,254	-278,368	-2,114
2036	1959	6.99	36,594	1,007	1,896	5,977	-36,288	-1,329	-1,574	-299	-5,678	-1,082	-5	45,474	-46,254	-779
2037	1960	12.24	3,616	2,685	5,055	5,977	-3,528	-1,303	-6,436	-299	-5,678	-102	-4	17,333	-17,351	-19
2038	1961	7.50	0	1,169	2,201	5,977	0	-952	-2,418	-299	-5,678	-38	-4	9,347	-9,389	-42
2039	1962	27.16	228,325	7,458	14,040	5,977	-227,575	-4,396	-17,101	-299	-5,678	-2,159	9	255,809	-257,209	-1,400
2040	1963	12.80	11,667	2,865	5,394	5,977	-11,546	-1,622	-6,637	-299	-5,678	-841	-9	25,903	-26,632	-729
2041	1964	8.70	6,128	1,553	2,923	5,977	-6,038	-1,022	-3,454	-299	-5,678	-46	-2	16,581	-16,539	41
Average:		*13.39*	*43,785*	*3,052*	*5,745*	*5,608*	*-43,478*	*-2,007*	*-6,790*	*-280*	*-5,328*	*-954*	*-8*	*58,191*	*-58,846*	*-655*
Sustaining Period (water years 2042 through 2071)																
2042	1965	15.34	5,288	3,676	6,919	5,977	-5,220	-1,918	-8,677	-299	-5,678	-973	-10	21,860	-22,775	-916
2043	1966	16.59	130,532	4,077	7,675	5,977	-130,011	-3,313	-8,438	-299	-5,678	-2,322	-23	148,260	-150,084	-1,824
2044	1967	18.25	112,063	4,608	8,674	5,977	-110,645	-4,099	-9,183	-299	-5,678	-3,099	-20	131,322	-133,023	-1,701
2045	1968	14.27	8,268	3,334	6,276	5,977	-7,673	-1,649	-7,961	-299	-5,678	-878	-10	23,855	-24,148	-292
2046	1969	24.02	968,493	6,452	12,145	5,977	-965,949	-4,955	-13,642	-299	-5,678	-3,409	-37	993,067	-993,969	-902
2047	1970	16.13	49,571	3,929	7,396	5,977	-48,414	-1,668	-9,657	-299	-5,678	-928	-7	66,873	-66,651	222
2048	1971	15.02	53,373	3,574	6,728	5,977	-52,393	-2,324	-7,978	-299	-5,678	-1,355	-15	69,653	-70,043	-390
2049	1972	8.39	24,837	1,453	2,735	5,977	-24,296	-1,492	-2,696	-299	-5,678	-1,198	-11	35,002	-35,671	-668
2050	1973	20.98	220,376	5,480	10,317	5,977	-218,890	-4,096	-11,701	-299	-5,678	-2,275	-24	242,150	-242,963	-813
2051	1974	15.51	75,257	3,730	7,021	5,977	-74,173	-2,328	-8,423	-299	-5,678	-1,314	-16	91,984	-92,230	-246
2052	1975	15.60	62,319	3,761	7,080	5,977	-61,171	-2,817	-8,024	-299	-5,678	-1,790	-16	79,137	-79,796	-659
2053	1976	14.10	27,763	3,281	6,176	5,977	-27,342	-2,191	-7,266	-299	-5,678	-1,218	-13	43,197	-44,007	-810

Projected Water Year	Analogous Historical Water Year[a]	Assumed Annual Rainfall at Ventura County Govt. Center (inches)[b]	Surface Water Gains and Inflows (acre-feet per year): Santa Clara River at Boundary Between Oxnard and Mound Basins	Ephemeral Streamflow Entering Mound Basin from Northern Foothills[c]	Ephemeral Streamflow Generated Within Mound Basin in Response to Rainfall[c]	Imported Surface Water (from Casitas MWD)[d]	Surface Water Losses and Outflows (acre-feet per year): Santa Clara River at Pacific Ocean[e]	Mountain-Front Recharge of Surface Flows in Ephemeral Streams in Northern Mound Basin[e]	Ephemeral Streams, Barrancas, and Storm Drain Discharges Exiting Mound Basin[c]	Fate of Imported Surface Water (from Casitas MWD): M&I Return Flows[e]	Fate of Imported Surface Water (from Casitas MWD): Consumptive Use[f]	Surface Water Inflow and Outflow Components (acre-feet per year)[g]: Groundwater/ Surface Water Exchange in the Santa Clara River within Mound Basin[e]	Groundwater/ Surface Water Exchange in Harmon Barranca[e]	Summary (acre-feet per year): Sum of Inflows	Sum of Outflows	Difference[h]
2054	1977	11.73	13,380	2,521	4,746	5,977	-13,206	-1,549	-5,719	-299	-5,678	-713	-6	26,625	-27,170	-545
2055	1978	34.58	722,565	9,829	18,502	5,977	-720,695	-6,781	-21,550	-299	-5,678	-3,386	-49	756,873	-758,438	-1,565
2056	1979	18.60	177,566	4,721	8,887	5,977	-176,287	-3,537	-10,071	-299	-5,678	-1,816	-21	197,151	-197,708	-557
2057	1980	26.28	407,091	7,176	13,509	5,977	-405,799	-4,365	-16,320	-299	-5,678	-2,026	-34	433,753	-434,521	-768
2058	1981	12.96	44,443	2,915	5,487	5,977	-43,555	-1,713	-6,689	-299	-5,678	-929	-9	58,822	-58,871	-49
2059	1982	12.28	37,493	2,697	5,078	5,977	-36,504	-1,723	-6,052	-299	-5,678	-1,187	-6	51,245	-51,449	-203
2060	1983	32.27	555,084	9,091	17,114	5,977	-553,750	-6,421	-19,784	-299	-5,678	-2,980	-43	587,266	-588,954	-1,688
2061	1984	10.44	29,625	2,110	3,971	5,977	-29,035	-1,956	-4,125	-299	-5,678	-687	-10	41,683	-41,789	-106
2062	1985	12.13	15,444	2,651	4,991	5,977	-14,480	-1,444	-6,199	-299	-5,678	-1,136	-5	29,063	-29,240	-177
2063	1986	25.61	190,583	6,963	13,107	5,977	-189,498	-3,969	-16,101	-299	-5,678	-1,835	-26	216,630	-217,407	-777
2064	1987	7.82	3,445	1,272	2,395	5,977	-2,882	-569	-3,098	-299	-5,678	-159	0	13,090	-12,685	405
2065	1988	13.44	27,954	3,068	5,776	5,977	-27,187	-1,865	-6,978	-299	-5,678	-164	-5	42,775	-42,177	598
2066	1989	8.44	2,230	1,471	2,768	5,977	-2,101	-1,088	-3,151	-299	-5,678	-1,028	-5	12,446	-13,350	-904
2067	1990	5.98	4,104	684	1,288	5,977	-4,017	-681	-1,290	-299	-5,678	-56	0	12,052	-12,021	31
2068	1991	16.22	109,593	3,959	7,453	5,977	-109,121	-2,799	-8,612	-299	-5,678	-1,733	-22	126,982	-128,264	-1,282
2069	1992	20.34	286,099	5,277	9,933	5,977	-284,754	-4,338	-10,871	-299	-5,678	-3,010	-30	307,285	-308,980	-1,695
2070	1993	28.42	847,487	7,860	14,796	5,977	-844,908	-5,463	-17,193	-299	-5,678	-3,669	-37	876,120	-877,247	-1,127
2071	1994	11.79	51,540	2,540	4,782	5,977	-50,244	-1,544	-5,778	-299	-5,678	-1,007	-8	64,840	-64,559	281
Average:		*16.78*	*175,462*	*4,139*	*7,791*	*5,977*	*-174,473*	*-2,822*	*-9,108*	*-299*	*-5,678*	*-1,609*	*-17*	*193,369*	*-194,006*	*-638*
Post-SGMA period (water years 2072 through 2096)																
2072	1995	30.11	475,895	8,401	15,815	5,977	-474,335	-5,276	-18,940	-299	-5,678	-2,603	-42	506,089	-507,174	-1,085
2073	1996	13.23	69,724	3,002	5,650	5,977	-68,939	-2,026	-6,626	-299	-5,678	-900	-11	84,353	-84,480	-127
2074	1997	15.29	79,281	3,662	6,894	5,977	-78,265	-2,915	-7,641	-299	-5,678	-1,557	-16	95,814	-96,370	-557
2075	1998	43.89	654,521	12,806	24,107	5,977	-653,151	-7,725	-29,188	-299	-5,678	-3,078	201	697,612	-699,118	-1,506
2076	1999	10.90	46,015	2,256	4,247	5,977	-45,402	-888	-5,615	-299	-5,678	-93	-2	58,495	-57,976	519
2077	2000	17.82	79,620	4,470	8,415	5,977	-78,795	-2,560	-10,326	-299	-5,678	-1,162	-16	98,482	-98,836	-353
2078	2001	22.45	192,786	5,951	11,203	5,977	-191,956	-3,920	-13,233	-299	-5,678	-1,637	-25	215,917	-216,749	-833
2079	2002	6.74	1,898	927	1,745	5,977	-1,511	-602	-2,071	-299	-5,678	-107	-2	10,548	-10,270	277
2080	2003	18.68	45,748	4,744	8,930	5,977	-45,094	-3,150	-10,524	-299	-5,678	-1,066	-17	65,399	-65,828	-429
2081	2004	11.59	35,245	2,478	4,665	5,977	-34,921	-1,479	-5,664	-299	-5,678	-734	-8	48,365	-48,783	-418
2082	2005	34.22	1,078,445	9,714	18,287	5,977	-1,076,751	-7,177	-20,825	-299	-5,678	-3,711	-53	1,112,423	-1,114,495	-2,072
2083	2006	15.50	131,916	3,728	7,018	5,977	-131,023	-2,482	-8,265	-299	-5,678	-1,413	-12	148,639	-149,171	-532
2084	2007	6.38	5,233	811	1,527	5,977	-4,587	-243	-2,094	-299	-5,678	-124	0	13,548	-13,025	522
2085	2008	12.32	153,718	2,710	5,102	5,977	-152,759	-2,518	-5,295	-299	-5,678	-1,660	-15	167,507	-168,223	-716
2086	2009	9.92	18,614	1,944	3,660	5,977	-18,067	-1,384	-4,220	-299	-5,678	-978	-5	30,196	-30,632	-436
2087	2010	17.14	90,022	4,254	8,008	5,977	-89,318	-3,084	-9,178	-299	-5,678	-1,360	-14	108,261	-108,932	-671

			Surface Water Gains and Inflows (acre-feet per year)				Surface Water Losses and Outflows (acre-feet per year)					Surface Water Inflow and Outflow Components (acre-feet per year)[g]		Summary (acre-feet per year)		
										Fate of Imported Surface Water (from Casitas MWD)						
Projected Water Year	**Analogous Historical Water Year[a]**	**Assumed Annual Rainfall at Ventura County Govt. Center (inches)[b]**	**Santa Clara River at Boundary Between Oxnard and Mound Basins**	**Ephemeral Streamflow Entering Mound Basin from Northern Foothills[c]**	**Ephemeral Streamflow Generated Within Mound Basin in Response to Rainfall[c]**	**Imported Surface Water (from Casitas MWD)[d]**	**Santa Clara River at Pacific Ocean[e]**	**Mountain-Front Recharge of Surface Flows in Ephemeral Streams in Northern Mound Basin[e]**	**Ephemeral Streams, Barrancas, and Storm Drain Discharges Exiting Mound Basin[c]**	**M&I Return Flows[e]**	**Consumptive Use[f]**	**Groundwater/ Surface Water Exchange in the Santa Clara River within Mound Basin[e]**	**Groundwater/ Surface Water Exchange in Harmon Barranca[e]**	**Sum of Inflows**	**Sum of Outflows**	**Difference[h]**
2088	2011	18.82	140,667	4,791	9,020	5,977	-139,628	-3,749	-10,062	-299	-5,678	-1,858	-23	160,455	-161,298	-843
2089	2012	9.33	9,997	1,754	3,303	5,977	-9,393	-602	-4,455	-299	-5,678	-130	0	21,030	-20,557	473
2090	2013	6.77	270	936	1,762	5,977	-21	-1,637	-1,061	-299	-5,678	-102	-8	8,945	-8,806	139
2091	2014	6.39	25,475	814	1,532	5,977	-25,335	-1,340	-1,007	-299	-5,678	-536	-5	33,798	-34,198	-400
2092	2015	9.80	605	1,905	3,587	5,977	-597	-1,316	-4,177	-299	-5,678	-39	-4	12,075	-12,109	-35
2093	2016	7.96	2,492	1,317	2,478	5,977	-2,447	-1,951	-1,844	-299	-5,678	-296	-11	12,264	-12,526	-262
2094	2017	20.00	87,307	5,166	9,725	5,977	-86,817	-3,575	-11,315	-299	-5,678	-2,210	-20	108,175	-109,915	-1,740
2095	2018	6.69	6,420	909	1,712	5,977	-6,332	-1,865	-756	-299	-5,678	-576	-8	15,018	-15,515	-497
2096	2019	19.96	158,881	5,155	9,705	5,977	-157,946	-3,575	-11,285	-299	-5,678	-2,858	-20	179,718	-181,662	-1,943
Average:		*15.68*	*143,632*	*3,784*	*7,124*	*5,977*	*-142,936*	*-2,682*	*-8,227*	*-299*	*-5,678*	*-1,232*	*-5*	*160,525*	*-161,066*	*-541*
Average 2022-2096:		***15.51***	***129,738***	***3,731***	***7,023***	***5,879***	***-129,029***	***-2,558***	***-8,196***	***-294***	***-5,585***	***-1,309***	***-11***	***146,373***	***-146,983***	***-610***

Notes

Positive values represent inflows or gains of surface-water flows in Mound Basin, and negative numbers represent outflows or losses of surface-water flows in Mound Basin.

a See Section 3.3 for an explanation of how water-year types were classified in this report.

b The California Department of Water Resources classification approach is described in Section 3.3.

c Inflows of ephemeral surface water to Mound Basin are projected based on an empirical relationship between measured streamflow in Arundell Barranca and annual (water year) rainfall measured at Ventura County Government Center, applied to the watershed areas of streams (barrancas) within Mound Basin and upstream from Mound Basin (in stream channels that flow across the basin's northern boundary). Outflows are assumed equal to inflows across the northern basin boundary plus surface flows generated by rainfall within Mound Basin, minus mountain-front recharge of inflows immediately south of the northern boundary of Mound Basin.

d Projected imports are from Ventura Water, 2020b.

e Estimated using United's (2021a) groundwater flow model or resulting from model calibration.

f "Consumptive use" represents loss of imported surface water from Casitas MWD to evaporation and wastewater discharges after M&I use, and in this table is equal to imported surface water (from Casitas MWD) minus M&I return flows.

g These components can comprise either net gains or losses of surface water from streams within Mound Basin, depending on hydrogeologic conditions that vary over time.

h Inflows and outflows of surface water in Mound Basin should be equal, resulting in a difference of zero. Although the long-term average difference is less than 1 percent of the long-term average inflows or outflows, indicating good overall agreement, the apparent difference between inflows and outflows is larger during years with above-average rainfall. This likely is a result of minor deviations of actual streamflow in Arundell Barranca in a given water year compared to the empirical relationship developed to estimate basinwide ephemeral flows across the basin.

MoundBasin
GROUNDWATER SUSTAINABILITY AGENCY

Table 3.3-10 Mound Basin Projected Surface Water Inflows and Outflows by Water Year, 2070 Climate Change and Sea Level Rise Factors.

			Surface Water Gains and Inflows (acre-feet per year)				Surface Water Losses and Outflows (acre-feet per year)					Surface Water Inflow and Outflow Components (acre-feet per year)[g]		Summary (acre-feet per year)		
										Fate of Imported Surface Water (from Casitas MWD)						
Projected Water Year	Analogous Historical Water Year[a]	Assumed Annual Rainfall at Ventura County Govt. Center (inches)[b]	Santa Clara River at Boundary Between Oxnard and Mound Basins	Ephemeral Streamflow Entering Mound Basin from Northern Foothills[c]	Ephemeral Streamflow Generated Within Mound Basin in Response to Rainfall[c]	Imported Surface Water (from Casitas MWD)[d]	Santa Clara River at Pacific Ocean[e]	Mountain-Front Recharge of Surface Flows in Ephemeral Streams in Northern Mound Basin[e]	Ephemeral Streams, Barrancas, and Storm Drain Discharges Exiting Mound Basin[c]	M&I Return Flows[e]	Consumptive Use[f]	Groundwater/ Surface Water Exchange in the Santa Clara River within Mound Basin[e]	Groundwater/ Surface Water Exchange in Harmon Barranca[e]	Sum of Inflows	Sum of Outflows	Difference[h]
Implementation Period (water years 2022 through 2041)																
2022	1945	11.93	69,224	2,588	4,871	3,362	-67,803	-2,753	-4,706	-168	-3,194	-1,420	-14	80,045	-80,059	-14
2023	1946	10.57	35,599	2,150	4,048	4,000	-34,378	-1,699	-4,499	-200	-3,800	-1,335	-8	45,797	-45,919	-122
2024	1947	10.28	20,182	2,059	3,876	4,000	-19,057	-1,831	-4,103	-200	-3,800	-1,275	-12	30,116	-30,279	-162
2025	1948	6.37	3,448	807	1,519	5,816	-2,443	-652	-1,674	-291	-5,525	-38	-2	11,590	-10,625	965
2026	1949	7.89	3,341	1,296	2,439	5,816	-2,362	-849	-2,885	-291	-5,525	-35	0	12,892	-11,948	943
2027	1950	14.11	5,475	3,283	6,180	5,816	-4,516	-1,522	-7,940	-291	-5,525	-55	-7	20,753	-19,856	897
2028	1951	7.07	689	1,033	1,944	5,816	-67	-607	-2,370	-291	-5,525	-13	-2	9,483	-8,875	608
2029	1952	26.82	159,903	7,349	13,834	5,816	-158,435	-5,123	-16,060	-291	-5,525	-3,067	-36	186,902	-188,537	-1,635
2030	1953	10.75	3,185	2,208	4,156	5,977	-2,243	-1,305	-5,059	-299	-5,678	-734	-3	15,526	-15,321	205
2031	1954	16.13	25,135	3,930	7,398	5,977	-24,044	-2,562	-8,766	-299	-5,678	-1,092	-14	42,440	-42,456	-16
2032	1955	12.49	3,921	2,765	5,206	5,977	-2,974	-1,587	-6,384	-299	-5,678	-554	-7	17,869	-17,483	386
2033	1956	16.88	26,948	4,170	7,849	5,977	-25,877	-2,195	-9,825	-299	-5,678	-871	-13	44,945	-44,757	187
2034	1957	10.35	11,831	2,081	3,918	5,977	-10,889	-1,503	-4,497	-299	-5,678	-804	-7	23,808	-23,676	131
2035	1958	29.83	249,188	8,311	15,645	5,977	-247,302	-5,377	-18,579	-299	-5,678	-3,507	-33	279,122	-280,776	-1,655
2036	1959	7.32	39,598	1,113	2,095	5,977	-38,365	-1,534	-1,674	-299	-5,678	-1,165	-6	48,783	-48,722	61
2037	1960	12.38	6,013	2,732	5,143	5,977	-5,001	-1,416	-6,459	-299	-5,678	-819	-5	19,864	-19,677	188
2038	1961	6.72	1,411	921	1,735	5,977	-497	-873	-1,783	-299	-5,678	-36	-4	10,044	-9,171	873
2039	1962	27.90	228,942	7,695	14,485	5,977	-227,372	-4,436	-17,744	-299	-5,678	-2,157	3	257,102	-257,686	-584
2040	1963	13.20	14,273	2,994	5,635	5,977	-13,228	-1,783	-6,846	-299	-5,678	-813	-9	28,878	-28,656	222
2041	1964	8.31	8,136	1,430	2,693	5,977	-7,117	-928	-3,195	-299	-5,678	-40	-1	18,236	-17,258	978
Average:		*13.37*	*45,822*	*3,046*	*5,734*	*5,608*	*-44,698*	*-2,027*	*-6,752*	*-280*	*-5,328*	*-992*	*-9*	*60,210*	*-60,087*	*123*
Sustaining Period (water years 2042 through 2071)																
2042	1965	14.57	6,836	3,431	6,459	5,977	-5,853	-1,616	-8,274	-299	-5,678	-842	-9	22,704	-22,572	132
2043	1966	15.79	132,745	3,820	7,191	5,977	-131,358	-3,078	-7,933	-299	-5,678	-2,308	-21	149,733	-150,675	-942
2044	1967	18.65	112,219	4,734	8,912	5,977	-110,527	-4,042	-9,605	-299	-5,678	-3,044	-20	131,843	-133,215	-1,372
2045	1968	13.34	10,394	3,036	5,716	5,977	-9,301	-1,665	-7,087	-299	-5,678	-953	-10	25,123	-24,994	129
2046	1969	25.72	966,585	6,997	13,173	5,977	-963,947	-5,563	-14,607	-299	-5,678	-3,504	-33	992,732	-993,630	-899
2047	1970	16.37	52,580	4,007	7,543	5,977	-51,235	-1,787	-9,764	-299	-5,678	-988	-9	70,107	-69,760	348
2048	1971	13.80	55,355	3,185	5,996	5,977	-54,082	-2,277	-6,904	-299	-5,678	-1,322	-15	70,514	-70,577	-63
2049	1972	7.66	27,939	1,221	2,299	5,977	-26,817	-1,430	-2,090	-299	-5,678	-1,132	-10	37,437	-37,457	-20
2050	1973	22.47	222,987	5,958	11,216	5,977	-221,284	-4,311	-12,863	-299	-5,678	-2,340	-27	246,138	-246,802	-663
2051	1974	15.65	76,825	3,777	7,111	5,977	-75,474	-2,408	-8,481	-299	-5,678	-1,345	-16	93,690	-93,701	-11

			Surface Water Gains and Inflows (acre-feet per year)				Surface Water Losses and Outflows (acre-feet per year)					Surface Water Inflow and Outflow Components (acre-feet per year)[g]		Summary (acre-feet per year)		
										Fate of Imported Surface Water (from Casitas MWD)						
Projected Water Year	Analogous Historical Water Year[a]	Assumed Annual Rainfall at Ventura County Govt. Center (inches)[b]	Santa Clara River at Boundary Between Oxnard and Mound Basins	Ephemeral Streamflow Entering Mound Basin from Northern Foothills[c]	Ephemeral Streamflow Generated Within Mound Basin in Response to Rainfall[c]	Imported Surface Water (from Casitas MWD)[d]	Santa Clara River at Pacific Ocean[e]	Mountain-Front Recharge of Surface Flows in Ephemeral Streams in Northern Mound Basin[e]	Ephemeral Streams, Barrancas, and Storm Drain Discharges Exiting Mound Basin[c]	M&I Return Flows[e]	Consumptive Use[f]	Groundwater/ Surface Water Exchange in the Santa Clara River within Mound Basin[e]	Groundwater/ Surface Water Exchange in Harmon Barranca[e]	Sum of Inflows	Sum of Outflows	Difference[h]
2052	1975	15.87	65,705	3,847	7,242	5,977	-64,354	-2,758	-8,330	-299	-5,678	-1,797	-16	82,770	-83,232	-462
2053	1976	16.13	30,304	3,930	7,399	5,977	-29,134	-3,243	-8,086	-299	-5,678	-1,448	-23	47,610	-47,910	-300
2054	1977	11.55	16,201	2,464	4,639	5,977	-15,125	-1,589	-5,514	-299	-5,678	-693	-7	29,281	-28,906	375
2055	1978	37.23	724,631	10,676	20,097	5,977	-722,783	-7,317	-23,456	-299	-5,678	-3,351	-54	761,381	-762,938	-1,557
2056	1979	20.33	184,970	5,274	9,928	5,977	-183,852	-3,826	-11,376	-299	-5,678	-1,750	-24	206,149	-206,805	-656
2057	1980	27.96	408,788	7,714	14,521	5,977	-407,556	-4,708	-17,526	-299	-5,678	-2,014	-36	436,999	-437,818	-819
2058	1981	13.18	48,001	2,985	5,620	5,977	-47,085	-1,995	-6,610	-299	-5,678	-928	-11	62,583	-62,607	-23
2059	1982	12.47	41,074	2,758	5,192	5,977	-40,026	-1,978	-5,973	-299	-5,678	-1,485	-8	55,002	-55,446	-444
2060	1983	32.62	560,277	9,202	17,322	5,977	-558,968	-6,434	-20,090	-299	-5,678	-2,911	-44	592,778	-594,424	-1,646
2061	1984	9.08	32,348	1,676	3,156	5,977	-31,660	-1,591	-3,241	-299	-5,678	-120	-8	43,157	-42,598	559
2062	1985	11.33	18,539	2,396	4,510	5,977	-17,447	-1,206	-5,699	-299	-5,678	-179	-3	31,421	-30,512	909
2063	1986	27.53	190,547	7,574	14,259	5,977	-189,406	-4,370	-17,463	-299	-5,678	-2,317	-29	218,357	-219,562	-1,205
2064	1987	7.25	7,667	1,091	2,053	5,977	-6,828	-454	-2,690	-299	-5,678	-154	0	16,788	-16,103	685
2065	1988	12.92	27,555	2,902	5,464	5,977	-26,526	-1,790	-6,577	-299	-5,678	-153	-5	41,898	-41,028	870
2066	1989	8.03	4,956	1,339	2,521	5,977	-3,961	-951	-2,910	-299	-5,678	-72	-4	14,794	-13,874	920
2067	1990	6.17	6,331	744	1,400	5,977	-5,316	-806	-1,337	-299	-5,678	-55	-1	14,452	-13,493	958
2068	1991	17.24	112,028	4,286	8,068	5,977	-110,702	-3,176	-9,178	-299	-5,678	-1,882	-25	130,359	-130,940	-581
2069	1992	21.67	287,295	5,702	10,733	5,977	-285,442	-4,666	-11,769	-299	-5,678	-2,777	-33	309,706	-310,663	-957
2070	1993	30.48	846,052	8,519	16,037	5,977	-843,572	-5,691	-18,865	-299	-5,678	-3,730	-39	876,584	-877,874	-1,290
2071	1994	11.88	56,812	2,570	4,838	5,977	-55,551	-1,667	-5,741	-299	-5,678	-1,035	-9	70,198	-69,981	217
Average:		*17.16*	*177,818*	*4,261*	*8,021*	*5,977*	*-176,506*	*-2,946*	*-9,335*	*-299*	*-5,678*	*-1,554*	*-18*	*196,076*	*-196,337*	*-260*
Post-SGMA period (water years 2072 through 2096)																
2072	1995	32.33	479,886	9,110	17,150	5,977	-478,382	-5,901	-20,359	-299	-5,678	-2,638	38	512,161	-513,257	-1,096
2073	1996	13.03	74,223	2,938	5,531	5,977	-73,405	-2,202	-6,267	-299	-5,678	-941	-13	88,669	-88,805	-136
2074	1997	15.40	82,779	3,696	6,958	5,977	-81,706	-2,892	-7,761	-299	-5,678	-1,538	-17	99,409	-99,892	-483
2075	1998	44.22	652,633	12,913	24,309	5,977	-651,248	-7,785	-29,437	-299	-5,678	-3,333	184	696,017	-697,780	-1,764
2076	1999	10.62	47,209	2,168	4,082	5,977	-46,538	-804	-5,446	-299	-5,678	-189	-1	59,437	-58,956	481
2077	2000	18.57	83,272	4,709	8,864	5,977	-82,368	-2,664	-10,908	-299	-5,678	-1,213	-17	102,821	-103,147	-325
2078	2001	23.94	195,387	6,428	12,100	5,977	-194,513	-4,234	-14,293	-299	-5,678	-1,740	-29	219,891	-220,786	-894
2079	2002	5.98	6,298	683	1,285	5,977	-5,580	-494	-1,474	-299	-5,678	-112	-1	14,243	-13,638	605
2080	2003	17.72	48,198	4,437	8,353	5,977	-47,366	-2,877	-9,913	-299	-5,678	-1,039	-17	66,965	-67,189	-224
2081	2004	11.41	38,203	2,419	4,555	5,977	-37,302	-1,535	-5,439	-299	-5,678	-725	-9	51,154	-50,987	167
2082	2005	36.72	1,076,121	10,513	19,791	5,977	-1,074,418	-7,586	-22,718	-299	-5,678	-3,710	-57	1,112,403	-1,114,467	-2,064
2083	2006	16.16	136,880	3,940	7,417	5,977	-135,989	-2,659	-8,699	-299	-5,678	-1,446	-14	154,215	-154,784	-569

			Surface Water Gains and Inflows (acre-feet per year)				Surface Water Losses and Outflows (acre-feet per year)					Surface Water Inflow and Outflow Components (acre-feet per year)[g]		Summary (acre-feet per year)		
										Fate of Imported Surface Water (from Casitas MWD)						
Projected Water Year	Analogous Historical Water Year[a]	Assumed Annual Rainfall at Ventura County Govt. Center (inches)[b]	Santa Clara River at Boundary Between Oxnard and Mound Basins	Ephemeral Streamflow Entering Mound Basin from Northern Foothills[c]	Ephemeral Streamflow Generated Within Mound Basin in Response to Rainfall[c]	Imported Surface Water (from Casitas MWD)[d]	Santa Clara River at Pacific Ocean[e]	Mountain-Front Recharge of Surface Flows in Ephemeral Streams in Northern Mound Basin[e]	Ephemeral Streams, Barrancas, and Storm Drain Discharges Exiting Mound Basin[c]	M&I Return Flows[e]	Consumptive Use[f]	Groundwater/ Surface Water Exchange in the Santa Clara River within Mound Basin[e]	Groundwater/ Surface Water Exchange in Harmon Barranca[e]	Sum of Inflows	Sum of Outflows	Difference[h]
2084	2007	5.86	10,287	647	1,218	5,977	-9,444	-208	-1,657	-299	-5,678	-127	0	18,129	-17,413	716
2085	2008	12.64	157,205	2,814	5,298	5,977	-156,004	-2,604	-5,508	-299	-5,678	-1,662	-16	171,294	-171,771	-477
2086	2009	9.59	22,916	1,838	3,460	5,977	-21,878	-1,321	-3,976	-299	-5,678	-938	-6	34,191	-34,096	94
2087	2010	17.19	91,477	4,270	8,038	5,977	-90,352	-3,026	-9,282	-299	-5,678	-1,515	-15	109,762	-110,167	-405
2088	2011	17.89	140,766	4,493	8,457	5,977	-139,714	-3,775	-9,175	-299	-5,678	-1,791	-25	159,693	-160,457	-763
2089	2012	8.96	12,951	1,637	3,081	5,977	-12,008	-444	-4,273	-299	-5,678	-136	0	23,646	-22,838	808
2090	2013	5.70	2,937	594	1,119	5,977	-1,986	-1,384	-329	-299	-5,678	-75	-7	10,627	-9,759	869
2091	2014	6.33	27,271	794	1,495	5,977	-26,213	-1,563	-727	-299	-5,678	-519	-6	35,538	-35,005	533
2092	2015	9.62	2,417	1,848	3,479	5,977	-1,448	-1,098	-4,229	-299	-5,678	-39	-4	13,721	-12,795	926
2093	2016	8.36	4,032	1,445	2,720	5,977	-3,063	-2,027	-2,137	-299	-5,678	-295	-12	14,174	-13,512	662
2094	2017	22.47	88,857	5,958	11,216	5,977	-87,530	-3,849	-13,325	-299	-5,678	-2,219	-24	112,008	-112,924	-916
2095	2018	7.16	8,383	1,060	1,995	5,977	-7,372	-2,050	-1,006	-299	-5,678	-588	-11	17,416	-17,003	412
2096	2019	21.95	160,024	5,792	10,904	5,977	-158,373	-3,849	-12,847	-299	-5,678	-2,886	-24	182,697	-183,956	-1,259
Average:		*15.99*	*146,025*	*3,886*	*7,315*	*5,977*	*-144,968*	*-2,753*	*-8,447*	*-299*	*-5,678*	*-1,257*	*-4*	*163,211*	*-163,415*	*-204*
Average 2022-2096:		***15.76***	***132,021***	***3,812***	***7,175***	***5,879***	***-130,845***	***-2,637***	***-8,350***	***-294***	***-5,585***	***-1,305***	***-11***	***148,890***	***-149,030***	***-139***

Notes

Positive values represent inflows or gains of surface-water flows in Mound Basin, and negative numbers represent outflows or losses of surface-water flows in Mound Basin.

a See Section 3.3 for an explanation of how water-year types were classified in this report.

b The California Department of Water Resources classification approach is described in Section 3.3.

c Inflows of ephemeral surface water to Mound Basin are projected based on an empirical relationship between measured streamflow in Arundell Barranca and annual (water year) rainfall measured at Ventura County Government Center, applied to the watershed areas of streams (barrancas) within Mound Basin and upstream from Mound Basin (in stream channels that flow across the basin's northern boundary). Outflows are assumed equal to inflows across the northern basin boundary plus surface flows generated by rainfall within Mound Basin, minus mountain-front recharge of inflows immediately south of the northern boundary of Mound Basin.

d Projected imports are from Ventura Water, 2020b.

e Estimated using United's (2021a) groundwater flow model or resulting from model calibration.

f "Consumptive use" represents loss of imported surface water from Casitas MWD to evaporation and wastewater discharges after M&I use, and in this table is equal to imported surface water (from Casitas MWD) minus M&I return flows.

g These components can comprise either net gains or losses of surface water from streams within Mound Basin, depending on hydrogeologic conditions that vary over time.

h Inflows and outflows of surface water in Mound Basin should be equal, resulting in a difference of zero. Although the long-term average difference is less than 1 percent of the long-term average inflows or outflows, indicating good overall agreement, the apparent difference between inflows and outflows is larger during years with above-average rainfall. This likely is a result of minor deviations of actual streamflow in Arundell Barranca in a given water year compared to the empirical relationship developed to estimate basinwide ephemeral flows across the basin.

Table 3.3-11 Mound Basin Projected Groundwater Inflows and Outflows by Water Year, 2030 Climate Change and Sea Level Rise Factors.

			Groundwater Inflows (acre-feet per year)		Groundwater Outflows (acre-feet per year)			Groundwater Inflow and Outflow Components (acre-feet per year)[e]					Summary (acre-feet per year)			All Aquifers Combined			Mugu Aquifer				Hueneme Aquifer			
Projected Water Year	Analogous Historical Water Year[a]	Assumed Annual Rainfall at Ventura County Govt. Center (inches)[b]	Areal Recharge (includes infiltration of precipitation, agricultural return flows, and M&I return flows)	Mountain-Front Recharge	Evapo-transpiration[c]	Groundwater Extraction (pumping from wells)	Discharge of Groundwater to Tile Drains[d]	Groundwater/ Surface Water Interaction in the Santa Clara River[f]	Groundwater/ Surface Water Interaction in Harmon Barranca[g]	Groundwater Underflow to/from Santa Paula Basin	Groundwater Underflow to/from Oxnard Basin	Groundwater Underflow to/from Offshore (south and west of the coastline)	Sum of Inflows	Sum of Outflows	Groundwater Released from Storage per Water Year[h]	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Cumulative Change in Storage per Water Year	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Annual Change in Storage per Water Year	Cumulative Change in Storage per Water Year	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Annual Change in Storage per Water Year	Cumulative Change in Storage per Water Year
Implementation Period (water years 2022 through 2041)																										
2022	1945	11.86	2,972	2,670	-827	-8,136	0	1,209	14	3,958	4,454	-4,741	15,277	-13,703	-1,574	3,647	3,647	1,574	640	640	156	156	1,580	1,580	1,223	1,223
2023	1946	11.18	2,563	1,752	-827	-8,555	0	1,370	8	3,899	5,184	-4,779	14,777	-14,161	-616	72	3,719	2,190	76	716	119	275	94	1,674	423	1,646
2024	1947	10.90	2,866	2,009	-864	-7,465	0	1,299	13	3,871	4,256	-5,017	14,314	-13,345	-968	954	4,673	3,159	62	778	46	321	368	2,042	692	2,338
2025	1948	6.77	2,129	717	-688	-8,279	0	43	2	4,018	180	-3,534	7,090	-12,501	5,411	-4,113	559	-2,252	-266	512	-563	-242	-101	1,942	-562	1,776
2026	1949	8.57	2,382	863	-499	-8,602	0	43	0	4,128	-1,152	-2,492	7,415	-12,746	5,330	-4,703	-4,143	-7,583	-692	-180	-710	-952	-770	1,172	-1,057	719
2027	1950	13.88	2,877	1,603	-382	-7,529	0	63	7	4,136	-748	-2,071	8,685	-10,729	2,044	-2,627	-6,770	-9,627	-426	-606	-361	-1,313	-619	552	-440	279
2028	1951	7.53	2,251	546	-353	-8,802	0	15	1	4,379	-2,745	-1,347	7,192	-13,248	6,055	-6,042	-12,812	-15,682	-988	-1,594	-1,309	-2,622	-1,024	-472	-1,105	-826
2029	1952	26.42	4,780	5,059	-601	-7,642	0	3,057	34	4,014	5,316	-3,044	22,260	-11,287	-10,973	7,127	-5,685	-4,708	447	-1,147	1,892	-730	1,645	1,174	1,051	225
2030	1953	12.12	2,644	1,547	-535	-7,589	0	865	6	3,985	4,231	-3,588	13,278	-11,712	-1,566	4,524	-1,161	-3,142	1,388	241	449	-280	-576	598	896	1,121
2031	1954	15.86	3,214	2,480	-509	-7,971	0	1,106	13	3,894	2,315	-3,403	13,023	-11,883	-1,140	995	-166	-2,002	-137	104	8	-272	1,463	2,061	231	1,353
2032	1955	12.53	2,829	1,515	-473	-8,158	0	609	5	3,951	790	-3,127	9,699	-11,758	2,059	-2,865	-3,031	-4,061	-179	-75	-288	-560	-998	1,064	-195	1,158
2033	1956	16.21	3,223	2,230	-494	-7,359	0	936	13	3,920	2,222	-3,164	12,543	-11,016	-1,527	849	-2,182	-2,533	-76	-151	138	-422	194	1,258	356	1,514
2034	1957	10.55	2,520	1,462	-473	-8,414	0	780	6	3,969	105	-3,102	8,841	-11,990	3,149	-755	-2,937	-5,682	-48	-199	-359	-781	28	1,285	-492	1,022
2035	1958	27.93	4,568	5,070	-803	-6,407	-6	3,410	31	3,691	6,954	-4,887	23,723	-12,103	-11,620	5,471	2,534	5,938	135	-63	981	200	1,826	3,111	1,750	2,772
2036	1959	6.99	2,157	1,329	-856	-8,618	0	1,082	5	3,723	3,604	-4,927	11,900	-14,401	2,501	3,566	6,100	3,437	769	706	-39	161	-425	2,686	-5	2,766
2037	1960	12.24	2,656	1,303	-597	-7,954	0	102	4	3,836	1,328	-3,787	9,230	-12,337	3,107	-3,027	3,073	330	-178	528	-327	-166	-33	2,653	-300	2,466
2038	1961	7.50	2,106	952	-415	-8,646	0	38	4	3,983	-424	-3,031	7,084	-12,516	5,432	-5,123	-2,051	-5,102	-566	-39	-636	-802	-891	1,762	-731	1,735
2039	1962	27.16	4,286	4,396	-678	-6,677	0	2,159	-9	3,876	4,662	-3,974	19,379	-11,338	-8,041	5,802	3,751	2,939	62	24	706	-95	1,793	3,555	939	2,674
2040	1963	12.80	2,668	1,622	-605	-8,106	0	841	9	3,851	5,491	-4,175	14,482	-12,887	-1,595	424	4,175	4,534	479	503	371	275	-684	2,871	269	2,943
2041	1964	8.70	2,379	1,022	-479	-8,718	0	46	2	3,835	725	-3,437	8,010	-12,634	4,624	-1,658	2,517	-90	-38	465	-501	-226	-361	2,510	-507	2,435
Average:		*13.39*	*2,903*	*2,007*	*-598*	*-7,981*	*0*	*954*	*8*	*3,946*	*2,337*	*-3,581*	*12,410*	*-12,415*	*4*											
Sustaining Period (water years 2042 through 2071)																										
2042	1965	15.34	2,898	1,918	-493	-7,814	0	973	10	3,794	1,109	-3,642	10,702	-11,950	1,248	-3,757	-1,240	-1,338	-454	11	-247	-473	-594	1,916	-314	2,121
2043	1966	16.59	3,619	3,313	-757	-7,819	0	2,322	23	3,680	6,411	-4,877	19,368	-13,453	-5,915	7,989	6,749	4,577	551	562	645	172	1,013	2,929	733	2,854
2044	1967	18.25	3,840	4,099	-772	-7,622	0	3,099	20	3,497	5,653	-5,895	20,208	-14,289	-5,919	4,005	10,754	10,496	294	856	272	444	1,201	4,130	1,216	4,069
2045	1968	14.27	2,940	1,649	-861	-7,430	0	878	10	3,563	4,033	-5,569	13,072	-13,860	788	1,506	12,261	9,709	111	967	1	445	377	4,507	110	4,179
2046	1969	24.02	4,320	4,955	-1,050	-7,515	-132	3,409	37	3,540	4,123	-6,563	20,384	-15,259	-5,124	5,749	18,010	14,833	157	1,124	122	567	2,115	6,621	1,327	5,507
2047	1970	16.13	2,741	1,668	-883	-8,255	0	928	7	3,606	3,900	-5,849	12,850	-14,987	2,137	-2,173	15,837	12,696	-81	1,043	-68	499	-746	5,875	-623	4,883
2048	1971	15.02	3,007	2,324	-922	-7,627	0	1,355	15	3,561	3,770	-6,178	14,032	-14,727	696	-1,179	14,658	12,000	-76	966	-42	457	-581	5,294	73	4,956
2049	1972	8.39	2,358	1,492	-940	-8,385	0	1,198	11	3,647	4,220	-5,694	12,927	-15,019	2,092	-2,473	12,185	9,908	-60	907	-28	429	-773	4,521	-441	4,515
2050	1973	20.98	3,813	4,096	-882	-7,089	-3	2,275	24	3,413	3,953	-6,044	17,574	-14,018	-3,556	4,355	16,541	13,463	125	1,032	85	514	2,003	6,524	689	5,204
2051	1974	15.51	3,064	2,328	-913	-7,503	0	1,314	16	3,449	3,884	-5,969	14,055	-14,385	330	-737	15,803	13,133	5	1,037	1	515	-710	5,814	-34	5,170
2052	1975	15.60	3,158	2,817	-876	-7,357	0	1,790	16	3,463	3,934	-6,168	15,179	-14,401	-778	353	16,156	13,911	-25	1,013	9	524	250	6,065	193	5,363
2053	1976	14.10	2,963	2,191	-959	-7,977	0	1,218	13	3,603	3,553	-5,660	13,541	-14,595	1,054	-3,392	12,764	12,857	-134	878	-70	453	-1,176	4,889	177	5,539
2054	1977	11.73	2,671	1,549	-829	-8,403	0	713	6	3,480	3,378	-5,192	11,797	-14,424	2,627	-754	12,010	10,229	-63	815	-98	355	-453	4,436	-1,092	4,447
2055	1978	34.58	5,801	6,781	-1,047	-7,636	-89	3,386	49	3,237	4,366	-6,626	23,620	-15,398	-8,222	9,184	21,195	18,451	308	1,123	219	574	3,889	8,325	2,161	6,608
2056	1979	18.60	3,851	3,537	-920	-7,583	-9	1,816	21	3,309	3,487	-6,917	16,021	-15,430	-591	1,882	23,076	19,042	-16	1,107	24	598	157	8,482	297	6,905
2057	1980	26.28	4,461	4,365	-1,014	-6,997	-47	2,026	34	3,309	3,106	-7,266	17,300	-15,325	-1,975	2,205	25,281	21,017	108	1,215	42	640	884	9,366	788	7,693
2058	1981	12.96	2,683	1,713	-935	-7,974	0	929	9	3,439	3,216	-6,443	11,989	-15,352	3,363	-4,233	21,048	17,655	-146	1,070	-95	545	-1,544	7,822	-1,095	6,598
2059	1982	12.28	2,749	1,723	-839	-8,474	0	1,187	6	3,487	4,068	-5,835	13,221	-15,148	1,927	-3,313	17,735	15,728	-58	1,012	-1	544	-1,496	6,326	-931	5,667
2060	1983	32.27	5,882	6,421	-1,042	-8,100	-67	2,980	43	3,172	3,622	-7,141	22,119	-16,350	-5,787	7,209	24,944	21,514	192	1,204	62	606	2,919	9,245	1,755	7,422
2061	1984	10.44	2,738	1,956	-968	-7,747	0	687	10	3,330	3,398	-6,834	12,118	-15,550	3,431	-3,671	21,274	18,083	-170	1,034	-47	559	-2,010	7,235	-731	6,691
2062	1985	12.13	2,581	1,444	-896	-7,459	0	1,136	5	3,495	3,144	-6,182	11,804	-14,538	2,734	-2,471	18,802	15,349	30	1,064	-58	501	-684	6,551	-852	5,839
2063	1986	25.61	4,242	3,969	-881	-6,877	-3	1,835	26	3,376	3,509	-6,294	16,957	-14,055	-2,902	2,115	20,917	18,252	21	1,085	98	599	1,062	7,612	619	6,457
2064	1987	7.82	2,162	569	-859	-9,253	0	159	0	3,616	3,431	-5,086	9,938	-15,197	5,260	-4,507	16,411	12,992	-90	995	-186	413	-2,004	5,609	-1,550	4,907
2065	1988	13.44	2,907	1,865	-785	-7,088	0	164	5	3,558	3,965	-4,813	12,465	-12,685	220	-2,080	14,331	12,772	-52	943	70	483	-697	4,911	-220	4,687
2066	1989	8.44	2,281	1,088	-842	-7,568	0	1,028	5	3,672	2,718	-5,219	10,792	-13,630	2,838	-1,515	12,816	9,934	-59	885	-152	331	-498	4,414	-407	4,280

			Groundwater Inflows (acre-feet per year)		Groundwater Outflows (acre-feet per year)			Groundwater Inflow and Outflow Components (acre-feet per year)[e]					Summary (acre-feet per year)			All Aquifers Combined			Mugu Aquifer				Hueneme Aquifer			
Projected Water Year	Analogous Historical Water Year[a]	Assumed Annual Rainfall at Ventura County Govt. Center (inches)[b]	Areal Recharge (includes infiltration of precipitation, agricultural return flows, and M&I return flows)	Mountain-Front Recharge	Evapo-transpiration[c]	Groundwater Extraction (pumping from wells)	Discharge of Groundwater to Tile Drains[d]	Groundwater/ Surface Water Interaction in the Santa Clara River[f]	Groundwater/ Surface Water Interaction in Harmon Barranca[g]	Groundwater Underflow to/from Santa Paula Basin	Groundwater Underflow to/from Oxnard Basin	Groundwater Underflow to/from Offshore (south and west of the coastline)	Sum of Inflows	Sum of Outflows	Groundwater Released from Storage per Water Year[h]	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Cumulative Change in Storage per Water Year	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Annual Change in Storage per Water Year	Cumulative Change in Storage per Water Year	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Annual Change in Storage per Water Year	Cumulative Change in Storage per Water Year
2067	1990	5.98	1,801	681	-652	-8,085	0	56	0	3,851	-83	-4,079	6,389	-12,899	6,509	-5,888	6,927	3,425	-410	475	-618	-287	-974	3,440	-991	3,288
2068	1991	16.22	3,132	2,799	-648	-8,128	0	1,733	22	3,847	2,972	-4,064	14,504	-12,841	-1,663	-906	6,021	5,088	-446	29	110	-177	792	4,232	-308	2,980
2069	1992	20.34	4,171	4,338	-866	-7,538	-1	3,010	30	3,562	6,322	-5,557	21,434	-13,962	-7,471	8,198	14,219	12,559	688	718	597	420	1,166	5,398	1,135	4,116
2070	1993	28.42	4,675	5,463	-1,105	-6,960	-127	3,669	37	3,373	3,807	-7,038	21,024	-15,230	-5,794	8,158	22,377	18,354	494	1,212	183	603	2,294	7,692	2,092	6,207
2071	1994	11.79	2,562	1,544	-851	-8,151	0	1,007	8	3,543	3,808	-6,006	12,472	-15,008	2,536	-3,748	18,628	15,818	-158	1,054	-65	538	-1,443	6,249	-667	5,540
Average:		*16.78*	*3,336*	*2,822*	*-876*	*-7,747*	*-16*	*1,609*	*17*	*3,516*	*3,693*	*-5,823*	*14,995*	*-14,465*	*-530*											
Post-SGMA period (water years 2072 through 2096)																										
2072	1995	30.11	4,822	5,276	-1,008	-7,194	-56	2,603	42	3,486	3,493	-6,906	19,723	-15,165	-4,558	5,577	24,206	20,376	211	1,265	107	645	2,278	8,526	1,367	6,908
2073	1996	13.23	2,992	2,026	-865	-8,611	0	900	11	3,491	3,484	-6,270	12,905	-15,746	2,841	-2,796	21,410	17,535	-121	1,144	-118	528	-1,267	7,259	-873	6,035
2074	1997	15.29	3,329	2,915	-972	-7,473	0	1,557	16	3,439	3,714	-6,781	14,970	-15,226	255	-931	20,479	17,279	-109	1,035	19	546	-449	6,810	83	6,117
2075	1998	43.89	6,509	7,725	-1,074	-6,035	-125	3,078	-201	3,357	2,329	-7,311	22,998	-14,747	-8,251	8,121	28,600	25,530	194	1,229	129	676	3,660	10,470	2,696	8,813
2076	1999	10.90	2,400	888	-833	-8,273	0	93	2	3,559	2,920	-5,915	9,861	-15,021	5,160	-5,500	23,100	20,370	-142	1,087	-87	589	-2,712	7,758	-1,720	7,093
2077	2000	17.82	3,334	2,560	-842	-7,934	0	1,162	16	3,490	3,280	-6,197	13,842	-14,972	1,130	-1,164	21,936	19,240	40	1,127	-33	556	-251	7,507	-505	6,588
2078	2001	22.45	3,967	3,920	-866	-8,105	-13	1,637	25	3,355	3,605	-6,551	16,510	-15,535	-975	2,121	24,057	20,215	-13	1,114	17	573	1,062	8,569	295	6,882
2079	2002	6.74	2,058	602	-821	-8,673	0	107	2	3,578	3,048	-5,229	9,395	-14,723	5,328	-5,963	18,094	14,887	-147	967	-158	415	-2,709	5,860	-1,472	5,411
2080	2003	18.68	3,721	3,150	-793	-7,328	0	1,066	17	3,448	3,983	-5,611	15,385	-13,732	-1,653	685	18,779	16,540	26	993	95	510	386	6,246	78	5,489
2081	2004	11.59	2,482	1,479	-852	-8,014	0	734	8	3,544	3,092	-5,517	11,339	-14,383	3,044	-1,951	16,828	13,496	-64	930	-104	406	-785	5,461	-639	4,850
2082	2005	34.22	5,865	7,177	-1,057	-6,358	-189	3,711	53	3,303	3,447	-7,295	23,556	-14,899	-8,657	9,659	26,487	22,153	284	1,214	222	628	3,616	9,077	2,510	7,360
2083	2006	15.50	2,989	2,482	-783	-7,439	-1	1,413	12	3,426	3,374	-6,606	13,695	-14,828	1,133	-4,159	22,329	21,020	-138	1,076	9	637	-1,721	7,356	-426	6,934
2084	2007	6.38	1,811	243	-875	-8,803	0	124	0	3,678	3,408	-5,501	9,265	-15,179	5,914	-4,567	17,762	15,106	-84	992	-164	473	-1,643	5,713	-1,560	5,374
2085	2008	12.32	3,012	2,518	-888	-8,387	-2	1,660	15	3,557	4,123	-5,916	14,884	-15,193	309	110	17,872	14,797	28	1,019	-2	471	-99	5,615	-365	5,010
2086	2009	9.92	2,425	1,384	-834	-8,023	0	978	5	3,627	3,841	-5,387	12,260	-14,245	1,985	-2,401	15,471	12,813	-78	942	-35	436	-818	4,797	-504	4,506
2087	2010	17.14	3,465	3,084	-795	-7,721	0	1,360	14	3,402	4,244	-5,450	15,571	-13,967	-1,604	1,269	16,740	14,417	-1	940	37	473	519	5,315	107	4,613
2088	2011	18.82	3,990	3,749	-801	-7,083	-7	1,858	23	3,370	4,093	-6,190	17,084	-14,081	-3,003	3,837	20,577	17,419	154	1,094	102	575	1,330	6,645	915	5,528
2089	2012	9.33	2,180	602	-854	-8,531	0	130	0	3,664	3,708	-5,083	10,284	-14,467	4,184	-5,442	15,135	13,235	-141	953	-137	438	-1,949	4,696	-967	4,561
2090	2013	6.77	2,617	1,637	-801	-7,511	0	102	8	3,630	1,826	-4,683	9,820	-12,995	3,175	-1,418	13,717	10,060	-73	880	-228	210	-332	4,364	-298	4,262
2091	2014	6.39	2,327	1,340	-736	-8,555	0	536	5	3,777	283	-4,382	8,268	-13,672	5,405	-5,172	8,545	4,656	-550	330	-573	-363	-611	3,753	-1,059	3,204
2092	2015	9.80	2,599	1,316	-464	-7,610	0	39	4	3,890	-422	-3,118	7,847	-11,614	3,766	-4,330	4,215	890	-397	-67	-413	-776	-831	2,921	-654	2,550
2093	2016	7.96	2,925	1,951	-373	-8,109	0	296	11	3,893	-488	-3,108	9,074	-12,078	3,003	-3,078	1,137	-2,114	-415	-483	-437	-1,213	-398	2,523	-673	1,877
2094	2017	20.00	3,663	3,575	-572	-7,561	0	2,210	20	3,793	2,655	-3,770	15,916	-11,903	-4,012	3,549	4,685	1,899	238	-245	554	-660	979	3,502	418	2,294
2095	2018	6.69	2,939	1,865	-398	-8,333	0	576	8	3,906	-1,006	-3,212	9,294	-12,950	3,656	-2,810	1,875	-1,757	-171	-416	-488	-1,147	-685	2,817	-448	1,846
2096	2019	19.96	3,624	3,575	-654	-7,356	0	2,858	20	3,812	5,248	-4,282	19,137	-12,292	-6,845	3,737	5,612	5,088	240	-176	985	-162	702	3,519	674	2,520
Average:		*15.68*	*3,282*	*2,682*	*-792*	*-7,801*	*-16*	*1,232*	*5*	*3,579*	*2,851*	*-5,451*	*13,715*	*-14,144*	*429*											
Average 2022-2096:		***15.51***	***3,202***	***2,558***	***-774***	***-7,827***	***-12***	***1,309***	***11***	***3,651***	***3,051***	***-5,101***	***13,879***	***-13,812***	***-68***											

Notes

N/A = Not applicable

Positive values represent inflows to the Mound Basin negative numbers represent outflows from the basin.

a The representative historical water year used as the basis for assumptions regarding rainfall and surface flows about future years, as described in Section 3.3.

b See Section 3.3 for an explanation of how water-year types were classified in this report.

c The Shallow Alluvial Deposits is modeled to be the sole hydrostratigraphic unit in Mound Basin with saturated conditions consistently shallow enough to be significantly affected by evapotranspiration.

d Tile drains are only known or suspected to be present in the Shallow Alluvial Deposits in Mound Basin.

e These components can comprise either net inflows to or outflows from each aquifer, depending on hydrogeologic conditions that vary over time (e.g., hydraulic gradients).

f Within Mound Basin, the sole hydrostratigraphic unit known or suspected to be in direct hydraulic communication with the Santa Clara River is the Shallow Alluvial Deposits.

g United (2021) modeled Harmon Barranca using MODFLOW's "Stream package," as described in Section 3.3 of this report, allowing the model to simulate direct hydraulic communication with the Shallow Alluvial Deposits, as well as with the fine-grained Pleistocene deposits."

h Water-year changes in storage are calculated from October 1 of the preceding calendar year to September 30 of the indicated year. Positive values for groundwater released from storage represent inflows to the basin, same as all other components on this table. However, specific to this parameter, inflow of groundwater from storage is associated with declining groundwater levels (or potentiometric heads) in the basin. Negative values are associated with increasing groundwater-levels (or potentiometric heads), as a result of groundwater being "added to storage."

Table 3.3-12 Mound Basin Projected Average Inflows and Outflows by Aquifer, 2030 Climate Change and Sea Level Rise Factors.

	Groundwater Inflows (acre-feet per year)		Groundwater Outflows (acre-feet per year)			Groundwater Inflow and Outflow Components (acre-feet per year)[a]							Summary (acre-feet per year)		
Aquifer	**Areal Recharge (includes infiltration of precipitation, agricultural return flows, and M&I return flows)**	**Mountain-Front Recharge**	**Evapo-transpiration[b]**	**Groundwater Extraction**	**Discharge of Groundwater to Tile Drains[c]**	**Groundwater/ Surface Water Interaction in the Santa Clara River[d]**	**Groundwater/ Surface Water Interaction in Harmon Barranca[e]**	**Groundwater Underflow to/from Santa Paula Basin**	**Groundwater Underflow to/from Oxnard Basin**	**Groundwater Underflow to/from Offshore (south and west of the coastline)**	**Vertical Groundwater Flow to/from the Overlying Aquifer**	**Vertical Groundwater Flow to/from the Underlying Aquifer**	**Sum of Inflows**	**Sum of Outflows**	**Groundwater Released from Storage[f]**
Averages during Implementation Period (water years 2022 through 2041)															
Shallow Alluvial Deposits	2,316	0	-598	0	0	954	47	0	1,081	-3,001	N/A	-943	4,398	-4,543	145
Fine-grained Pleistocene deposits[g]	141	0	N/A	-6	N/A	N/A	71	7	1,552	-73	943	-2,685	2,715	-2,764	49
Mugu Aquifer	0	0	N/A	-2,600	N/A	N/A	0	223	1,628	-856	2,685	-1,092	4,536	-4,547	11
Hueneme Aquifer[h]	446	2,007	N/A	-4,755	N/A	N/A	-110	1,979	-919	340	1,092	42	5,906	-5,784	-122
Fox Canyon Aquifer[i]	0	0	N/A	-620	N/A	N/A	0	1,737	-1,004	9	-42	N/A	1,745	-1,666	-79
Basin Total:	***2,903***	***2,007***	***-598***	***-7,981***	***0***	***954***	***8***	***3,946***	***2,337***	***-3,581***	***4,678***	***-4,678***	***19,300***	***-19,305***	***4***
Averages during Sustaining Period (water years 2042 through 2071)															
Shallow Alluvial Deposits	2,611	0	-876	0	-16	1,609	102	0	1,571	-3,929	N/A	-986	5,893	-5,807	-86
Fine-grained Pleistocene deposits[g]	166	0	N/A	-4	N/A	N/A	131	7	1,809	-123	986	-2,769	3,099	-2,897	-202
Mugu Aquifer	0	0	N/A	-2,502	N/A	N/A	0	191	2,032	-1,562	2,769	-902	4,991	-4,966	-25
Hueneme Aquifer[h]	559	2,822	N/A	-4,627	N/A	N/A	-215	1,699	-840	-60	902	-138	5,982	-5,879	-103
Fox Canyon Aquifer[i]	0	0	N/A	-614	N/A	N/A	0	1,619	-879	-149	138	N/A	1,756	-1,643	-113
Basin Total:	***3,336***	***2,822***	***-876***	***-7,747***	***-16***	***1,609***	***17***	***3,516***	***3,693***	***-5,823***	***4,795***	***-4,795***	***21,722***	***-21,193***	***-530***
Averages during post-SGMA period (water years 2072 through 2096)															
Shallow Alluvial Deposits	2,577	0	-792	0	-16	1,232	103	0	1,493	-3,682	N/A	-989	5,404	-5,480	76
Fine-grained Pleistocene deposits[g]	164	0	N/A	-5	N/A	N/A	127	7	1,555	-113	989	-2,835	2,843	-2,953	110
Mugu Aquifer	0	0	N/A	-2,488	N/A	N/A	0	213	1,664	-1,436	2,835	-816	4,712	-4,740	28
Hueneme Aquifer[h]	540	2,682	N/A	-4,691	N/A	N/A	-224	1,729	-942	-62	816	31	5,798	-5,919	121
Fox Canyon Aquifer[i]	0	0	N/A	-618	N/A	N/A	0	1,631	-919	-157	-31	N/A	1,631	-1,725	94
Basin Total:	***3,282***	***2,682***	***-792***	***-7,801***	***-16***	***1,232***	***5***	***3,579***	***2,851***	***-5,451***	***4,609***	***-4,609***	***20,388***	***-20,817***	***429***

Notes

N/A = Not applicable

Positive values represent inflows to an aquifer; negative numbers represent outflows from an aquifer.

a These components can comprise either net inflows to or outflows from each aquifer, depending on hydrogeologic conditions that vary over time (e.g., hydraulic gradients).

b The Shallow Alluvial Deposits is the sole hydrostratigraphic unit in Mound Basin with saturated conditions consistently shallow enough to be significantly affected by evapotranspiration.

c Tile drains are only known or suspected to be present in the Shallow Alluvial Deposits in Mound Basin.

d Within Mound Basin, the sole hydrostratigraphic unit known or suspected to be in direct hydraulic communication with the Santa Clara River is the Shallow Alluvial Deposits.

e United (2021) modeled Harmon Barranca using MODFLOW's "Stream package," as described in Section 3.3 of this report, allowing the model to simulate direct hydraulic communication with the Shallow Alluvial Deposits and the fine-grained Pleistocene deposits.

f Positive values for groundwater released from storage represent inflows to an aquifer, same as all other components on this page. Inflow of groundwater from storage is associated with declining groundwater levels (or potentiometric heads) in that aquifer. Negative values are associated with increasing groundwater-levels (or potentiometric-heads), as a result of groundwater being "added to storage."

g Although the fine-grained Pleistocene deposits in Mound Basin are not considered a principal aquifer due to their low hydraulic conductivity, they have a substantial thickness and are stratigraphically adjacent to the Oxnard Aquifer in the Oxnard Basin (see Section 3.1 for more information). The fine-grained Pleistocene deposits are included in this table for completeness in depicting the groundwater budget for Mound Basin

h To provide a complete and balanced water budget (the sum of water-budget components for all units should be zero), the values shown in this row include both the Hueneme Aquifer and the overlying Mugu-Hueneme aquitard, which is thin and has low hydraulic conductivity. For these reasons, inflows and outflows from the aquitard are small compared to those from the aquifer.

i To provide a complete and balanced water budget (the sum of water-budget components for all units should be zero), the values shown in this row include the Fox Canyon Aquifer (main and basal) and the overlying and intervening aquitards, which are thin and have low hydraulic conductivity. For these reasons, inflows and outflows from the aquitards are small compared to those from the aquifer.

j See Section 3.3 for an explanation of how water-year types were classified in this report.

Table 3.3-13 Mound Basin Projected Groundwater Inflows and Outflows by Water Year, 2070 Climate Change and Sea Level Rise Factors.

			Groundwater Inflows (acre-feet per year)		Groundwater Outflows (acre-feet per year)			Groundwater Inflow and Outflow Components (acre-feet per year)[e]					Summary (acre-feet per year)			All Aquifers Combined			Mugu Aquifer				Hueneme Aquifer			
Projected Water Year	Analogous Historical Water Year[a]	Assumed Annual Rainfall at Ventura County Govt. Center (inches)[b]	Areal Recharge (includes infiltration of precipitation, agricultural return flows, and M&I return flows)	Mountain-Front Recharge	Evapo-transpiration[c]	Groundwater Extraction (pumping from wells)	Discharge of Groundwater to Tile Drains[d]	Groundwater/ Surface Water Interaction in the Santa Clara River[f]	Groundwater/ Surface Water Interaction in Harmon Barranca[g]	Groundwater Underflow to/from Santa Paula Basin	Groundwater Underflow to/from Oxnard Basin	Groundwater Underflow to/from Offshore (south and west of the coastline)	Sum of Inflows	Sum of Outflows	Groundwater Released from Storage per Water Year[h]	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Cumulative Change in Storage per Water Year	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Annual Change in Storage per Water Year	Cumulative Change in Storage per Water Year	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Annual Change in Storage per Water Year	Cumulative Change in Storage per Water Year
Implementation Period (water years 2022 through 2041)																										
2022	1945	11.93	3,027	2,753	-855	-8,131	0	1,420	14	4,049	4,131	-4,760	15,395	-13,746	-1,649	3,445	3,445	1,649	586	586	147	147	1,563	1,563	1,226	1,226
2023	1946	10.57	2,547	1,699	-860	-8,818	0	1,335	8	3,996	5,038	-4,655	14,622	-14,334	-288	-256	3,189	1,937	57	643	118	266	-76	1,487	343	1,569
2024	1947	10.28	2,786	1,831	-894	-7,651	0	1,275	12	3,979	4,007	-4,830	13,890	-13,374	-516	567	3,756	2,454	59	702	34	299	271	1,758	625	2,194
2025	1948	6.37	2,155	652	-682	-8,429	0	38	2	4,116	-433	-3,295	6,962	-12,839	5,877	-4,569	-813	-3,423	-329	372	-637	-337	-82	1,676	-621	1,573
2026	1949	7.89	2,382	849	-480	-8,626	0	35	0	4,215	-1,438	-2,254	7,481	-12,798	5,315	-4,837	-5,650	-8,738	-711	-339	-737	-1,074	-819	857	-1,055	518
2027	1950	14.11	2,798	1,522	-375	-7,733	0	55	7	4,229	-1,244	-1,792	8,610	-11,144	2,533	-2,963	-8,613	-11,272	-503	-842	-489	-1,563	-658	199	-492	26
2028	1951	7.07	2,162	607	-344	-8,964	0	13	2	4,448	-2,786	-1,053	7,232	-13,147	5,910	-6,139	-14,752	-17,182	-1,086	-1,928	-1,296	-2,859	-1,087	-888	-1,098	-1,072
2029	1952	26.82	4,816	5,123	-589	-7,843	0	3,067	36	4,113	4,843	-2,707	21,998	-11,139	-10,861	7,290	-7,462	-6,321	484	-1,444	1,993	-866	1,785	897	1,018	-54
2030	1953	10.75	2,511	1,305	-470	-7,752	0	734	3	4,134	3,248	-3,138	11,936	-11,360	-575	3,491	-3,972	-5,746	1,419	-24	354	-513	-817	80	781	727
2031	1954	16.13	3,274	2,562	-448	-8,006	0	1,092	14	4,016	1,631	-2,949	12,590	-11,403	-1,187	1,057	-2,915	-4,559	-162	-187	3	-510	1,557	1,636	228	955
2032	1955	12.49	2,839	1,587	-400	-8,305	0	554	7	4,064	562	-2,667	9,613	-11,371	1,757	-2,830	-5,744	-6,316	-159	-345	-228	-738	-1,072	564	-166	790
2033	1956	16.88	3,180	2,195	-430	-7,718	0	871	13	4,043	1,371	-2,663	11,673	-10,810	-863	775	-4,970	-5,453	-39	-384	54	-684	149	714	281	1,071
2034	1957	10.35	2,609	1,503	-408	-8,873	0	804	7	4,108	-159	-2,569	9,030	-12,010	2,978	-955	-5,925	-8,432	-136	-520	-410	-1,094	53	767	-542	528
2035	1958	29.83	4,745	5,377	-799	-6,607	-3	3,507	33	3,803	7,261	-4,450	24,727	-11,859	-12,869	6,227	302	4,437	195	-325	1,219	126	2,088	2,855	1,911	2,440
2036	1959	7.32	2,245	1,534	-823	-8,861	0	1,165	6	3,813	3,422	-4,605	12,186	-14,289	2,104	4,376	4,679	2,333	918	592	-1	124	-445	2,409	97	2,537
2037	1960	12.38	2,685	1,416	-633	-8,068	0	819	5	3,887	1,451	-4,091	10,262	-12,792	2,530	-2,203	2,476	-196	-126	466	-278	-154	27	2,436	-206	2,331
2038	1961	6.72	2,089	873	-418	-8,849	0	36	4	4,043	-494	-2,908	7,046	-12,669	5,623	-5,678	-3,202	-5,819	-576	-110	-641	-795	-979	1,457	-744	1,586
2039	1962	27.90	4,320	4,436	-689	-6,764	0	2,157	-3	3,924	4,590	-3,821	19,427	-11,278	-8,149	5,957	2,755	2,330	59	-51	701	-93	1,918	3,375	973	2,560
2040	1963	13.20	2,843	1,783	-607	-8,204	0	813	9	3,922	5,251	-3,992	14,622	-12,804	-1,818	512	3,266	4,148	477	426	360	267	-691	2,684	342	2,901
2041	1964	8.31	2,361	928	-478	-8,835	0	40	1	3,890	449	-3,270	7,670	-12,583	4,913	-1,560	1,707	-765	-35	391	-512	-245	-342	2,342	-548	2,353
Average:		*13.37*	*2,919*	*2,027*	*-584*	*-8,152*	*0*	*992*	*9*	*4,040*	*2,035*	*-3,323*	*12,349*	*-12,387*	*38*	*85*	*-1,922*	*-3,247*	*20*	*-116*	*-12*	*-515*	*117*	*1,443*	*118*	*1,338*
Sustaining Period (water years 2042 through 2071)																										
2042	1965	14.57	2,710	1,616	-455	-8,069	0	842	9	3,904	448	-3,368	9,529	-11,892	2,362	-4,740	-3,033	-3,127	-523	-131	-354	-599	-745	1,597	-480	1,873
2043	1966	15.79	3,537	3,078	-723	-8,197	0	2,308	21	3,789	6,211	-4,450	18,944	-13,370	-5,574	7,243	4,210	2,447	496	364	659	59	736	2,333	529	2,402
2044	1967	18.65	3,791	4,042	-772	-7,840	0	3,044	20	3,589	5,959	-5,460	20,444	-14,071	-6,373	4,401	8,611	8,819	373	738	352	411	1,189	3,523	1,193	3,595
2045	1968	13.34	2,943	1,665	-891	-7,591	0	953	10	3,650	3,965	-5,249	13,186	-13,731	545	1,821	10,432	8,275	132	869	7	419	453	3,976	228	3,824
2046	1969	25.72	4,643	5,563	-1,091	-7,628	-137	3,504	33	3,647	3,934	-6,395	21,324	-15,251	-6,073	6,753	17,185	14,348	158	1,027	135	553	2,548	6,524	1,585	5,409
2047	1970	16.37	2,852	1,787	-915	-8,401	0	988	9	3,700	3,783	-5,717	13,119	-15,033	1,913	-1,900	15,285	12,434	-53	974	-52	502	-683	5,841	-571	4,838
2048	1971	13.80	2,957	2,277	-961	-7,839	0	1,322	15	3,639	3,600	-6,036	13,810	-14,836	1,026	-1,429	13,856	11,409	-73	900	-53	449	-752	5,089	13	4,851
2049	1972	7.66	2,361	1,430	-947	-8,537	0	1,132	10	3,737	3,742	-5,465	12,413	-14,949	2,535	-2,783	11,073	8,873	-81	820	-59	390	-829	4,259	-509	4,343
2050	1973	22.47	3,997	4,311	-902	-7,121	-3	2,340	27	3,497	3,920	-5,856	18,091	-13,881	-4,210	4,680	15,754	13,083	113	933	110	501	2,187	6,447	788	5,131
2051	1974	15.65	3,108	2,408	-952	-7,705	0	1,345	16	3,530	3,833	-5,850	14,239	-14,506	267	-597	15,156	12,816	45	978	18	519	-774	5,672	-26	5,105
2052	1975	15.87	3,157	2,758	-909	-7,535	0	1,797	16	3,545	3,786	-6,017	15,057	-14,461	-597	315	15,472	13,413	-29	949	4	523	207	5,879	137	5,242
2053	1976	16.13	3,658	3,243	-1,011	-7,986	0	1,448	23	3,664	3,561	-5,565	15,596	-14,563	-1,034	-3,468	12,004	14,447	-137	812	43	566	-1,177	4,702	1,086	6,328
2054	1977	11.55	2,631	1,589	-861	-8,478	0	693	7	3,460	3,228	-5,330	11,609	-14,670	3,061	1,301	13,305	11,386	2	815	-172	394	219	4,921	-1,523	4,805
2055	1978	37.23	6,167	7,317	-1,100	-7,621	-93	3,351	54	3,298	3,902	-6,719	24,089	-15,533	-8,556	9,034	22,339	19,942	295	1,109	218	612	3,979	8,900	2,379	7,184
2056	1979	20.33	4,038	3,826	-954	-7,691	-12	1,750	24	3,349	3,064	-6,905	16,050	-15,562	-487	2,034	24,372	20,429	-47	1,062	8	619	266	9,166	329	7,513
2057	1980	27.96	4,641	4,708	-1,056	-7,287	-50	2,014	36	3,327	2,800	-7,294	17,527	-15,687	-1,840	2,112	26,484	22,269	115	1,177	40	660	795	9,962	700	8,213
2058	1981	13.18	2,851	1,995	-964	-8,087	0	928	11	3,471	2,895	-6,468	12,151	-15,519	3,368	-4,279	22,205	18,901	-152	1,026	-92	568	-1,580	8,382	-1,127	7,086
2059	1982	12.47	2,945	1,978	-873	-8,599	0	1,485	8	3,518	3,839	-6,140	13,773	-15,612	1,838	-3,449	18,756	17,063	-59	967	9	577	-1,626	6,756	-969	6,117
2060	1983	32.62	5,798	6,434	-1,075	-8,281	-72	2,911	44	3,177	3,267	-7,132	21,631	-16,560	-5,089	7,187	25,943	22,152	232	1,199	49	627	2,929	9,685	1,598	7,715
2061	1984	9.08	2,620	1,591	-1,004	-7,895	0	120	8	3,478	3,080	-6,119	10,898	-15,017	4,120	-5,028	20,915	18,032	-221	978	-62	565	-2,534	7,151	-996	6,720
2062	1985	11.33	2,464	1,206	-902	-7,726	0	179	3	3,642	2,967	-5,315	10,462	-13,943	3,481	-3,355	17,560	14,551	17	995	-65	500	-857	6,293	-1,022	5,698
2063	1986	27.53	4,539	4,370	-896	-6,785	-5	2,317	29	3,475	3,339	-6,331	18,069	-14,015	-4,054	3,152	20,712	18,605	30	1,025	113	613	1,356	7,649	863	6,561
2064	1987	7.25	2,185	454	-876	-9,670	0	154	0	3,706	3,245	-4,903	9,745	-15,449	5,704	-4,608	16,104	12,901	-92	933	-203	410	-2,179	5,470	-1,723	4,838
2065	1988	12.92	2,879	1,790	-805	-7,259	0	153	5	3,656	3,854	-4,676	12,337	-12,740	403	-2,431	13,673	12,498	-70	863	77	487	-804	4,666	-240	4,598
2066	1989	8.03	2,172	951	-745	-7,873	0	72	4	3,803	1,941	-4,382	8,942	-12,999	4,057	-2,622	11,051	8,441	-90	773	-240	247	-575	4,091	-540	4,058

			Groundwater Inflows (acre-feet per year)		Groundwater Outflows (acre-feet per year)			Groundwater Inflow and Outflow Components (acre-feet per year)[e]					Summary (acre-feet per year)			All Aquifers Combined			Mugu Aquifer				Hueneme Aquifer			
Projected Water Year	Analogous Historical Water Year[a]	Assumed Annual Rainfall at Ventura County Govt. Center (inches)[b]	Areal Recharge (includes infiltration of precipitation, agricultural return flows, and M&I return flows)	Mountain-Front Recharge	Evapo-transpiration[c]	Groundwater Extraction (pumping from wells)	Discharge of Groundwater to Tile Drains[d]	Groundwater/ Surface Water Interaction in the Santa Clara River[f]	Groundwater/ Surface Water Interaction in Harmon Barranca[g]	Groundwater Underflow to/from Santa Paula Basin	Groundwater Underflow to/from Oxnard Basin	Groundwater Underflow to/from Offshore (south and west of the coastline)	Sum of Inflows	Sum of Outflows	Groundwater Released from Storage per Water Year[h]	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Cumulative Change in Storage per Water Year	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Annual Change in Storage per Water Year	Cumulative Change in Storage per Water Year	Annual Change in Spring-high Storage	Cumulative Change in Spring-high Storage	Annual Change in Storage per Water Year	Cumulative Change in Storage per Water Year
2067	1990	6.17	1,869	806	-530	-8,284	0	55	1	3,939	-216	-3,760	6,671	-12,791	6,120	-5,656	5,396	2,321	-433	340	-599	-352	-948	3,143	-993	3,066
2068	1991	17.24	3,341	3,176	-622	-8,246	0	1,882	25	3,948	2,877	-3,850	15,249	-12,717	-2,532	-112	5,284	4,853	-421	-80	147	-204	1,064	4,207	-152	2,913
2069	1992	21.67	4,418	4,666	-872	-7,636	0	2,777	33	3,672	6,136	-5,189	21,702	-13,698	-8,004	8,903	14,187	12,856	728	647	621	417	1,332	5,539	1,317	4,230
2070	1993	30.48	4,795	5,691	-1,143	-7,118	-128	3,730	39	3,469	3,590	-6,946	21,315	-15,335	-5,980	8,440	22,627	18,837	500	1,147	193	609	2,307	7,846	2,128	6,358
2071	1994	11.88	2,631	1,667	-884	-8,134	0	1,035	9	3,613	3,505	-5,960	12,461	-14,977	2,516	-3,780	18,847	16,321	-133	1,014	-55	554	-1,506	6,339	-640	5,718
Average:		*17.16*	*3,423*	*2,946*	*-890*	*-7,904*	*-17*	*1,554*	*18*	*3,596*	*3,469*	*-5,628*	*15,014*	*-14,446*	*-570*	*571*	*15,192*	*12,986*	*21*	*841*	*27*	*407*	*133*	*5,867*	*112*	*5,211*
Post-SGMA period (water years 2072 through 2096)																										
2072	1995	32.33	5,153	5,901	-1,063	-7,570	-63	2,638	-38	3,574	3,285	-6,867	20,552	-15,601	-4,950	6,149	24,997	21,271	198	1,212	105	659	2,563	8,903	1,523	7,242
2073	1996	13.03	3,038	2,202	-896	-8,677	0	941	13	3,570	3,183	-6,259	12,947	-15,831	2,884	-2,905	22,091	18,387	-120	1,092	-110	549	-1,321	7,582	-897	6,345
2074	1997	15.40	3,333	2,892	-1,005	-7,609	0	1,538	17	3,514	3,398	-6,707	14,692	-15,321	629	-1,326	20,765	17,758	-105	987	6	556	-589	6,992	-30	6,315
2075	1998	44.22	6,525	7,785	-1,118	-6,080	-121	3,333	-184	3,408	2,164	-7,573	23,215	-15,076	-8,139	7,932	28,697	25,896	177	1,164	131	686	3,639	10,631	2,710	9,024
2076	1999	10.62	2,308	804	-866	-8,436	0	189	1	3,600	2,735	-5,935	9,638	-15,237	5,599	-5,928	22,769	20,297	-139	1,026	-89	597	-2,927	7,704	-1,888	7,137
2077	2000	18.57	3,387	2,664	-875	-8,192	0	1,213	17	3,558	3,138	-6,064	13,977	-15,132	1,155	-1,204	21,566	19,143	37	1,063	-37	560	-266	7,438	-571	6,566
2078	2001	23.94	4,183	4,234	-910	-8,299	-16	1,740	29	3,402	3,482	-6,466	17,070	-15,691	-1,379	2,643	24,208	20,522	35	1,097	28	588	1,285	8,724	416	6,982
2079	2002	5.98	2,023	494	-854	-8,814	0	112	1	3,667	2,830	-5,152	9,128	-14,821	5,693	-6,403	17,805	14,829	-179	918	-167	421	-2,934	5,789	-1,574	5,409
2080	2003	17.72	3,734	2,877	-817	-7,437	0	1,039	17	3,528	3,857	-5,470	15,052	-13,725	-1,328	364	18,169	16,157	12	930	97	518	217	6,006	-76	5,332
2081	2004	11.41	2,475	1,535	-883	-8,210	0	725	9	3,633	2,811	-5,337	11,187	-14,431	3,243	-2,199	15,970	12,913	-62	868	-127	391	-809	5,197	-638	4,694
2082	2005	36.72	6,068	7,586	-1,095	-6,426	-189	3,710	57	3,397	3,370	-7,157	24,190	-14,867	-9,322	10,319	26,289	22,236	272	1,141	238	630	3,878	9,075	2,684	7,378
2083	2006	16.16	3,155	2,659	-810	-7,679	-1	1,446	14	3,514	3,170	-6,488	13,957	-14,978	1,021	-3,975	22,314	21,215	-126	1,015	5	635	-1,647	7,428	-381	6,998
2084	2007	5.86	1,856	208	-910	-8,980	0	127	0	3,749	3,258	-5,426	9,199	-15,317	6,118	-4,730	17,583	15,097	-75	940	-154	480	-1,784	5,644	-1,633	5,365
2085	2008	12.64	3,101	2,604	-918	-8,446	-3	1,662	16	3,644	3,905	-5,819	14,932	-15,186	254	9	17,593	14,843	25	964	1	481	-98	5,546	-359	5,006
2086	2009	9.59	2,427	1,321	-863	-8,236	0	938	6	3,720	3,461	-5,225	11,873	-14,323	2,450	-2,677	14,916	12,393	-93	872	-62	419	-925	4,620	-568	4,438
2087	2010	17.19	3,459	3,026	-828	-7,691	0	1,515	15	3,494	4,166	-5,450	15,674	-13,969	-1,705	1,138	16,053	14,097	-15	857	47	466	530	5,151	99	4,537
2088	2011	17.89	4,002	3,775	-817	-7,266	-5	1,791	25	3,452	3,961	-5,976	17,004	-14,064	-2,940	3,762	19,816	17,037	164	1,021	100	566	1,312	6,462	877	5,415
2089	2012	8.96	2,054	444	-891	-8,865	0	136	0	3,765	3,486	-4,893	9,885	-14,649	4,765	-5,774	14,041	12,273	-149	872	-154	412	-2,098	4,365	-1,076	4,339
2090	2013	5.70	2,591	1,384	-801	-7,660	0	75	7	3,736	1,561	-4,436	9,354	-12,898	3,544	-1,829	12,212	8,729	-74	797	-253	160	-445	3,920	-376	3,962
2091	2014	6.33	2,408	1,563	-706	-8,580	0	519	6	3,832	92	-4,119	8,419	-13,405	4,986	-5,012	7,200	3,743	-584	213	-568	-408	-426	3,494	-960	3,002
2092	2015	9.62	2,514	1,098	-429	-7,897	0	39	4	3,990	-536	-2,869	7,645	-11,731	4,086	-4,662	2,538	-343	-415	-202	-445	-853	-965	2,530	-699	2,303
2093	2016	8.36	2,916	2,027	-351	-8,239	0	295	12	3,956	-462	-2,881	9,206	-11,932	2,725	-2,791	-253	-3,069	-426	-627	-406	-1,259	-282	2,247	-626	1,676
2094	2017	22.47	3,850	3,849	-556	-7,712	0	2,219	24	3,851	2,577	-3,573	16,370	-11,841	-4,529	4,182	3,929	1,460	299	-328	590	-669	1,194	3,442	527	2,203
2095	2018	7.16	3,013	2,050	-390	-8,258	0	588	11	3,946	-1,087	-3,097	9,607	-12,831	3,223	-2,502	1,426	-1,763	-148	-476	-440	-1,109	-653	2,789	-327	1,876
2096	2019	21.95	3,800	3,849	-671	-7,447	0	2,886	24	3,860	5,079	-4,212	19,498	-12,330	-7,169	4,496	5,922	5,405	292	-184	970	-139	899	3,688	787	2,663
Average:		*15.99*	*3,335*	*2,753*	*-813*	*-7,948*	*-16*	*1,257*	*4*	*3,654*	*2,675*	*-5,338*	*13,771*	*-14,207*	*437*	*-517*	*15,945*	*13,221*	*-48*	*689*	*-28*	*213*	*-106*	*5,815*	*-122*	*5,048*
Average 2022-2096:		***15.76***	***3,259***	***2,637***	***-783***	***-7,985***	***-12***	***1,305***	***11***	***3,734***	***2,822***	***-4,917***	***13,889***	***-13,817***	***-72***	***79***	***10,879***	***8,736***	***-2***	***535***	***-2***	***96***	***49***	***4,670***	***36***	***4,124***

Notes

N/A = Not applicable

Positive values represent inflows to the Mound Basin negative numbers represent outflows from the basin.

a The representative historical water year used as the basis for assumptions regarding rainfall and surface flows about future years, as described in Section 3.3.

b See Section 3.3 for an explanation of how water-year types were classified in this GSP.

c The Shallow Alluvial Deposits is modeled to be the sole hydrostratigraphic unit in Mound Basin with saturated conditions consistently shallow enough to be significantly affected by evapotranspiration.

d Tile drains are only known or suspected to be present in the Shallow Deposits Aquifer in Mound Basin.

e These components can comprise either net inflows to or outflows from each aquifer, depending on hydrogeologic conditions that vary over time (e.g., hydraulic gradients).

f Within Mound Basin, the sole hydrostratigraphic unit known or suspected to be in direct hydraulic communication with the Santa Clara River is the Shallow Alluvial Deposits.

g United (2021) modeled Harmon Barranca using MODFLOW's ""Stream package,"" as described in Section 3.3 of this report, allowing the model to simulate direct hydraulic communication with the Shallow Alluvial Deposits, as well as with the fine-grained Pleistocene deposits."

h Water-year changes in storage are calculated from October 1 of the preceding calendar year to September 30 of the indicated year. Positive values for groundwater released from storage represent inflows to the basin, same as all other components on this table. However, specific to this parameter, inflow of groundwater from storage is associated with declining groundwater levels (or potentiometric heads) in the basin. Negative values are associated with increasing groundwater-levels (or potentiometric heads), as a result of groundwater being "added to storage."

Table 3.3-14 Mound Basin Projected Average Groundwater Inflows and Outflows by Aquifer, 2070 Climate Change and Sea Level Rise Factors.

	Groundwater Inflows (acre-feet per year)		Groundwater Outflows (acre-feet per year)			Variable Groundwater Flow Components (acre-feet per year)[a]							Summary (acre-feet per year)		
Aquifer	Areal Recharge (includes infiltration of precipitation, agricultural return flows, and M&I return flows)	Mountain-Front Recharge	Evapo-transpiration[b]	Groundwater Extraction	Discharge of Groundwater to Tile Drains[c]	Groundwater/ Surface Water Interaction in the Santa Clara River[d]	Groundwater/ Surface Water Interaction in Harmon Barranca[e]	Groundwater Underflow to/from Santa Paula Basin	Groundwater Underflow to/from Oxnard Basin	Groundwater Underflow to/from Offshore (south and west of the coastline)	Vertical Groundwater Flow to/from the Overlying Aquifer	Vertical Groundwater Flow to/from the Underlying Aquifer	Sum of Inflows	Sum of Outflows	Groundwater Released from Storage[f]
Averages during Implementation Period (water years 2022 through 2041)															
Shallow Alluvial Deposits	2,338	0	-584	0	0	992	55	0	1,016	-3,000	N/A	-966	4,401	-4,550	149
Fine-grained Pleistocene deposits[g]	140	0	N/A	-7	N/A	N/A	78	7	1,362	-65	966	-2,548	2,552	-2,619	67
Mugu Aquifer	0	0	N/A	-2,175	N/A	N/A	0	223	1,353	-757	2,548	-1,204	4,123	-4,136	12
Hueneme Aquifer[h]	441	2,027	N/A	-5,340	N/A	N/A	-123	2,036	-739	458	1,204	155	6,319	-6,202	-118
Fox Canyon Aquifer[i]	0	0	N/A	-630	N/A	N/A	0	1,774	-957	41	-155	N/A	1,815	-1,742	-73
Basin Total:	***2,919***	***2,027***	***-584***	***-8,152***	***0***	***992***	***9***	***4,040***	***2,035***	***-3,323***	***4,563***	***-4,563***	***19,211***	***-19,250***	***38***
Averages during Sustaining Period (water years 2042 through 2071)															
Shallow Alluvial Deposits	2,684	0	-890	0	-17	1,554	133	0	1,533	-3,875	N/A	-1,031	5,904	-5,813	-91
Fine-grained Pleistocene deposits[g]	169	0	N/A	-5	N/A	N/A	143	8	1,648	-120	1,031	-2,657	2,998	-2,782	-216
Mugu Aquifer	0	0	N/A	-2,089	N/A	N/A	0	186	1,809	-1,536	2,657	-1,001	4,652	-4,626	-27
Hueneme Aquifer[h]	571	2,946	N/A	-5,186	N/A	N/A	-258	1,750	-679	31	1,001	-64	6,298	-6,187	-112
Fox Canyon Aquifer[i]	0	0	N/A	-624	N/A	N/A	0	1,653	-842	-128	64	N/A	1,717	-1,594	-123
Basin Total:	***3,423***	***2,946***	***-890***	***-7,904***	***-17***	***1,554***	***18***	***3,596***	***3,469***	***-5,628***	***4,754***	***-4,754***	***21,570***	***-21,001***	***-570***
Averages during post-SGMA period (water years 2072 through 2096)															
Shallow Alluvial Deposits	2,624	0	-813	0	-16	1,257	124	0	1,476	-3,711	N/A	-1,019	5,481	-5,559	78
Fine-grained Pleistocene deposits[g]	165	0	N/A	-5	N/A	N/A	140	7	1,408	-110	1,019	-2,738	2,739	-2,852	113
Mugu Aquifer	0	0	N/A	-2,094	N/A	N/A	0	208	1,446	-1,420	2,738	-906	4,392	-4,420	28
Hueneme Aquifer[h]	546	2,753	N/A	-5,223	N/A	N/A	-260	1,772	-778	34	906	127	6,139	-6,262	122
Fox Canyon Aquifer[i]	0	0	N/A	-627	N/A	N/A	0	1,667	-877	-132	-127	N/A	1,667	-1,763	95
Basin Total:	***3,335***	***2,753***	***-813***	***-7,948***	***-16***	***1,257***	***4***	***3,654***	***2,675***	***-5,338***	***4,536***	***-4,536***	***20,418***	***-20,855***	***437***

Notes

N/A = Not applicable.

Positive values represent inflows to an aquifer; negative numbers represent outflows from an aquifer.

a These components can comprise either net inflows to or outflows from each aquifer, depending on hydrogeologic conditions that vary over time (e.g., hydraulic gradients).

b The Shallow Alluvial Deposits is the sole hydrostratigraphic unit in Mound Basin with saturated conditions consistently shallow enough to be significantly affected by evapotranspiration.

c Tile drains are only known or suspected to be present in the Shallow Alluvial Deposits in Mound Basin.

d Within Mound Basin, the sole hydrostratigraphic unit known or suspected to be in direct hydraulic communication with the Santa Clara River is the Shallow Alluvial Deposits.

e United (2021) modeled Harmon Barranca using MODFLOW's "Stream package," as described in Section 3.3 of this report, allowing the model to simulate direct hydraulic communication with the Shallow Alluvial Deposits and the fine-grained Pleistocene deposits.

f Positive values for groundwater released from storage represent inflows to an aquifer, same as all other components on this page. Inflow of groundwater from storage is associated with declining groundwater levels (or potentiometric heads) in that aquifer. Negative values are associated with increasing groundwater-levels (or potentiometric-heads), as a result of groundwater being "added to storage."

g Although the fine-grained Pleistocene deposits in Mound Basin are not considered a principal aquifer due to their low hydraulic conductivity, they have a substantial thickness and are stratigraphically adjacent to the Oxnard Aquifer in the Oxnard Basin (see Section 3.1 for more information). The fine-grained Pleistocene deposits are included in this table for completeness in depicting the groundwater budget for Mound Basin

h To provide a complete and balanced water budget (the sum of water-budget components for all units should be zero), the values shown in this row include both the Hueneme Aquifer and the overlying Mugu-Hueneme aquitard, which is thin and has low hydraulic conductivity. For these reasons, inflows and outflows from the aquitard are small compared to those from the aquifer.

i To provide a complete and balanced water budget (the sum of water-budget components for all units should be zero), the values shown in this row include the Fox Canyon Aquifer (main and basal) and the overlying and intervening aquitards, which are thin and have low hydraulic conductivity. For these reasons, inflows and outflows from the aquitards are small compared to those from the aquifer.

j See Section 3.3 for an explanation of how water-year types were classified in this report.

Tables

Section 4

Table 4.1-01 Sustainable Mangement Criteria for the Chronic Lowering of Groundwater Levels and Land Subsidence Sustainability Indicators.

State Well Identification Number	Aquifers Monitored	Frequency of Groundwater Elevation Measurement 2015-2020	Basin Half	Land Subsidence MT (ft amsl)	Land Subsidence MO (ft amsl)	Chronic Lowering of GW Levels MT (ft amsl)	Chronic Lowering of GW Levels MO (ft amsl)	IM 5-year (ft amsl)	IM 10-year (ft amsl)	IM 15-year (ft amsl)	IM 20-year (ft amsl)
02N22W08G01S	Mugu	Monthly	Eastern	≥ 0.1 ft/yr*	≥ 0.1 ft/yr*	-20.39	5.21	-13.99	-7.59	-1.19	5.21
02N22W08P01S	Mugu	Quarterly	Eastern	≥ 0.1 ft/yr*	≥ 0.1 ft/yr*	-16.11	7.93	-10.10	-4.09	1.92	7.93
02N22W07M02S	Mugu	Monthly	Western	-19.77	1.00	-19.77	1.00	-14.58	-9.38	-4.19	1.00
02N22W07P01S	Mugu	Monthly	Western	-21.00	0.88	-21.00	0.88	-15.53	-10.06	-4.59	0.88
02N22W19M04S	Mugu	Bimonthly	Western	-64.19	-43.98	-64.19	-43.98	-59.14	-54.08	-49.03	-43.98
02N23W15J02S	Mugu	Monthly	Western	-18.64	-0.96	-18.64	-0.96	-14.22	-9.80	-5.38	-0.96
TBD	Mugu	Quarterly	Western	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
TBD	Mugu	Quarterly	Western	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
TBD	Mugu	Quarterly	Western	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
02N22W09K04S	Hueneme	Monthly	Eastern	≥ 0.1 ft/yr*	≥ 0.1 ft/yr*	-32.41	-10.31	-26.88	-21.36	-15.83	-10.31
02N22W09L03S	Hueneme	Monthly	Eastern	≥ 0.1 ft/yr*	≥ 0.1 ft/yr*	28.27	50.37	33.80	39.32	44.85	50.37
02N22W09L04S	Hueneme	Monthly	Eastern	≥ 0.1 ft/yr*	≥ 0.1 ft/yr*	42.28	64.39	47.81	53.34	58.86	64.39
02N22W10N03S	Hueneme	Bimonthly	Eastern	≥ 0.1 ft/yr*	≥ 0.1 ft/yr*	-38.20	-15.40	-32.50	-26.80	-21.10	-15.40
02N22W16K01S	Hueneme	Quarterly	Eastern	≥ 0.1 ft/yr*	≥ 0.1 ft/yr*	-56.09	-33.73	-50.50	-44.91	-39.32	-33.73
02N22W17Q05S	Hueneme	Bimonthly	Eastern	≥ 0.1 ft/yr*	≥ 0.1 ft/yr*	-66.73	-45.48	-61.42	-56.11	-50.79	-45.48
02N22W07M01S	Hueneme	Monthly	Western	-25.21	-4.59	-25.21	-4.59	-20.06	-14.90	-9.75	-4.59
02N22W17M02S	Hueneme	Bimonthly	Western	-18.76	2.51	-18.76	2.51	-13.44	-8.12	-2.81	2.51
02N22W20E01S	Hueneme	Monthly	Western	-72.79	-51.82	-72.79	-51.82	-67.55	-62.31	-57.07	-51.82
02N23W13K03S	Hueneme	Quarterly	Western	-34.23	-14.44	-34.23	-14.44	-29.28	-24.33	-19.39	-14.44
02N23W13K04S	Hueneme	Quarterly	Western	-25.60	-5.81	-25.60	-5.81	-20.65	-15.71	-10.76	-5.81
02N23W15J01S	Hueneme	Monthly	Western	-25.86	-7.30	-25.86	-7.30	-21.22	-16.58	-11.94	-7.30
02N23W24G01S	Hueneme	Quarterly	Western	-22.30	-3.21	-22.30	-3.21	-17.53	-12.75	-7.98	-3.21
TBD	Hueneme	Quarterly	Western	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
TBD	Hueneme	Quarterly	Western	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
TBD	Hueneme	Quarterly	Western	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Notes:

GW = Groundwater
MT = Minimum Threshold
MO = Measurable Objective
IM = Interim Measure
SMC = Sustainable Management Criteria
TBD = SMC to be determined following future monitoring well construction and data collection
* MT/MO based on land subsidence measurements

Table 4.1-02 Water Quality Minimum Thresholds and Measurable Objectives.

Constituent	MCL (mg/L)	Sec. MCL (R/U/ST)[1] (mg/L)	RWQCB WQO (mg/L)	Average Conc. Representative Monitoring Wells Last 10 Years (mg/l)	Proposed MT[2] (mg/L)	MT Rationale	Proposed MO[3] (mg/L)	MO Rationale
Mugu Aquifer								
Nitrate	45	N/A	45	Non-Detect	45	Protect water quality for potable uses.	5	Preserve existing water quality for potable uses.
TDS	N/A	500/1,000/1,500	1,200	902	1,200	Protect agricultural, municipal, and industrial beneficial uses consistent with RWQCB WQOs.	1,000	Preserve existing water quality for agricultural, municipal, and industrial beneficial uses. MO is set at Upper Consumer Acceptance Level to support potable uses.
Sulfate	N/A	250/500/600	600	350	600	Protect municipal beneficial use consistent with RWQCB WQOs and prevent exceedances of Short-Term Consumer Acceptance Level.	500	Preserve existing water quality for municipal beneficial use. MO is set at Upper Consumer Acceptance Level to support potable uses.
Chloride	N/A	250/500/600	150	50	150	Protect agricultural beneficial use consistent with RWQCB WQOs.	75	Preserve existing water quality for agricultural beneficial use. MO is selected to preserve existing water quality.
Boron	N/A	N/A	1	0.47	1	Protect agricultural beneficial use consistent with RWQCB WQOs.	0.75	Preserve existing water quality for agricultural beneficial use. MO is selected to preserve existing water quality.

Constituent	MCL (mg/L)	Sec. MCL (R/U/ST)[1] (mg/L)	RWQCB WQO (mg/L)	Average Conc. Representative Monitoring Wells Last 10 Years (mg/l)	Proposed MT[2] (mg/L)	MT Rationale	Proposed MO[3] (mg/L)	MO Rationale
Hueneme Aquifer								
Nitrate	45	N/A	45	Non-Detect	45	Protect water quality for potable uses.	5	Preserve existing water quality for potable uses.
TDS	N/A	500/1,000/1,500	1,200	1,171	1,400	Protect agricultural, municipal, and industrial beneficial uses. MT is 200 mg/L higher than RWQCB WQO based on current and historical data at representative monitoring wells (set at upper range of data from past ten years).	1,400	Preserve existing water quality for agricultural, municipal, and industrial beneficial uses.
Sulfate	N/A	250/500/600	600	488	600	Protect municipal beneficial use consistent with RWQCB WQOs and prevent exceedances of Short Term Consumer Acceptance Level.	600	Preserve existing water quality for municipal beneficial use.
Chloride	N/A	250/500/600	150	76	150	Protect agricultural beneficial use consistent with RWQCB WQOs.	100	Preserve existing water quality for agricultural beneficial use. MO is selected to preserve existing water quality.
Boron	N/A	N/A	1	0.62	1	Protect agricultural beneficial use consistent with RWQCB WQOs.	0.75	Preserve existing water quality for agricultural beneficial use. MO is selected to preserve existing water quality.

Notes:

1 Consumer Acceptance Levels, where R = Recommended, U = Upper, and ST = Short Term

2 Undesirable results are considered to occur when all representative monitoring wells in a principal aquifer exceed the minimum threshold concentration for a constituent for two consecutive years.

3 Sustainability Goal for degraded water quality for a given constituent is considered to be met when the two-year running average concentration for at least one representative monitoring well is below the measurable objective.

MCL = Maximum Concentration Limit.

mg/L = milligrams per liter.

MO = Measurable Objective.

MT = Minimum Threshold.

Table 4.1-03 Water Quality and Seawater Intrusion Minimum Thresholds and Measurable Objectives.

State Well Identification Number	Local Well Identifier	Aquifers Monitored	Frequency of Groundwater Quality Sampling 2015-2020	Measurement or Sampling Entity[d]	Degraded WQ Nitrate MT	Degraded WQ Nitrate MO	Degraded WQ TDS MT	Degraded WQ TDS MO	Degraded WQ Sulfate MT	Degraded WQ Sulfate MO	Degraded WQ Chloride MT	Degraded WQ Chloride MO	Degraded WQ Boron MT	Degraded WQ Boron MO	Seawater Intrusion Chloride MT	Seawater Intrusion Chloride MO	IM 5YR	IM 10YR	IM 15YR	IM 20YR	SMC Notes
02N22W08G01S	Mound #1	Mugu[e]	Monthly	City of Ventura	Not used - water quality is anomalous																
02N22W07M02S	CP-780	Mugu	Semiannually	United	45	5	1200	1000	600	500	150	75	1	0.75			Same as MOs	Same as MOs	Same as MOs	Same as MOs	
02N23W15J02S	MP-660	Mugu	Semiannually	United	45	5	1200	1000	600	500	150	75	1	0.75			Same as MOs	Same as MOs	Same as MOs	Same as MOs	
TBD	Site A	Mugu	Semiannually	TBD	45	5	1200	1000	600	500	150	75	1	1			Same as MOs	Same as MOs	Same as MOs	Same as MOs	Future Monitoring Well
TBD	Site B	Mugu	Semiannually	TBD	45	5	1200	1000	600	500	150	75	1	1	150	75	Same as MOs	Same as MOs	Same as MOs	Same as MOs	Future Monitoring Well
TBD	Site C	Mugu	Semiannually	TBD	45	5	1200	1000	600	500	150	75	1	1	150	75	Same as MOs	Same as MOs	Same as MOs	Same as MOs	Future Monitoring Well
02N22W08F01S	Victoria #2	Hueneme	Monthly	City of Ventura	Not used - water quality is anomalous																
02N22W09L03S	CWP-950	Hueneme	Semiannually	United	45	5	1400	1200	600	500	150	100	1	0.75			Same as MOs	Same as MOs	Same as MOs	Same as MOs	
02N22W09L04S	CWP-510	Hueneme	Semiannually	United	Not used - water quality is anomalous																
02N23W13F02S	---	Hueneme[f]	Annually	United	45	5	1400	1200	600	500	150	100	1	0.75			Same as MOs	Same as MOs	Same as MOs	Same as MOs	
02N22W07M01S	CP-1280	Hueneme	Semiannually	United	45	5	1400	1200	600	500	150	100	1	0.75			Same as MOs	Same as MOs	Same as MOs	Same as MOs	
02N23W13K03S	---	Hueneme	Annually	VCWPD	Not used - water quality is anomalous																
02N23W15J01S	MP-1070	Hueneme	Semiannually	United	45	5	1400	1200	600	500	150	100	1	0.75			Same as MOs	Same as MOs	Same as MOs	Same as MOs	
TBD	Site A	Hueneme	Semiannually	TBD	45	5	1400	1200	600	500	150	100	1	1			Same as MOs	Same as MOs	Same as MOs	Same as MOs	Future Monitoring Well
TBD	Site B	Hueneme	Semiannually	TBD	45	5	1400	1200	600	500	150	100	1	1	150	100	Same as MOs	Same as MOs	Same as MOs	Same as MOs	Future Monitoring Well
TBD	Site C	Hueneme	Semiannually	TBD	45	5	1400	1200	600	500	150	100	1	1	150	100	Same as MOs	Same as MOs	Same as MOs	Same as MOs	Future Monitoring Well

Notes:
MO = Measurable Objective.
MT = Minimum Threshold.
SMC = sustainable management criteria.
WQ = water quality.

Table 4.8-01. Land Subsidence Literature Review.

Reference	Title	Period of Observation	Subsidence Rate (in/yr)	Cumulative Subsidence (ft)	Reported Damage	Location
Leon et al., 2018	Land Subsidence and its Effects on the Urban Area of Tepic City, Mexico	2007 - 2011	2.4 - 2.8	Not reported	Surface cracking, sidewalks and planters; ruptured pipes and walls in houses. It is noted that the damage caused by this phenomenon has not been sufficiently noticeable to alarm governments or those affected.	Tepic City, Mexico
Dinary et al., 2020	Land Subsidence: The Forgotten Enigma of Groundwater (Over)Extraction	1950 - 1957(through early 1970s)	1.2	0.7	Subsidence exacerbated the impact of sea level rise including, delta, erosion, shoreline retreat, and morphological changes to spits and lagoons. Land uses were impacted by the combined effects of subsidence and sea level rise.	Po River delta, Italy
Dinary et al., 2020	Land Subsidence: The Forgotten Enigma of Groundwater (Over)Extraction	1993 - 2004, 2004 - 2008	Not reported	0.6	300 building complaints and estimated damages of nearly 50 million euro. Groundwater use is now managed to prevent more than 2 cm (0.8 inch) of subsidence per year.	Murcia, Spain
Dinary et al., 2020	Land Subsidence: The Forgotten Enigma of Groundwater (Over)Extraction	1987 - 1995	3.1	2.2	Ground fissuring that resulted in damage to existing infrastructure.	Chino Basin, California
He et al., 2019	Land Subsidence Control Zone and Policy for the Environmental Protection of Shanghai	Since ~1986	2.3	8.0	Increased risk of coastal hazards such as marine flooding, storm surges, and tsunamis.	Shanghai, China
Lawrence Berkeley National Laboratory, 1979	Environmental and Economic Effects of Subsidence	1948 - 1967	4.5	7.5 - 10	Ground fissuring increased maintenance on highways and railroads, disrupted ditch irrigation systems, increased erosion (along fissures), embankment failure at Picacho Reservoir, and impacted aqueduct routing. Well damage was also reported.	Arizona
Lawrence Berkeley National Laboratory, 1979	Environmental and Economic Effects of Subsidence	1924 - 1964	3	10	Minor sidewalk cracks and well damages. Differential movement on pre-existing faults a dam failure.	Baldwin Hills, California
Lawrence Berkeley National Laboratory, 1979	Environmental and Economic Effects of Subsidence	1906 - 1973	1.5	8.5	Damage to structures and cracks in roads and sewer systems associated with differential movement along pre-existing faults. Subsidence also cause shoreline retreatment in coastal areas.	Houston-Galveston, Texas
Lawrence Berkeley National Laboratory, 1979	Environmental and Economic Effects of Subsidence	1935- 1974	1.5	5	Ground fissuring damaged wells, reservoirs, pipelines, homes, roads, and railroads.	Las Vegas Valley,
Lawrence Berkeley National Laboratory, 1979	Environmental and Economic Effects of Subsidence	1934 - 1967	2.9	8	Well sewer, and bridge damages. Aggravated flood hazard.	Santa Clara Valley, CA
		Range:	1.2- 4.5 in/yr	0.6 – 10 ft		

Tables

Section 5

Table 5.3-01 Existing Monitoring Well Information.

State Well Identification Number	Local Well Identifier	CASGEM Master Site Code	Year Well Constructed	Easting Coordinate[a]	Northing Coordinate[a]	Ground Surface Elevation (feet msl)[b]	Reference Point Elevation (feet msl)[b]	Reference Point Description	Reported (Original) Well Use	Well Pumping Status	Well Configuration	Depth of Screened Interval(s) (feet bgs)[c,h]	Borehole Depth (feet bgs)[c]	Total Well (Casing) Depth (feet bgs)[c]	Casing Diameter (inches)	Aquifers Monitored	Frequency of Groundwater Elevation Measurement 2015-2020	Frequency of Groundwater Quality Sampling 2015-2020	Measurement or Sampling Entity[d]	Notes
02N22W07M02S	CP-780	342703N1192342W002	1995	6,188,662	1,922,431	164.56	164.06	Ground surface (flush-mount vault)	Monitoring	---	Cluster	710-780	790	790	2	Mugu	Monthly	Semiannually	United	
02N22W07P01S	---	not currently in CASGEM	2000	6,190,044	1,920,430	150 (approx.)	150.21	Top of casing cover plate (at 1/2" access hole)	Irrigation	Active	Single casing	460-580	580	580	10	Mugu	Monthly	---	United	Water quality is anomalous
02N22W08G01S	Mound #1	not currently in CASGEM	2000	6,196,790	1,923,509	260 (approx.)	261.61	Lip of sounder access port	Municipal Supply	Active	Single casing	580-650	720	660	18	Mugu[e]	Monthly	Monthly	City of Ventura	Water quality is anomalous
02N22W08P01S	---	342658N1192109W001	1932	6,195,769	1,921,338	215.29	213.79	Lip of sounder access port	Irrigation	Inactive	Single casing	160-321	364	321	10	Mugu	Quarterly	---	VCWPD	
02N22W19M04S	---	not currently in CASGEM	2004	6,188,984	1,912,787	48.18	49.68	Lip of 1" access port at base of pump pedestal	Irrigation	Active	Single casing	343-493	500	500	12	Mugu	Bimonthly	---	United	
02N23W15J02S	MP-660	342533N1192690W001	1995	6,178,364	1,917,108	8.73	8.23	Ground surface (flush-mount vault)	Monitoring	---	Cluster	480-660	660	660	2	Mugu	Monthly	Semiannually	United	
02N22W07M01S	CP-1280	342703N1192342W001	1995	6,188,662	1,922,431	164.56	164.06	Ground surface (flush-mount vault)	Monitoring	---	Cluster	1,200-1,280	1,280	1,280	2	Hueneme	Monthly	Semiannually	United	
02N22W08F01S	Victoria #2	not currently in CASGEM	1994	6,195,468	1,923,287	245 (approx.)	245.82	Lip of sounder access port	Municipal Supply	Active	Single casing	580-640, 900-940, 1,060-1,180	1,310	1,190	14	Hueneme	---	Monthly	City of Ventura	Water quality is anomalous
02N22W09K04S	---	342703N1191881W001	1935	6,202,524	1,922,919	244.89	244.49	Lip of 2" sounder access pipe	Irrigation	Inactive	Single casing	521-794	548	548	14	Hueneme	Monthly	---	United	
02N22W09L03S	CWP-950	342688N1191952W001	2008	6,200,555	1,922,367	253.25	251 .25	Lip of 2" PVC casing	Monitoring	---	Cluster	890-950	1,480	950	3	Hueneme	Monthly	Semiannually	United	
02N22W09L04S	CWP-510	342688N1191952W002	2008	6,200,555	1,922,367	253.25	251.25	Lip of 2" PVC casing	Monitoring	---	Cluster	480-510	510	510	2	Hueneme	Monthly	Semiannually	United	Water quality is anomalous
02N22W10N03S	Well 2	not currently in CASGEM	2002	6,205,442	1,921,235	185 (approx.)	187.07	Lip of 2" sounder access pipe	Irrigation	Active	Single casing	200-280	280	280	12	Hueneme	Bimonthly	---	United	
02N23W13F02S	---	not currently in CASGEM	1990	6,184,131	1,918,834	60 (approx.)	60.85	Lip of sounder access port	Irrigation	Active	Single casing	521-982	997	982	14	Hueneme[f]	---	Annually	United	
02N22W16K01S	---	342564N1191892W001	1934	6,202,316	1,917,850	150.74	149.37	Lip of sounder access port	Industrial	Active	Single casing	292-345	354	354	12	Hueneme	Quarterly	---	VCWPD	
02N22W17M02S	---	342555N1192173W001	2001	6,193,835	1,917,580	143.44	145.04	Lip of 2" sounder access pipe	Irrigation	Active	Single casing	550-850	853	850	14	Hueneme	Bimonthly	---	United	
02N22W17Q05S	---	342491N1192078W001	1965	6,196,677	1,915,235	88.60	89.60	Top of casing cover plate (at access hole)	Irrigation	Inactive	Single casing	365-483	506	500	not reported	Hueneme	Bimonthly	---	United	
02N22W20E01S	Olivas-Victoria	342459N1192169W001	1991	6,193,910	1,914,098	74.15	72.15	Lip of 1" access port at base of pump pedestal	Irrigation	Active	Single casing	462-592, 612-723, 737-818	818	818	10	Hueneme	Monthly	---	United	
02N23W13K03S	---	342552N1192422W001	1977	6,186,323	1,917,561	68.71	68.71	Lip of sounder access port	Irrigation	Active	Single casing	800-1,200	1,200	1,200	16	Hueneme	Quarterly	Annually	VCWPD	Water quality is anomalous

State Well Identification Number	Local Well Identifier	CASGEM Master Site Code	Year Well Constructed	Easting Coordinate[a]	Northing Coordinate[a]	Ground Surface Elevation (feet msl)[b]	Reference Point Elevation (feet msl)[b]	Reference Point Description	Reported (Original) Well Use	Well Pumping Status	Well Configuration	Depth of Screened Interval(s) (feet bgs)[c,h]	Borehole Depth (feet bgs)[c]	Total Well (Casing) Depth (feet bgs)[c]	Casing Diameter (inches)	Aquifers Monitored	Frequency of Groundwater Elevation Measurement 2015-2020	Frequency of Groundwater Quality Sampling 2015-2020	Measurement or Sampling Entity[d]	Notes
02N23W13K04S	---	not currently in CASGEM	1981	6,186,689	1,917,396	70 (approx.)	70.66	Lip of 2" sounder access pipe	Irrigation	Active	Single casing	800-1,200	1,215	1,200	14	Hueneme	Quarterly	---	United	
02N23W15J01S	MP-1070	342533N1192676W001	1995	6,178,365	1,917,106	8.73	8.23	Ground surface (flush-mount vault)	Monitoring	---	Cluster	970-1,070	1,110	1,070	2	Hueneme	Monthly	Semiannually	United	
02N23W24G01S	Olivas (old)	not currently in CASGEM	1948	6,186,343	1,913,155	25 (approx.)	26.30	Lip of 3" access port at base of pump pedestal	Municipal Supply	Inactive	Single casing	742-754, 795-825, 898-927	932	932	not reported	Hueneme	Quarterly	---	United	
02N22W09K05S	---	342684N1191895W001	1975	6,202,284	1,922,175	244.89	245.39	Lip of 1.5" sounder access pipe	Irrigation	Active	Single casing	625-1,455	1,468	1,455	16	Hueneme and Fox Canyon[g]	Bimonthly	---	United	
02N22W07M03S	CP-280	342703N1192342W003	1995	6,188,662	1,922,431	164.56	164.06	Ground surface (flush-mount vault)	Monitoring	---	Cluster	210-280	290	290	2	Fine-grained Pleistocene deposits	Monthly	---	United	
02N23W15J03S	MP-240	342533N1192690W002	1995	6,178,364	1,917,109	8.73	8.23	Ground surface (flush-mount vault)	Monitoring	---	Cluster	170-240	250	240	2	Fine-grained Pleistocene deposits	Monthly	---	United	
02N22W16H01S		not currently in CASGEM	not reported	6,203,225	1,918,690	155 (approx.)	158.47	Lip of 2" sounder access pipe	not reported	Active	Single casing	not reported	not reported	not reported	not reported	unknown	Bimonthly		United	

Notes:
"---" = Not applicable
a Coordinate system is North American Datum 1983 (NAD83), State Plane, California Zone 5, in feet.
b from light detecting and ranging (LiDAR) data to an accuracy of 0.5 feet or better (except where listed as "approx."), referenced to North American Vertical Datum 1988 (NAVD88).
c reported by driller (updated by video survey by United Water Conservation District in some wells).
d United = United Water Conservation District; VCWPD = Ventura County Watershed Protection District.
e This well may be partially screened in the Hueneme Aquifer.
f This well is screened primarily in the Hueneme Aquifer with a small length of its screen in the Mugu Aquifer. Sample results from this well appear to be consistent with sample results from other wells screened in the Hueneme Aquifer.
g This well is screened through substantial intervals of both the Hueneme and Fox Canyon Aquifers. This well is part of the existing monitoring program in Mound Basin and is included in this table for reference only.
h note, some wells are screened across multiple aquifers.
CASGEM = California Statewide Groundwater Elevation Monitoring
feet bgs = feet below ground surface.
feet msl = feet above mean sea level.

Table 5.3-02 Planned and New Groundwater Monitoring Well Information.

Location[a]	Ground Surface Elevation (feet msl)[b]	Planned Well Use	Proposed Well Configuration	Planned Depth of Screened Interval (feet bgs)[c]	Planned Borehole Depth (feet bgs)[c]	Planned Total Well (Casing) Depth (feet bgs)[c]	Planned Casing Diameter (inches)	Aquifer to be Monitored	Minimum Frequency of Groundwater Elevation Measurement	Minimum Frequency of Groundwater Quality Sampling[d]	Measurement or Sampling Entity
Site A	12	Monitoring	Cluster	480-660	670	665	2 or 3	Mugu	Quarterly	Semiannually	TBD
Site B	31	Monitoring	Cluster	500-680	690	685	2 or 3	Mugu	Quarterly	Semiannually	TBD
Site C	16	Monitoring	Cluster	490-670	680	675	2 or 3	Mugu	Quarterly	Semiannually	TBD
Site A	12	Monitoring	Cluster	970-1,070	1,080	1,075	2 or 3	Hueneme	Quarterly	Semiannually	TBD
Site B	31	Monitoring	Cluster	990-1,090	1,100	1,095	2 or 3	Hueneme	Quarterly	Semiannually	TBD
Site C	16	Monitoring	Cluster	980-1,080	1,090	1,085	2 or 3	Hueneme	Quarterly	Semiannually	TBD

Notes:

"TBD" = To be determined.

a Locations of planned monitoring well Sites A, B, and C are shown on Figures 5.3-01, -02, -04, and -05.

b feet msl = Feet above mean sea level, estimated from Google Earth digital elevation model data.

c feet bgs = Feet below ground surface (approximate), estimated based on depth of Mugu and Hueneme Aquifers at well 02N23W15J01S in Marina Park (location shown on Figures 5.3-02 and 5.3-04).

d See Table 5.6-01 for the analyte list for water quality samples obtained from these wells.

Table 5.6-01. Proposed Water Quality Sampling.

Type of Monitoring Network	State Well Identification Number	Local Well Identifier	CASGEM Master Site Code	Aquifers Monitored	Minimum Frequency of Groundwater Quality Sampling	Current Monitoring Entity[a]	Notes	Analytes for Spring Sampling Events	Analytes for Fall Sampling Events
Degraded Water Quality	02N22W07M02S	CP-780	342703N1192342W002	Mugu	Semiannually	United		**Field** • hydrogen ion activity (pH), temperature **Laboratory** • Method 300.0: sulfate, chloride, nitrate (as nitrate [NO3]), nitrate (as nitrogen [N]) • Method 2510B: specific conductance • Method 2540CE: total dissolved solids (total filterable residue [TFR])	**Field** • pH, temperature **Laboratory** • Method 200.7: total hardness (as calcium carbonate [$CaCO_3$]), calcium, magnesium, potassium, sodium, total cations, boron, copper, iron, manganese, zinc, sodium absorption ratio (SAR) • Method 300.0: sulfate, chloride, nitrate (as NO_3), nitrate (as N), nitrite (as N), nitrate+ nitrite (as N), fluoride • Method 2320B: total alkalinity (as $CaCO_3$), hydroxide (as OH), carbonate (as CO_3), bicarbonate (as HCO_3), total anions • Method 2510B: specific conductance • Method 2540CE: total dissolved solids (TFR) • Method 4500-H B: pH, aggressiveness index, Langelier index (20°C) • Method 5540C: methylene blue active substances (MBAS) screen
	02N22W08G01S	Mound #1	not currently in CASGEM	Mugu[b]	Monthly	City of Ventura	Water quality is anomalous		
	02N22W07M01S	CP-1280	342703N1192342W001	Hueneme	Semiannually	United			
	02N22W08F01S	Victoria #2	not currently in CASGEM	Hueneme	Semiannually	City of Ventura	Water quality is anomalous		
	02N22W09L03S	CWP-950	342688N1191952W001	Hueneme	Semiannually	United			
	02N22W09L04S	CWP-510	342688N1191952W002	Hueneme	Semiannually	United	Water quality is anomalous		
	02N23W13F02S	---	not currently in CASGEM	Hueneme[c]	Semiannually	United			
	02N23W13K03S	---	342552N1192422W001	Hueneme	Semiannually	VCWPD	Water quality is anomalous		
Seawater Intrusion	02N23W15J02S	MP-660	342533N1192690W001	Mugu	Semiannually	United			
	TBD	Site A[d]	TBD	Mugu	Semiannually				
	TBD	Site B[d]	TBD	Mugu	Semiannually				
	TBD	Site C[d]	TBD	Mugu	Semiannually				
	02N23W15J01S	MP-1070	342533N1192676W001	Hueneme	Semiannually	United			
	TBD	Site A[d]	TBD	Hueneme	Semiannually				
	TBD	Site B[d]	TBD	Hueneme	Semiannually				
	TBD	Site C[d]	TBD	Hueneme	Semiannually				

Notes:

--- = Not applicable.

TBD = To be determined.

a United = United Water Conservation District; VCWPD = Ventura County Watershed Protection District.

b This well may be partially screened in the Hueneme Aquifer.

c This well is screened primarily in the Hueneme Aquifer with a small length of its screen in the Mugu Aquifer. Sample results from this well appear to be consistent with sample results from other wells screened in the Hueneme Aquifer."

d Locations of planned monitoring well Sites A, B, and C are shown on Figures 5.3-01, -02, -04, and -05.

Table

Section6

Table 6.6-01 Monitoring Locations for Interim Shallow Groundwater Data Collection Project.

Location	Latitude	Longitude	Reference Point	Reference Point Elevation (ft amsl)	Aquifer to be Monitored	Groundwater Monitoring Type	Monitoring Frequency	Measurement or Sampling Entity
GW-1	34.22703500000	-119.26029800000	Top of Casing	15.78233267720	Shallow Alluvial Deposits	Water Levels	transducer monthly downloads	Ventura Water
GW-2	34.22454600000	-119.25906100000	Top of Casing	14.34585629920	Shallow Alluvial Deposits	Water Levels	transducer monthly downloads	Ventura Water
GW-4	34.23788700000	-119.21859100000	Top of Casing	47.07079068240	Shallow Alluvial Deposits	Water Levels, Water Quality	manual 2/month	Ventura Water
GW-6	34.23271340000	-119.22067230000	Top of Casing	41.30000000000	Shallow Alluvial Deposits	Water Levels, Water Quality	manual 2/month	Ventura Water
GW-8	34.23783600000	-119.24105500000	Top of Casing	27.34400590550	Shallow Alluvial Deposits	Water Levels	TBD	TBD
GW-9	34.23660500000	-119.25614900000	Top of Casing	25.11578740160	Shallow Alluvial Deposits	Water Levels, Water Quality	manual 2/month	Ventura Water
GW-10	34.23729500000	-119.25156000000	Top of Casing	17.66382217850	Shallow Alluvial Deposits	Water Levels, Water Quality	manual 2/month	Ventura Water
GW-11	34.24203700000	-119.25528400000	Top of Casing	21.54430774280	Shallow Alluvial Deposits	Water Levels	TBD	TBD
GW-14	34.23694500000	-119.26091100000	Top of Casing	22.49499671920	Shallow Alluvial Deposits	Water Levels, Water Quality	transducer monthly downloads	Ventura Water

Notes:
"TBD" = To be determined.

Table

Section7

Table 7.1-01 Costs Associated with GSP Implementation Activities.

Fiscal Year	Agency Administration	Legal Counsel	GW Mgmt., Coord., & Outreach	Groundwater Level and Quality Monitoring	Annual Reports	Projects and Mgmt. Actions	Model Simulations	GSP Evaluation	GSP Update	Respond to DWR Comments and Requests	Contingency Non-Capital	Monitoring Well Construction	Contingency Capital Projects	Totals	Extraction Fee ($/AF)	Ending Cash
2022	$57,538	$7,500	$45,000	$4,500	$53,000	$-	$-	$-	$-	$-	$16,754	$30,000	$3,000	$217,292	$59.00	$443,817
2023	$39,638	$7,725	$20,600	$5,150	$35,000	$10,000	$-	$-	$-	$-	$11,811	$10,000	$1,000	$140,924	$59.00	$680,493
2024	$54,148	$7,957	$21,218	$6,365	$36,050	$25,000	$-	$-	$-	$50,000	$20,074	$30,000	$3,000	$253,812	$59.00	$804,280
2025	$41,986	$8,195	$21,855	$6,556	$37,132	$25,000	$-	$-	$-	$-	$14,072	$60,000	$6,000	$220,796	$59.00	$961,085
2026	$57,851	$8,441	$22,510	$8,310	$38,245	$25,000	$15,000	$25,000	$50,000	$-	$25,036	$754,000	$75,400	$1,104,794	$59.00	$233,891
2027	$44,546	$8,695	$23,185	$4,620	$39,393	$-	$10,000	$25,000	$65,000	$-	$22,044	$-	$-	$242,483	$59.00	$369,008
2028	$61,380	$8,955	$23,881	$4,759	$40,575	$-	$-	$-	$-	$28,138	$16,769	$35,700	$3,570	$223,726	$59.00	$522,882
2029	$47,263	$9,224	$24,597	$4,902	$41,792	$-	$-	$-	$-	$-	$12,778	$11,900	$1,190	$153,646	$59.00	$746,836
2030	$65,124	$9,501	$25,335	$5,049	$43,046	$-	$-	$-	$-	$-	$14,805	$35,700	$3,570	$202,130	$59.00	$922,306
2031	$50,146	$9,786	$26,095	$5,200	$44,337	$-	$17,389	$28,982	$57,964	$-	$23,990	$71,400	$7,140	$342,429	$59.00	$957,477
2032	$69,097	$10,079	$26,878	$5,356	$45,667	$-	$11,593	$28,982	$75,353	$-	$27,301	$897,260	$89,726	$1,287,292	$59.00	$47,785
2033	$53,205	$10,382	$27,685	$5,517	$47,037	$-	$-	$-	$-	$32,640	$17,646	$-	$-	$194,111	$41.00	$116,074
2034	$73,312	$10,693	$28,515	$5,682	$48,448	$-	$-	$-	$-	$-	$16,665	$-	$-	$183,316	$41.00	$195,158
2035	$56,450	$11,014	$29,371	$5,853	$49,902	$-	$-	$-	$-	$-	$15,259	$-	$-	$167,848	$41.00	$289,710
2036	$77,784	$11,344	$30,252	$6,028	$51,399	$-	$20,159	$33,598	$67,196	$-	$29,776	$-	$-	$327,535	$41.00	$224,574
2037	$59,894	$11,685	$31,159	$6,209	$52,941	$-	$13,439	$33,598	$87,355	$-	$29,628	$-	$-	$325,907	$41.00	$161,067
2038	$82,529	$12,035	$32,094	$6,395	$54,529	$-	$-	$-	$-	$37,862	$22,544	$-	$-	$247,989	$41.00	$175,478
2039	$63,547	$12,396	$33,057	$6,587	$56,165	$-	$-	$-	$-	$-	$17,175	$-	$-	$188,928	$40.00	$242,550
2040	$87,563	$12,768	$34,049	$6,785	$57,850	$-	$-	$-	$-	$-	$19,901	$-	$-	$218,916	$40.00	$279,634
2041	$67,424	$13,151	$35,070	$6,988	$59,585	$-	$23,370	$38,949	$77,898	$-	$32,244	$-	$-	$354,680	$40.00	$180,955
2042	$92,904	$13,546	$36,122	$7,198	$61,373	$-	$15,580	$38,949	$101,268	$-	$36,694	$-	$-	$403,634	$40.00	$33,321
Yrs.1-5	$251,161	$39,819	$131,183	$30,882	$199,427	$85,000	$15,000	$25,000	$50,000	$50,000	$87,747	$884,000	$88,400	$1,937,618		
Yrs.6-20	$1,052,167	$175,255	$467,347	$93,129	$794,036	$-	$111,529	$228,058	$532,033	$98,640	$355,219	$1,051,960	$105,196	$5,064,570		
Total	$1,303,328	$215,074	$598,530	$124,011	$993,463	$85,000	$126,529	$253,058	$582,033	$148,640	$442,967	$1,935,960	$193,596	$7,002,188		

Notes:

Section 7.1 activities wholly funded by Member Agencies are not listed in the table.

Costs escalated for inflation at an assume rate of 3% per year.

Appendix A

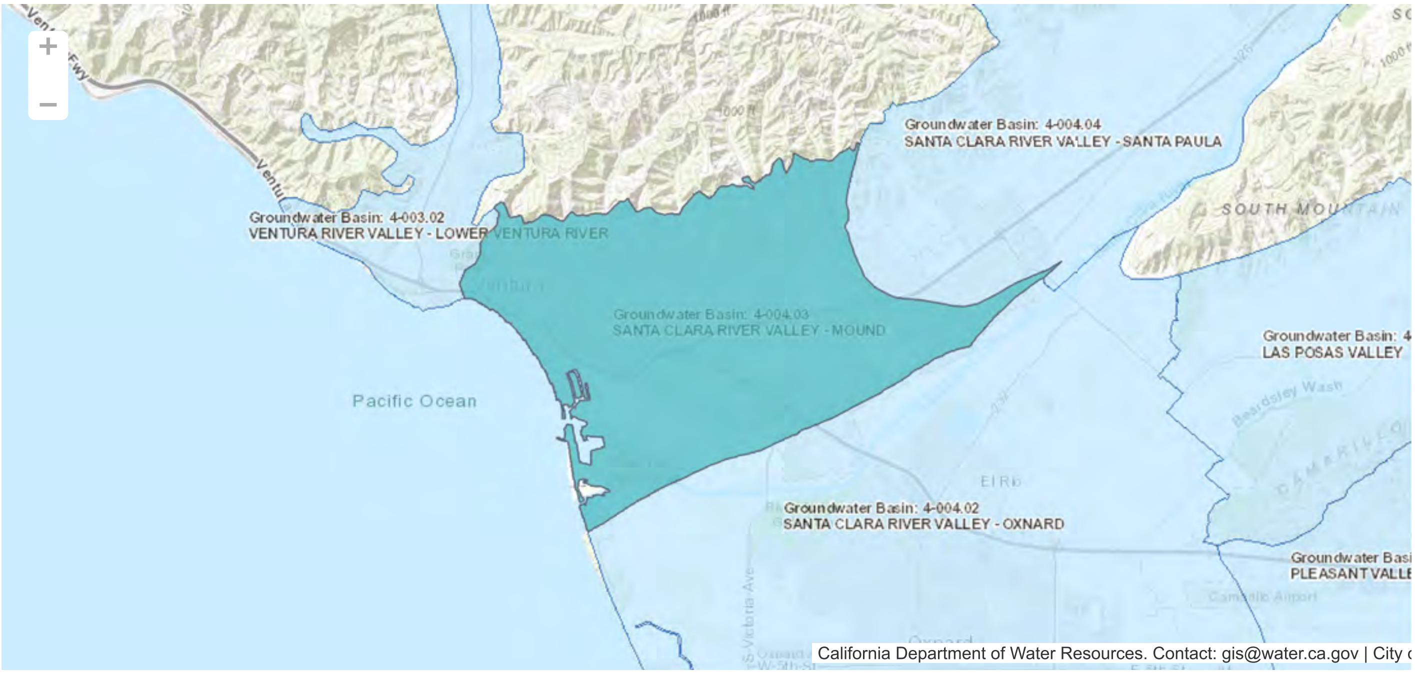
GSP Initial Notification

GSP Initial Notification

4-004.03 SANTA CLARA RIVER VALLEY

Mound Basin GSA

Date Submitted: ***09/17/2018*** *Last Mo*



1. How many GSPs are planned for the basin?

   Single GSP for the entire basin

2. Select GSA(s) that will develop the GSP(s)

   Mound Basin GSA (Exclusive)

   a. (Optional) If one or more GSAs have identified a representative to submit an initial notification on their behalf, the designated representative shou evidence of that identified.

3. Select or add the point of contact for your GSP area or Plan Manager if identified.

   Bryan Bondy
   (Mound Basin GSA)
   P.O. Box 3544, Ventura, CA93006-3544
   805-212-0484
   bryan@bondygroundwater.com

4. Please provide general information about the Agency's process for developing the GSP, including the manner in which interested parties may conta Agency and participate in the development and implementation of the GSP as required by Water Codes §10723.4 and §10727.8
   (Fill in the text box AND/OR attach a file).

   Interested parties may contact the Mound Basin GSA through its website (https://moundbasingsa.org) or by email (Bryan@BondyGroundwater.co phone (805) 212-0484
   2018-09-17 MBGSA DWR Notice of Intent to Prepare GSP - submitted.pdf (518.7kB) Uploaded on 09/17/2018 at 07:11PM

5. Please provide link(s) to the Agency's website where relevant information regarding the GSP is posted or will be posted.

   http://moundbasingsa.org/gsp/

Post Office Box 3544
Ventura, CA 93006-3544
(805) 525-4431
https://moundbasingsa.org

September 17, 2018

Mr. Trevor Joseph
Sustainable Groundwater Management Section Chief
Department of Water Resources
9001 P Street, Room 213
P.O. Box 942836
Sacramento, CA 94236

Subject: Initial Notification of Groundwater Sustainability Plan Development for the Mound Subbasin (4-004.03)

Dear Mr. Joseph:

This letter is to provide initial notification that the Mound Basin Groundwater Sustainability Agency (Agency) intends to develop a Groundwater Sustainability Plan (GSP) for the subject basin pursuant to Water Code Section 10727.8 and GSP Regulations Section 353.6. The Agency filed notice of intent to serve as the Groundwater Sustainability Agency (GSA) for the subject basin in June 2017.

The Mound subbasin (4-004.03) has a wide variety of stakeholders, as evidenced by the composition of the Agency Board of Directors. The five-member Board of Directors consists of one member from United Water Conservation District (a wholesale water agency and water conservation district), the County of Ventura (land use entity), the City of Ventura (a land use entity and municipal water purveyor), a stakeholder director from the Mound Basin Agricultural Water Group (MBAWG), and a stakeholder director from Environmental Interest Groups (to represent interests of environmental organizations performing work in the basins).

The Agency is currently in the process of developing a GSP, assisted by its Executive Director (Bryan Bondy of Bondy Groundwater Consulting, Inc.) and United Water Conservation District. A plan for stakeholder engagement will be developed to interface with the public on activities needed to develop the GSPs. The stakeholder engagement strategy will address outreach challenges, including: building trust among water agencies, agricultural interests, and environmental interests; and determining the need for—and potential composition of—an advisory committee or facilitation support. The stakeholder engagement plan will address noticing, time and place of meetings, roles and responsibilities of any committees, how stakeholder input will be documented and addressed, as well as target audiences and key messaging.

As part of the stakeholder engagement plan, the Agency will implement a public outreach plan. This will involve developing materials for public outreach and then holding forums on the GSPs at critical junctures. Materials will be developed to provide consistent messaging. Informational materials will be developed that can be used to inform the stakeholders and the community about basin status, GSP goals, objectives, process, and outcomes. These materials will be suitable for both printed distribution and via the internet.

The Agency has established a website (https://moundbasingsa.org/) and a Facebook page (https://www.facebook.com/moundbasingsa/) for stakeholders and interested parties to stay abreast of GSA activities, GSP development progress, and meeting announcement notification.

Draft GSP chapters and other relevant Sustainable Groundwater Management Act (SGMA) information will be posted to the Agency's website. Additionally, updates on GSP development will be provided at publicly noticed Agency Board meetings. Stakeholders should send an email to info@moundbasingsa.org with questions regarding GSP development or to request to be placed on the Agency's interested parties list.

Please feel free to contact me, via email at Bryan@BondyGroundwater.com or by phone at 805-212-0484, if you should have any questions about this initial notification of GSP development.

Sincerely,

Bryan Bondy
Executive Director

Cc: Ventura County Board of Supervisors
City of San Buenaventura City Council
United Water Conservation District
Interested Parties List

Appendix B

Elements of the Plan Table

Article 5.			Plan Contents for Mound Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
§ 354.			**Introduction to Plan Contents**					
			This Article describes the required contents of Plans submitted to the Department for evaluation, including administrative information, a description of the basin setting, sustainable management criteria, description of the monitoring network, and projects and management actions.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
SubArticle 1.			**Administrative Information**					
§ 354.2.			**Introduction to Administrative Information**					
			This Subarticle describes information in the Plan relating to administrative and other general information about the Agency that has adopted the Plan and the area covered by the Plan.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.4.			**General Information**					
			Each Plan shall include the following general information:					
(a)			An executive summary written in plain language that provides an overview of the Plan and description of groundwater conditions in the basin.	3:16	ES			
(b)			A list of references and technical studies relied upon by the Agency in developing the Plan. Each Agency shall provide to the Department electronic copies of reports and other documents and materials cited as references that are not generally available to the public.	240:248	8.0			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10733.2 and 10733.4, Water Code.					
§ 354.6.			**Agency Information**					
			When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:					
(a)			The name and mailing address of the Agency.	40	2.1.1			
(b)			The organization and management structure of the Agency, identifying persons with management authority for implementation of the Plan.	41	2.1.2			
(c)			The name and contact information, including the phone number, mailing address and electronic mail address, of the plan manager.	41	2.1.3			
(d)			The legal authority of the Agency, with specific reference to citations setting forth the duties, powers, and responsibilities of the Agency, demonstrating that the Agency has the legal authority to implement the Plan.	41:43	2.1.4			
(e)			An estimate of the cost of implementing the Plan and a general description of how the Agency plans to meet those costs.	233:239	7.1:7.4		7.1-01	
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.8, 10727.2, and 10733.2, Water Code.					
§ 354.8.			**Description of Plan Area**					
			Each Plan shall include a description of the geographic areas covered, including the following information:					
(a)			One or more maps of the basin that depict the following, as applicable:					
	(1)		The area covered by the Plan, delineating areas managed by the Agency as an exclusive Agency and any areas for which the Agency is not an exclusive Agency, and the name and location of any adjacent basins.	43:45	2.2.1	2.1-01, 2.1-02		
	(2)		Adjudicated areas, other Agencies within the basin, and areas covered by an Alternative.	43:45	2.2.1			

Article 5.			Plan Contents for Mound Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(3)		Jurisdictional boundaries of federal or state land (including the identity of the agency with jurisdiction over that land), tribal land, cities, counties, agencies with water management responsibilities, and areas covered by relevant general plans.	43:45	2.2.1	2.1-01		
	(4)		Existing land use designations and the identification of water use sector and water source type.	43:45	2.2.1	2.1-03		
	(5)		The density of wells per square mile, by dasymetric or similar mapping techniques, showing the general distribution of agricultural, industrial, and domestic water supply wells in the basin, including de minimis extractors, and the location and extent of communities dependent upon groundwater, utilizing data provided by the Department, as specified in Section 353.2, or the best available information.	43:45	2.2.1	2.2-01		
(b)			A written description of the Plan area, including a summary of the jurisdictional areas and other features depicted on the map.	43:45	2.2.1	2.1-01		
(c)			Identification of existing water resource monitoring and management programs, and description of any such programs the Agency plans to incorporate in its monitoring network or in development of its Plan. The Agency may coordinate with existing water resource monitoring and management programs to incorporate and adopt that program as part of the Plan.	45:48	2.2.2, 2.2.2.1, 2.2.2.2		2.1-01, 2.1-02	
(d)			A description of how existing water resource monitoring or management programs may limit operational flexibility in the basin, and how the Plan has been developed to adapt to those limits.	46:48	2.2.2			
(e)			A description of conjunctive use programs in the basin.	48:49	2.2.2.3			
(f)			A plain language description of the land use elements or topic categories of applicable general plans that includes the following:					
	(1)		A summary of general plans and other land use plans governing the basin.	49:57	2.2.3.1	2.1-03		
	(2)		A general description of how implementation of existing land use plans may change water demands within the basin or affect the ability of the Agency to achieve sustainable groundwater management over the planning and implementation horizon, and how the Plan addresses those potential effects	49:57	2.2.3.1	2.1-03		
	(3)		A general description of how implementation of the Plan may affect the water supply assumptions of relevant land use plans over the planning and implementation horizon.	49:57	2.2.3.1			
	(4)		A summary of the process for permitting new or replacement wells in the basin, including adopted standards in local well ordinances, zoning codes, and policies contained in adopted land use plans.	57:58	2.2.3.2	2.1-03		
	(5)		To the extent known, the Agency may include information regarding the implementation of land use plans outside the basin that could affect the ability of the Agency to achieve sustainable groundwater management.	57	2.2.3.1.3	2.1-03		
(g)			A description of any of the additional Plan elements included in Water Code Section 10727.4 that the Agency determines to be appropriate.	58:59	2.2.4			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10720.3, 10727.2, 10727.4, 10733, and 10733.2, Water Code.					
§ 354.10.			**Notice and Communication**					
			Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:					

Article 5.			Plan Contents for Mound Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(a)			A description of the beneficial uses and users of groundwater in the basin, including the land uses and property interests potentially affected by the use of groundwater in the basin, the types of parties representing those interests, and the nature of consultation with those parties.	60:62	2.3.1	2.1-03		
(b)			A list of public meetings at which the Plan was discussed or considered by the Agency.	62	2.3.2			Appendix E List of Public Meetings
(c)			Comments regarding the Plan received by the Agency and a summary of any responses by the Agency.	63	2.3.3			Appendix F GSP Comments and Responses
(d)			A communication section of the Plan that includes the following:					
	(1)		An explanation of the Agency's decision-making process.	63:64	2.3.4.1			
	(2)		Identification of opportunities for public engagement and a discussion of how public input and response will be used.	64:66	2.3.4.2			Appendix D Stakeholder Engagement Plan
	(3)		A description of how the Agency encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin.	64:66	2.3.4.2			Appendix D Stakeholder Engagement Plan
	(4)		The method the Agency shall follow to inform the public about progress implementing the Plan, including the status of projects and actions.	66	2.3.4.3			Appendix D Stakeholder Engagement Plan
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.8, 10728.4, and 10733.2, Water Code					
SubArticle 2.			**Basin Setting**					
§ 354.12.			**Introduction to Basin Setting**					
			This Subarticle describes the information about the physical setting and characteristics of the basin and current conditions of the basin that shall be part of each Plan, including the identification of data gaps and levels of uncertainty, which comprise the basin setting that serves as the basis for defining and assessing reasonable sustainable management criteria and projects and management actions. Information provided pursuant to this Subarticle shall be prepared by or under the direction of a professional geologist or professional engineer.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.14.			**Hydrogeologic Conceptual Model**					
(a)			Each Plan shall include a descriptive hydrogeologic conceptual model of the basin based on technical studies and qualified maps that characterizes the physical components and interaction of the surface water and groundwater systems in the basin.	67:91	3.1			
(b)			The hydrogeologic conceptual model shall be summarized in a written description that includes the following:					
	(1)		The regional geologic and structural setting of the basin including the immediate surrounding area, as necessary for geologic consistency.	69:71	3.1.2	3.1-02:3.1-08		
	(2)		Lateral basin boundaries, including major geologic features that significantly affect groundwater flow.	73:74	3.1.4.1.1	3.1-02:3.1-08		
	(3)		The definable bottom of the basin.	73:74	3.1.4.1.1	3.1-04:3.1-08		
	(4)		Principal aquifers and aquitards, including the following information:					
		(A)	Formation names, if defined.	72	3.1.4	3.1-02, 3.1-04		
		(B)	Physical properties of aquifers and aquitards, including the vertical and lateral extent, hydraulic conductivity, and storativity, which may be based on existing technical studies or other best available information.	76:80	3.1.4.1.3	3.1-02:3.1-08, 3.1-10	3.1-01 3.1-02	Appendix G Shallow Alluvial Deposits and ISW

Article 5.			Plan Contents for Mound Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
		(C)	Structural properties of the basin that restrict groundwater flow within the principal aquifers, including information regarding stratigraphic changes, truncation of units, or other features.	74:76	3.1.4.1.2	3.1-02:3.1-08, 3.1-10		
		(D)	General water quality of the principal aquifers, which may be based on information derived from existing technical studies or regulatory programs.	76:80	3.1.4.3	3.1-12:3.1-25	3.1-03	
		(E)	Identification of the primary use or uses of each aquifer, such as domestic, irrigation, or municipal water supply.	87:88	3.1.4.4	3.1-26	3.1-02	Appendix G Shallow Alluvial Deposits and ISW
	(5)		Identification of data gaps and uncertainty within the hydrogeologic conceptual model	88:91	3.1.5			
(c)			The hydrogeologic conceptual model shall be represented graphically by at least two scaled cross-sections that display the information required by this section and are sufficient to depict major stratigraphic and structural features in the basin.	73:74	3.1.4.1.1	3.1-05:3.1-08		
(d)			Physical characteristics of the basin shall be represented on one or more maps that depict the following:					
	(1)		Topographic information derived from the U.S. Geological Survey or another reliable source.	68	3.1.1.1	3.1-01		
	(2)		Surficial geology derived from a qualified map including the locations of cross-sections required by this Section.	69:71	3.1.2	3.1-02:3.1-08		
	(3)		Soil characteristics as described by the appropriate Natural Resources Conservation Service soil survey or other applicable studies.	71:72	3.1.3	3.1-09		
	(4)		Delineation of existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas, including significant active springs, seeps, and wetlands within or adjacent to the basin.	81:82	3.1.4.2	3.1-11		
	(5)		Surface water bodies that are significant to the management of the basin.	68	3.1.1.2	3.1-01		
	(6)		The source and point of delivery for imported water supplies.	68:69	3.1.1.3	3.1-01		
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2, 10733, and 10733.2, Water Code.					
§ 354.16.			**Groundwater Conditions**					
			Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:					
(a)			Groundwater elevation data demonstrating flow directions, lateral and vertical gradients, and regional pumping patterns, including:					
	(1)		Groundwater elevation contour maps depicting the groundwater table or potentiometric surface associated with the current seasonal high and seasonal low for each principal aquifer within the basin.	91:93	3.2.1.1	3.2-01:3.2-08		
	(2)		Hydrographs depicting long-term groundwater elevations, historical highs and lows, and hydraulic gradients between principal aquifers.	93:96	3.2.1.2	3.2-10:3.2-16	3.2-01	
(b)			A graph depicting estimates of the change in groundwater in storage, based on data, demonstrating the annual and cumulative change in the volume of groundwater in storage between seasonal high groundwater conditions, including the annual groundwater use and water year type.	96:98	3.2.2	3.2-17		
(c)			Seawater intrusion conditions in the basin, including maps and cross-sections of the seawater intrusion front for each principal aquifer.	98:99	3.2.3	3.1-10		

Article 5.			**Plan Contents for Mound Basin**	**GSP Document References**				
				Page Numbers of Plan	**Or Section Numbers**	**Or Figure Numbers**	**Or Table Numbers**	**Notes**
(d)			Groundwater quality issues that may affect the supply and beneficial uses of groundwater, including a description and map of the location of known groundwater contamination sites and plumes.	99:102	3.2.4	3.1-15:3.1-19, 3.1-21, 3.1-22, 3.2-18		
(e)			The extent, cumulative total, and annual rate of land subsidence, including maps depicting total subsidence, utilizing data available from the Department, as specified in Section 353.2, or the best available information.	102:103	3.2.5	3.2-19		
(f)			Identification of interconnected surface water systems within the basin and an estimate of the quantity and timing of depletions of those systems, utilizing data available from the Department, as specified in Section 353.2, or the best available information.	103:105	3.2.6	3.1-01, 3.1-10, 3.1-11, 3.2-20		Appendix G Shallow Alluvial Deposits and ISW
(g)			Identification of groundwater dependent ecosystems within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information.	105:106	3.2.7	3.1-11		Appendix H GDEs
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10727.4, and 10733.2, Water Code.					
§ 354.18.			**Water Budget**					
(a)			Each Plan shall include a water budget for the basin that provides an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current and projected water budget conditions, and the change in the volume of water stored. Water budget information shall be reported in tabular and graphical form.	107:135	3.3		3.3-01	
(b)			The water budget shall quantify the following, either through direct measurements or estimates based on data:					
	(1)		Total surface water entering and leaving a basin by water source type.	107:124, 131:134	3.3, 3.3.1, 3.3.2, 3.3.3.2	3.1-01, 3.3-01, 3.3-07	3.3-02, 3.3-06	
	(2)		Inflow to the groundwater system by water source type, including subsurface groundwater inflow and infiltration of precipitation, applied water, and surface water systems, such as lakes, streams, rivers, canals, springs and conveyance systems.	107:124, 131:134	3.3, 3.3.1, 3.3.2, 3.3.3.2	3.1-11, 3.3-02, 3.3-08	3.3-03, 3.3-04, 3.3-07, 3.3-08	
	(3)		Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow.	107:124, 131:134	3.3, 3.3.1, 3.3.2, 3.3.3.2	3.3-01, 3.3-02, 3.3-08	3.3-03, 3.3-04, 3.3-07, 3.3-08	
	(4)		The change in the annual volume of groundwater in storage between seasonal high conditions.	107:124, 131:134	3.3, 3.3.1, 3.3.2, 3.3.3.2	3.2-17		
	(5)		If overdraft conditions occur, as defined in Bulletin 118, the water budget shall include a quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions.	134:135	3.3.4			
	(6)		The water year type associated with the annual supply, demand, and change in groundwater stored.	107:124, 131:134	3.3, 3.3.1, 3.3.2, 3.3.3.2	3.2-17		
	(7)		An estimate of sustainable yield for the basin.	134:135	3.3.4, 3.3.4.1, 3.3.4.2		3.3-03	
(c)			Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:					

Article 5.			Plan Contents for Mound Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(1)		Current water budget information shall quantify current inflows and outflows for the basin using the most recent hydrology, water supply, water demand, and land use information.	122:124	3.3.2	3.3-01, 3.3-02	3.3-01:3.3-04	
	(2)		Historical water budget information shall be used to evaluate availability or reliability of past surface water supply deliveries and aquifer response to water supply and demand trends relative to water year type. The historical water budget shall include the following:					
		(A)	A quantitative evaluation of the availability or reliability of historical surface water supply deliveries as a function of the historical planned versus actual annual surface water deliveries, by surface water source and water year type, and based on the most recent ten years of surface water supply information.	120:121	3.3.1.1	2.2-01, 3.3-04, 3.3-06	3.3-05	
		(B)	A quantitative assessment of the historical water budget, starting with the most recently available information and extending back a minimum of 10 years, or as is sufficient to calibrate and reduce the uncertainty of the tools and methods used to estimate and project future water budget information and future aquifer response to proposed sustainable groundwater management practices over the planning and implementation horizon.	116:121	3.3.1	3.3-01, 3.3-02, 3.3-03	3.3-02:3.3-04	
		(C)	A description of how historical conditions concerning hydrology, water demand, and surface water supply availability or reliability have impacted the ability of the Agency to operate the basin within sustainable yield. Basin hydrology may be characterized and evaluated using water year type.	121	3.3.1.2			
	(3)		Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:					
		(A)	Projected hydrology shall utilize 50 years of historical precipitation, evapotranspiration, and streamflow information as the baseline condition for estimating future hydrology. The projected hydrology information shall also be applied as the baseline condition used to evaluate future scenarios of hydrologic uncertainty associated with projections of climate change and sea level rise.	125:128	3.3.3.1.1	3.3-05		
		(B)	Projected water demand shall utilize the most recent land use, evapotranspiration, and crop coefficient information as the baseline condition for estimating future water demand. The projected water demand information shall also be applied as the baseline condition used to evaluate future scenarios of water demand uncertainty associated with projected changes in local land use planning, population growth, and climate.	128:130	3.3.3.1.2			
		(C)	Projected surface water supply shall utilize the most recent water supply information as the baseline condition for estimating future surface water supply. The projected surface water supply shall also be applied as the baseline condition used to evaluate future scenarios of surface water supply availability and reliability as a function of the historical surface water supply identified in Section 354.18(c)(2)(A), and the projected changes in local land use planning, population growth, and climate.	130	3.3.3.1.3	3.3-07	3.3-05:3.3-08	
(d)			The Agency shall utilize the following information provided, as available, by the Department pursuant to Section 353.2, or other data of comparable quality, to develop the water budget:					

Article 5.			Plan Contents for Mound Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(1)		Historical water budget information for mean annual temperature, mean annual precipitation, water year type, and land use.	116:120	3.3.1			
	(2)		Current water budget information for temperature, water year type, evapotranspiration, and land use.	122:124	3.3.2			
	(3)		Projected water budget information for population, population growth, climate change, and sea level rise.	131:134	3.3.3.2			
(e)			Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater flow. If a numerical groundwater and surface water model is not used to quantify and evaluate the projected water budget conditions and the potential impacts to beneficial uses and users of groundwater, the Plan shall identify and describe an equally effective method, tool, or analytical model to evaluate projected water budget conditions.	125	3.3.3.1	3.3-07:3.3-15	3.3-06:3.3-14	
(f)			The Department shall provide the California Central Valley Groundwater-Surface Water Simulation Model (C2VSIM) and the Integrated Water Flow Model (IWFM) for use by Agencies in developing the water budget. Each Agency may choose to use a different groundwater and surface water model, pursuant to Section 352.4.	125	3.3.3.1			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10721, 10723.2, 10727.2, 10727.6, 10729, and 10733.2, Water Code.					
§ 354.20.			**Management Areas**					
(a)			Each Agency may define one or more management areas within a basin if the Agency has determined that creation of management areas will facilitate implementation of the Plan. Management areas may define different minimum thresholds and be operated to different measurable objectives than the basin at large, provided that undesirable results are defined consistently throughout the basin.	135	3.4			
(b)			A basin that includes one or more management areas shall describe the following in the Plan:					
	(1)		The reason for the creation of each management area.	N/A				No management areas
	(2)		The minimum thresholds and measurable objectives established for each management area, and an explanation of the rationale for selecting those values, if different from the basin at large.	N/A				No management areas
	(3)		The level of monitoring and analysis appropriate for each management area.	N/A				No management areas
	(4)		An explanation of how the management area can operate under different minimum thresholds and measurable objectives without causing undesirable results outside the management area, if applicable.	N/A				No management areas
(c)			If a Plan includes one or more management areas, the Plan shall include descriptions, maps, and other information required by this Subarticle sufficient to describe conditions in those areas.	N/A				No management areas
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10733.2 and 10733.4, Water Code.					
SubArticle 3.			**Sustainable Management Criteria**					
§ 354.22.			**Introduction to Sustainable Management Criteria**					

Article 5.			Plan Contents for Mound Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
			This Subarticle describes criteria by which an Agency defines conditions in its Plan that constitute sustainable groundwater management for the basin, including the process by which the Agency shall characterize undesirable results, and establish minimum thresholds and measurable objectives for each applicable sustainability indicator.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.24.			**Sustainability Goal**					
			Each Agency shall establish in its Plan a sustainability goal for the basin that culminates in the absence of undesirable results within 20 years of the applicable statutory deadline. The Plan shall include a description of the sustainability goal, including information from the basin setting used to establish the sustainability goal, a discussion of the measures that will be implemented to ensure that the basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation and is likely to be maintained through the planning and implementation horizon.	138:139	4.2			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10721, 10727, 10727.2, 10733.2, and 10733.8, Water Code.					
§ 354.26.			**Undesirable Results**					
(a)			Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.	139:141, 150:152, 158:160, 167:168	4.3, 4.4.1, 4.5.1, 4.6.1, 4.7.1, 4.8.1			
(b)			The description of undesirable results shall include the following:					
	(1)		The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.	150:152, 158:160, 167:168	4.4.1, 4.5.1, 4.6.1, 4.7.1, 4.8.1			Appendix I GW Levels with MTs and MOs, Apendix J GW Quality With MTs and MOs
	(2)		The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.	150:152, 158:160, 167:168	4.4.1, 4.5.1, 4.6.1, 4.7.1, 4.8.1			
	(3)		Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.	150:152, 158:160, 167:168	4.4.1, 4.5.1, 4.6.1, 4.7.1, 4.8.1			
(c)			The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.	144, 153, 162, 170, 174:177	4.4.2.1.1, 4.5.2.1.1, 4.6.2.1.1, 4.7.2.1.1, 4.8.1			
(d)			An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.	185	4.9			

Article 5.			Plan Contents for Mound Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10721, 10723.2, 10727.2, 10733.2, and 10733.8, Water Code.					
§ 354.28.			**Minimum Thresholds**					
(a)			Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.	143:144, 153, 161:162, 169:170, 177:180	4.4.2.1, 4.5.2.1, 4.6.2.1, 4.7.2.1, 4.8.2.1	4.6-04, 4.6-05, 4.8-02	4.1-01:4.1-03	Appendix I GW Levels with MTs and Mos, Appendix J GW Quality MTs and MOs
(b)			The description of minimum thresholds shall include the following:					
	(1)		The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by uncertainty in the understanding of the basin setting.	143:144, 153, 161:162, 169:170, 177:180	4.4.2.1, 4.5.2.1, 4.6.2.1, 4.7.2.1, 4.8.2.1	4.6-01:4.6-05, 4.8-01a, 4.8-01b, 4.8-02	4.1-01:4.1-03,4.8-01	Appendix I GW Levels with MTs and Mos, Appendix J GW Quality MTs and MOs
	(2)		The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.	145, 154:155, 163, 171,180:181	4.4.2.2, 4.5.2.2, 4.6.2.2, 4.7.2.2, 4.8.2.2			Appendix K GW Storage Estimation
	(3)		How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.	145:146, 155, 163, 172, 181	4.4.2.3, 4.5.2.3, 4.6.2.3, 4.7.2.3, 4.8.2.3			
	(4)		How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.	146, 155, 164, 172, 181:182	4.4.2.4, 4.5.2.4, 4.6.2.4, 4.7.2.4, 4.8.2.4			
	(5)		How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.	148, 155, 164, 173, 182	4.4.2.6, 4.5.2.5, 4.6.2.5, 4.7.2.5, 4.8.2.5			
	(6)		How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.	148, 156, 165, 173, 182	4.4.2.7, 4.5.2.6, 4.6.2.6, 4.7.2.6, 4.8.2.6			
(c)			Minimum thresholds for each sustainability indicator shall be defined as follows:					
	(1)		Chronic Lowering of Groundwater Levels. The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results. Minimum thresholds for chronic lowering of groundwater levels shall be supported by the following:					
		(A)	The rate of groundwater elevation decline based on historical trends, water year type, and projected water use in the basin.	143:144	4.4.2.1			Appendix I GW Levels with MTs and MOs

Article 5.			Plan Contents for Mound Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
		(B)	Potential effects on other sustainability indicators.	143:144, 146:147	4.4.2.1, 4.4.2.5			
	(2)		Reduction of Groundwater Storage. The minimum threshold for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results. Minimum thresholds for reduction of groundwater storage shall be supported by the sustainable yield of the basin, calculated based on historical trends, water year type, and projected water use in the basin.	153	4.5.2.1			Appendix I GW Levels with MTs and MOs
	(3)		Seawater Intrusion. The minimum threshold for seawater intrusion shall be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results. Minimum thresholds for seawater intrusion shall be supported by the following:					
		(A)	Maps and cross-sections of the chloride concentration isocontour that defines the minimum threshold and measurable objective for each principal aquifer.	161:162	4.6.2.1	4.6-04, 4.6-05		
		(B)	A description of how the seawater intrusion minimum threshold considers the effects of current and projected sea levels.	161:162	4.6.2.1	4.6-02, 4.6-03		
	(4)		Degraded Water Quality. The minimum threshold for degraded water quality shall be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the Agency that may lead to undesirable results. The minimum threshold shall be based on the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined by the Agency to be of concern for the basin. In setting minimum thresholds for degraded water quality, the Agency shall consider local, state, and federal water quality standards applicable to the basin.	169:170	4.7.2.1	4.6-04, 4.6-05	4.1-03	Appendix J GW Quality with MTs and MOs
	(5)		Land Subsidence. The minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. Minimum thresholds for land subsidence shall be supported by the following:					
		(A)	Identification of land uses and property interests that have been affected or are likely to be affected by land subsidence in the basin, including an explanation of how the Agency has determined and considered those uses and interests, and the Agency's rationale for establishing minimum thresholds in light of those effects.	177:180	4.8.2.1	4.8-01a, 4.8-01b		
		(B)	Maps and graphs showing the extent and rate of land subsidence in the basin that defines the minimum threshold and measurable objectives.	177:180	4.8.2.1	3.2-19		
	(6)		Depletions of Interconnected Surface Water. The minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results. The minimum threshold established for depletions of interconnected surface water shall be supported by the following:					
		(A)	The location, quantity, and timing of depletions of interconnected surface water.	N/A				Does not apply to this GSP
		(B)	A description of the groundwater and surface water model used to quantify surface water depletion. If a numerical groundwater and surface water model is not used to quantify surface water depletion, the Plan shall identify and describe an equally effective method, tool, or analytical model to accomplish the requirements of this Paragraph.	N/A				Does not apply to this GSP

Article 5.			Plan Contents for Mound Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(d)			An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.	145, 154, 162, 171, 180	4.4.2.1.2, 4.5.2.1.2, 4.6.2.1.2, 4.7.2.1.2, 4.8.2.1.1		4.1-01	Appendix I GW Levels with MTs and MOs
(e)			An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.	143:144, 153, 161:162, 169:170, 177:180	4.4.2.1, 4.5.2.1, 4.6.2.1, 4.7.2.1, 4.8.2.1			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10733, 10733.2, and 10733.8, Water Code.					
§ 354.30.			**Measurable Objectives**					
(a)			Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.	148:150, 156:157, 165, 173:174, 183:185	4.4.3, 4.5.3, 4.6.3, 4.7.3, 4.8.3	4.6-04, 4.6-05	4.1-01:4.1-03	Appendix I GW Levels with MTs and MOs, Appendix J GW Quality with MTs and MOs
(b)			Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.	148:150, 156:157, 165, 173:174, 183:185	4.4.3, 4.5.3, 4.6.3, 4.7.3, 4.8.3	4.6-04, 4.6-05	4.1-01:4.1-03	Appendix I GW Levels with MTs and MOs, Appendix J GW Quality with MTs and MOs
(c)			Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.	148:150, 156:157, 165, 173:174, 183:185	4.4.3, 4.5.3, 4.6.3, 4.7.3, 4.8.3	4.6-04, 4.6-05	4.1-01:4.1-03	Appendix I GW Levels with MTs and MOs, Appendix J GW Quality with MTs and MOs
(d)			An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.	148:150, 156:157, 165, 173:174, 183:185	4.4.3, 4.5.3, 4.6.3, 4.7.3, 4.8.3	4.8-02	4.1-01, 4.1-03	Appendix I GW Levels with MTs and MOs
(e)			Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.	148:150, 156:157, 165, 173:174, 183:185	4.4.3, 4.5.3, 4.6.3, 4.7.3, 4.8.3		4.1-01	Appendix I GW Levels with MTs and MOs
(f)			Each Plan may include measurable objectives and interim milestones for additional Plan elements described in Water Code Section 10727.4 where the Agency determines such measures are appropriate for sustainable groundwater management in the basin.	185	4.10			
(g)			An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.	148:150, 156:157, 165, 173:174, 183:185	4.4.3, 4.5.3, 4.6.3, 4.7.3, 4.8.3		4.1-01, 4.1-02	Appendix I GW Levels with MTs and Mos, Appendix J GW Quality with MTs and MOs
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2, 10727.4, and 10733.2, Water Code.					

Article 5.			Plan Contents for Mound Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
SubArticle 4.			Monitoring Networks					
§ 354.32.			Introduction to Monitoring Networks					
			This Subarticle describes the monitoring network that shall be developed for each basin, including monitoring objectives, monitoring protocols, and data reporting requirements. The monitoring network shall promote the collection of data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions that occur through implementation of the Plan.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.34.			Monitoring Network					
(a)			Each Agency shall develop a monitoring network capable of collecting sufficient data to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface conditions, and yield representative information about groundwater conditions as necessary to evaluate Plan implementation.	187:193	5.2			
(b)			Each Plan shall include a description of the monitoring network objectives for the basin, including an explanation of how the network will be developed and implemented to monitor groundwater and related surface conditions, and the interconnection of surface water and groundwater, with sufficient temporal frequency and spatial density to evaluate the affects and effectiveness of Plan implementation. The monitoring network objectives shall be implemented to accomplish the following:					
	(1)		Demonstrate progress toward achieving measurable objectives described in the Plan.	187:193	5.2			
	(2)		Monitor impacts to the beneficial uses or users of groundwater.	187:193	5.2			
	(3)		Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds.	187:193	5.2			
	(4)		Quantify annual changes in water budget components.	187:193	5.2			
(c)			Each monitoring network shall be designed to accomplish the following for each sustainability indicator:					
	(1)		Chronic Lowering of Groundwater Levels. Demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features by the following methods:					
		(A)	A sufficient density of monitoring wells to collect representative measurements through depth-discrete perforated intervals to characterize the groundwater table or potentiometric surface for each principal aquifer.	194:196	5.3.1	5.3-01:5.3-03	5.3-01	
		(B)	Static groundwater elevation measurements shall be collected at least two times per year, to represent seasonal low and seasonal high groundwater conditions.	194:196	5.3.1		5.3-01	
	(2)		Reduction of Groundwater Storage. Provide an estimate of the change in annual groundwater in storage.	200:201	5.4.1			Appendix K GW Storage Estimation
	(3)		Seawater Intrusion. Monitor seawater intrusion using chloride concentrations, or other measurements convertible to chloride concentrations, so that the current and projected rate and extent of seawater intrusion for each applicable principal aquifer may be calculated.	203:204	5.5.1	5.3-04, 5.3-05	5.6-01	
	(4)		Degraded Water Quality. Collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues.	207:208	5.6.1	5.3-04, 5.3-05	5.6-01	

Article 5.			**Plan Contents for Mound Basin**	**GSP Document References**				
				Page Numbers of Plan	**Or Section Numbers**	**Or Figure Numbers**	**Or Table Numbers**	**Notes**
	(5)		Land Subsidence. Identify the rate and extent of land subsidence, which may be measured by extensometers, surveying, remote sensing technology, or other appropriate method.	212	5.7.1	3.2-19		
	(6)		Depletions of Interconnected Surface Water. Monitor surface water and groundwater, where interconnected surface water conditions exist, to characterize the spatial and temporal exchanges between surface water and groundwater, and to calibrate and apply the tools and methods necessary to calculate depletions of surface water caused by groundwater extractions. The monitoring network shall be able to characterize the following:					
		(A)	Flow conditions including surface water discharge, surface water head, and baseflow contribution.	N/A				Does not apply to this GSP
		(B)	Identifying the approximate date and location where ephemeral or intermittent flowing streams and rivers cease to flow, if applicable.	N/A				Does not apply to this GSP
		(C)	Temporal change in conditions due to variations in stream discharge and regional groundwater extraction.	N/A				Does not apply to this GSP
		(D)	Other factors that may be necessary to identify adverse impacts on beneficial uses of the surface water.	N/A				Does not apply to this GSP
(d)			The monitoring network shall be designed to ensure adequate coverage of sustainability indicators. If management areas are established, the quantity and density of monitoring sites in those areas shall be sufficient to evaluate conditions of the basin setting and sustainable management criteria specific to that area.	187:193	5.2			
(e)			A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.	193:214	5.3, 5.4, 5.5, 5.6, 5.7, 5.8			
(f)			The Agency shall determine the density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends based upon the following factors:					
	(1)		Amount of current and projected groundwater use.	187:193	5.2			
	(2)		Aquifer characteristics, including confined or unconfined aquifer conditions, or other physical characteristics that affect groundwater flow.	187:193	5.2			
	(3)		Impacts to beneficial uses and users of groundwater and land uses and property interests affected by groundwater production, and adjacent basins that could affect the ability of that basin to meet the sustainability goal.	187:193	5.2			
	(4)		Whether the Agency has adequate long-term existing monitoring results or other technical information to demonstrate an understanding of aquifer response.	187:193	5.2			
(g)			Each Plan shall describe the following information about the monitoring network:					
	(1)		Scientific rationale for the monitoring site selection process.	194:196, 200:201, 203:204, 207:208	5.3.1, 5.4.1, 5.5.1, 5.6.1, 5.7.1			
	(2)		Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.	196, 201, 204, 208:209, 212	5.3.2, 5.4.2, 5.5.2, 5.6.2, 5.7.2	3.2-19, 5.3-01:5.3-05	5.3-01, 5.6-01	

Article 5.			Plan Contents for Mound Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(3)		For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.	139:140, 193:194, 200, 203, 206, 211, 214	4.3, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8		4.1-01:4.1-03	
(h)			The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.	193:194, 200, 203, 206, 211, 214	5.3, 5.4, 5.5, 5.6, 5.7, 5.8	3.2-19, 5.3-01:5.3-05		
(i)			The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.	197, 201, 204, 209, 213	5.3.3, 5.4.3, 5.5.3, 5.6.3, 5.7.3			
(j)			An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.	193:194, 200, 203, 206, 211, 214	5.3, 5.4, 5.5, 5.6, 5.7, 5.8			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10727.4, 10728, 10733, 10733.2, and 10733.8, Water Code					
§ 354.36.			**Representative Monitoring**					
			Each Agency may designate a subset of monitoring sites as representative of conditions in the basin or an area of the basin, as follows:					
(a)			Representative monitoring sites may be designated by the Agency as the point at which sustainability indicators are monitored, and for which quantitative values for minimum thresholds, measurable objectives, and interim milestones are defined.	214	5.9	5.3-01, 5.3-02, 5.3-04, 5.3-05	5.3-02, 5.6-01	
(b)			(b) Groundwater elevations may be used as a proxy for monitoring other sustainability indicators if the Agency demonstrates the following:					
	(1)		Significant correlation exists between groundwater elevations and the sustainability indicators for which groundwater elevation measurements serve as a proxy.	214	5.9			
	(2)		Measurable objectives established for groundwater elevation shall include a reasonable margin of operational flexibility taking into consideration the basin setting to avoid undesirable results for the sustainability indicators for which groundwater elevation measurements serve as a proxy.	214	5.9			
(c)			The designation of a representative monitoring site shall be supported by adequate evidence demonstrating that the site reflects general conditions in the area.	214	5.9			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2 and 10733.2, Water Code					
§ 354.38.			**Assessment and Improvement of Monitoring Network**					
(a)			Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.	198:199, 202, 205, 210:211, 213:214	5.3.4, 5.4.4, 5.5.4, 5.6.4, 5.7.4			

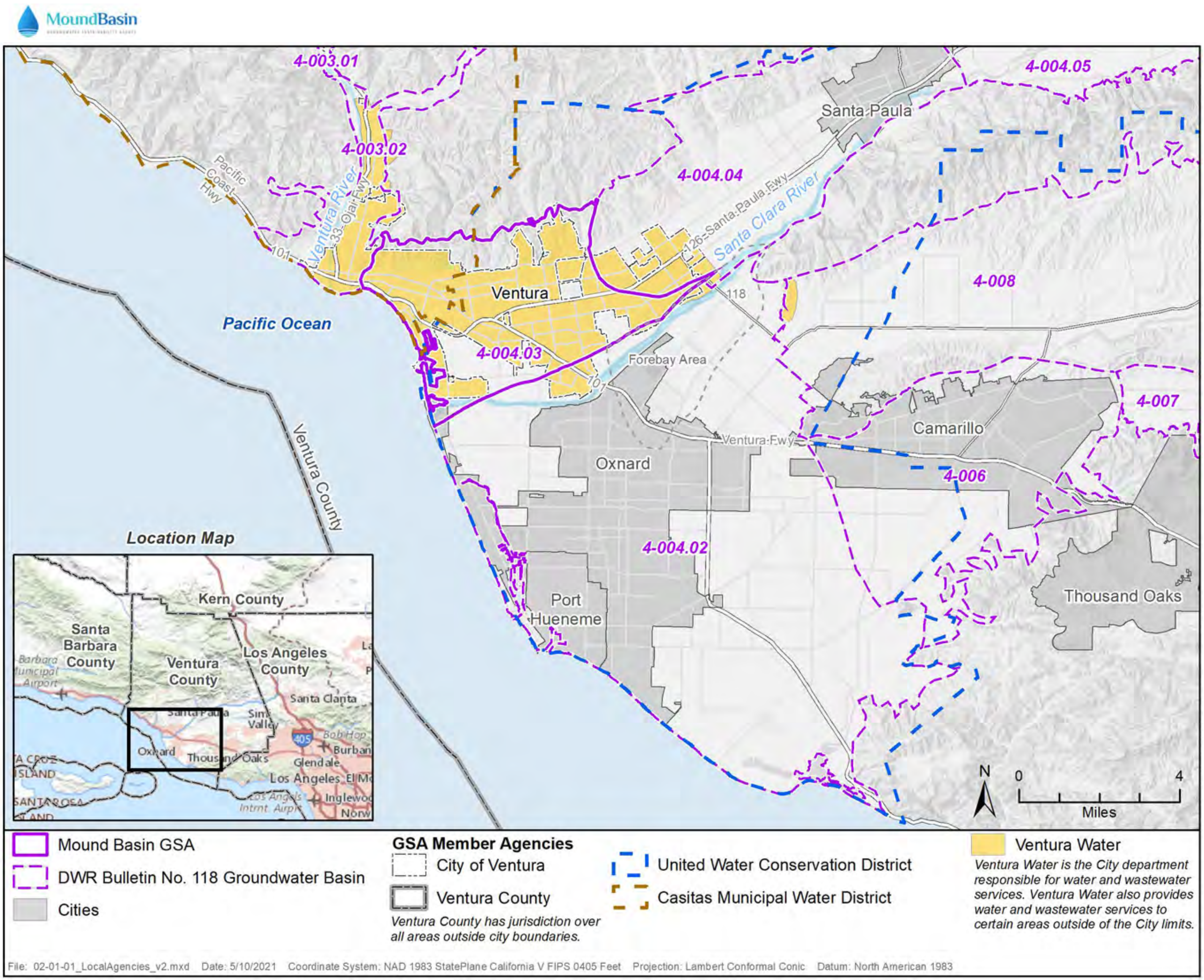
Article 5.			Plan Contents for Mound Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(b)			Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.	198:199, 202, 205, 210:211, 213:214	5.3.4, 5.4.4, 5.5.4, 5.6.4, 5.7.4	5.3-01, 5.3-02, 5.3-04, 5.3-05	5.3-02, 5.6-01	
(c)			If the monitoring network contains data gaps, the Plan shall include a description of the following:					
	(1)		The location and reason for data gaps in the monitoring network.	198:199, 202, 205, 210:211, 213:214	5.3.4, 5.4.4, 5.5.4, 5.6.4, 5.7.4	5.3-01, 5.3-02, 5.3-04, 5.3-05	5.3-02, 5.6-01	
	(2)		Local issues and circumstances that limit or prevent monitoring.	198:199, 202, 205, 210:211, 213:214	5.3.4, 5.4.4, 5.5.4, 5.6.4, 5.7.4			
(d)			Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.	198:199, 202, 205, 210:211, 213:214	5.3.4, 5.4.4, 5.5.4, 5.6.4, 5.7.4			
(e)			Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:					
	(1)		Minimum threshold exceedances.	198:199, 202, 205, 210:211, 213:214	5.3.4, 5.4.4, 5.5.4, 5.6.4, 5.7.4			
	(2)		Highly variable spatial or temporal conditions.	198:199, 202, 205, 210:211, 213:214	5.3.4, 5.4.4, 5.5.4, 5.6.4, 5.7.4			
	(3)		Adverse impacts to beneficial uses and users of groundwater.	198:199, 202, 205, 210:211, 213:214	5.3.4, 5.4.4, 5.5.4, 5.6.4, 5.7.4			
	(4)		The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.	198:199, 202, 205, 210:211, 213:214	5.3.4, 5.4.4, 5.5.4, 5.6.4, 5.7.4			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10728.2, 10733, 10733.2, and 10733.8, Water Code					
§ 354.40.			**Reporting Monitoring Data to the Department**					

Article 5.			Plan Contents for Mound Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
			Monitoring data shall be stored in the data management system developed pursuant to Section 352.6. A copy of the monitoring data shall be included in the Annual Report and submitted electronically on forms provided by the Department.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10728, 10728.2, 10733.2, and 10733.8, Water Code.					
SubArticle 5.			**Projects and Management Actions**					
§ 354.42.			**Introduction to Projects and Management Actions**					
			This Subarticle describes the criteria for projects and management actions to be included in a Plan to meet the sustainability goal for the basin in a manner that can be maintained over the planning and implementation horizon.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.44.			**Projects and Management Actions**					
(a)			Each Plan shall include a description of the projects and management actions the Agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.	216	6.1			
(b)			Each Plan shall include a description of the projects and management actions that include the following:					
	(1)		A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent. The Plan shall include the following:					
		(A)	A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management actions, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.	218, 221, 224, 227, 230	6.2.2, 6.3.2, 6.4.2, 6.5.2, 6.6.2			
		(B)	The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.	218, 221, 224:225, 227, 230	6.2.3, 6.3.3, 6.4.3, 6.5.3, 6.6.3			
	(2)		If overdraft conditions are identified through the analysis required by Section 354.18, the Plan shall describe projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft.	216	6.1			
	(3)		A summary of the permitting and regulatory process required for each project and management action.	218, 221, 225, 227, 231	6.2.4, 6.3.4, 6.4.4, 6.5.4, 6.6.4			
	(4)		The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.	218:219, 222, 225, 227:228, 231	6.2.5, 6.3.5, 6.4.5, 6.5.5, 6.6.5			

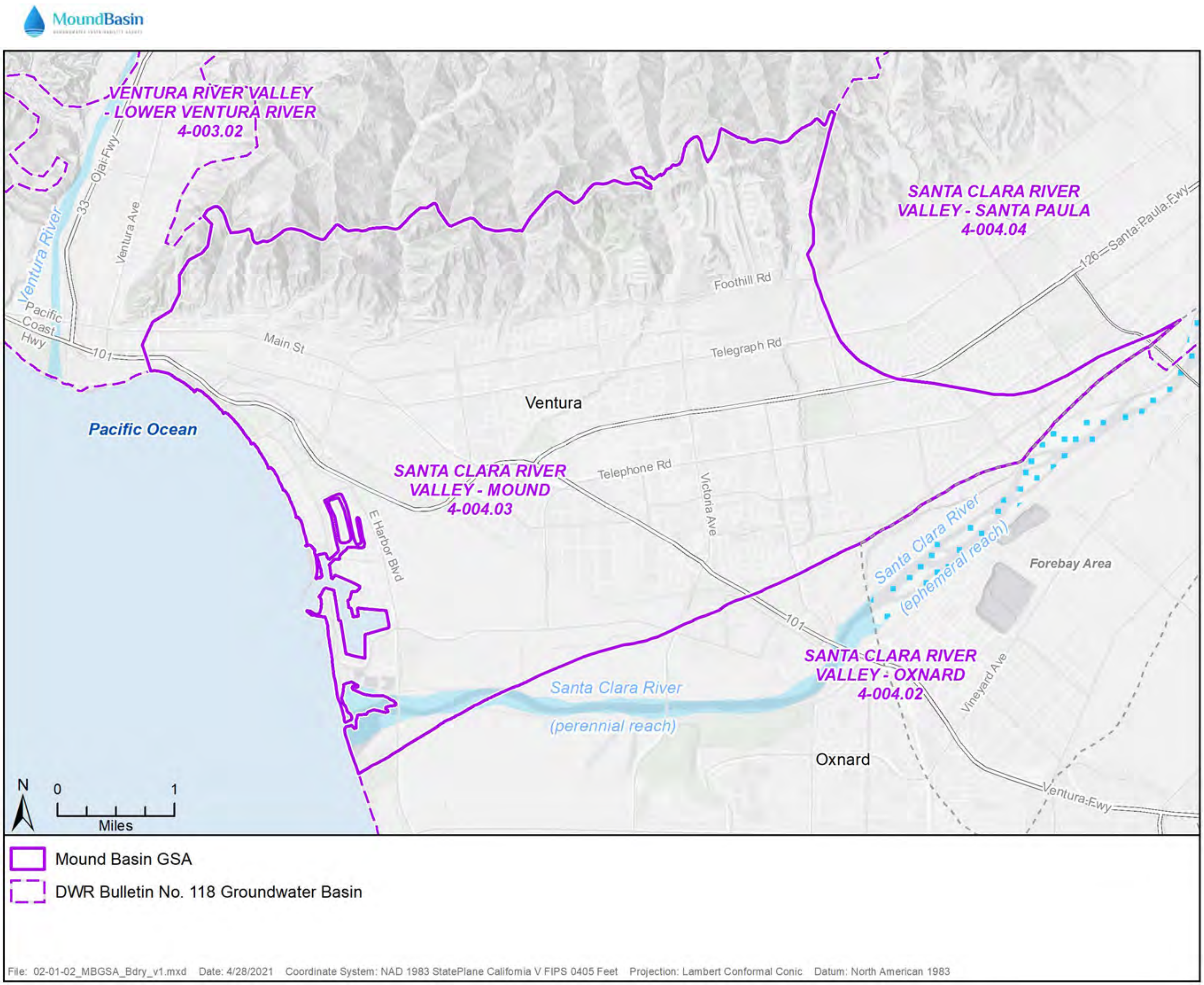
Article 5.			Plan Contents for Mound Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(5)		An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.	2189, 222, 225, 228, 231	6.2.6, 6.3.6, 6.4.6, 6.5.6, 6.6.6			
	(6)		An explanation of how the project or management action will be accomplished. If the projects or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.	219, 222, 225, 228, 231	6.2.7, 6.3.7, 6.4.7, 6.5.7, 6.6.7			
	(7)		A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.	219, 223, 226, 228, 232	6.2.8, 6.3.8, 6.4.8, 6.5.8, 6.6.8			
	(8)		A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.	219:220, 223, 226, 228, 232	6.2.9, 6.3.9, 6.4.9, 6.5.9, 6.6.9			
	(9)		A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.	216	6.1			
(c)			Projects and management actions shall be supported by best available information and best available science.	216	6.1			
(d)			An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.	216, 217, 220, 223:224, 226, 229:230	6.1, 6.2, 6.3, 6.4, 6.5, 6.6			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2, 10727.4, and 10733.2, Water Code.					

Appendix C

GSA Formation, MBGSA JPA and MBGSA Bylaws



Local Agency Boundary Map



Mound Basin Groundwater Sustainability Agency Boundary Map

BOARD OF DIRECTORS

MOUND BASIN GROUNDWATER SUSTAINABILITY AGENCY

RESOLUTION NO. 2017-01

A RESOLUTION OF THE MOUND BASIN GROUNDWATER SUSTAINABILITY AGENCY TO BE ELECTED AS THE GROUNDWATER SUSTAINABILITY AGENCY FOR THE MOUND BASIN PURSUANT TO THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT

WHEREAS, the California Legislature has adopted, and the Governor has signed into law, the Sustainable Groundwater Management Act of 2014 ("Act"), which authorizes local agencies to manage groundwater in a sustainable fashion; and

WHEREAS, the legislative intent of the Act is to provide for sustainable management of groundwater basins, to enhance local management of groundwater, to establish minimum standards for sustainable groundwater management, and to provide local agencies with the authority and the technical and financial assistance necessary to sustainably manage groundwater; and

WHEREAS, in order to exercise the authority granted in the Act, a local agency or combination of local agencies must elect to become a groundwater sustainability agency ("GSA"); and

WHEREAS, the Mound Groundwater Sustainability Agency ("Agency") is a local agency, as the Act defines that term; and

WHEREAS, the Agency exercises jurisdiction upon land overlying the entire Mound Basin (designated basin number 4-4.03 Department of Water Resources' ("DWR") CASGEM groundwater basin system) ("Basin"); and

WHEREAS, the Agency is committed to sustainable management of the Basin's groundwater resources; and

WHEREAS, the Act requires that a GSA be formed for all basins designated by DWR as a medium- or high-priority basins by June 30, 2017; and

WHEREAS, the Basin is designated as a medium-priority sub-basin of the Santa Clara River Valley Basin pursuant to the DWR's initial prioritization; and

WHEREAS, it is the intent of the Agency to work cooperatively with other local GSAs and stakeholders, as may be appropriate, to sustainably manage the Basin and ensure that the Act's goals are satisfied; and

WHEREAS, notice of a hearing on the Agency's election to become a GSA for the Basin ("Notice") has been published in the Ventura County Star as provided by law; and

WHEREAS, on this day, the Agency held a public hearing to consider whether it should elect to become a GSA for the Basin; and

WHEREAS, it would be in the best interest of the Basin for the Agency to become a GSA for the Basin, and to begin the process of preparing a groundwater sustainability plan ("Sustainability Plan"); and

WHEREAS, the Agency's process to develop the Sustainability Plan for the Basin will include stakeholder outreach and will provide multiple opportunities for public involvement; and

WHEREAS, adoption of this resolution does not constitute a "project" under California Environmental Quality Act Guidelines Section 15378(b)(5), including organization and administrative activities of government, because there would be no direct or indirect physical change in the environment.

THEREFORE, BE IT RESOLVED by the Board of Directors of the Mound Basin Groundwater Sustainability Agency, as follows:

1. All the recitals in this resolution are true and correct and the Agency so finds, determines and represents.

2. The Agency hereby elects to become the GSA for the Basin.

3. Within thirty days of the date of this resolution, but no later than June 30, 2017, the Agency's interim Executive Director is directed to provide notice to DWR of the Agency's election to be the GSA for the Basin ("Notice of GSA Election") in the manner required by law.

4. One of the elements of the Notice of GSA Election is the boundaries the Agency intends to manage as the GSA for the Basin. Until further action of the Agency, the boundaries of the GSA shall be the external boundaries of the Basin, the entirety of which currently falls within the Agency's jurisdiction.

5. Upon submission of the Notice of GSA Election, the Agency's Board of Director's shall begin discussions with interested stakeholders and beneficial users within the Basin in order to begin the process of developing a Sustainability Plan for the Basin.

6. The Agency's Executive Director is directed to report back to the Agency's Board of Directors at least quarterly on the progress toward developing the Sustainability Plan.

7. This resolution shall take effect immediately upon passage and adoption.

WE, THE UNDERSIGNED, do hereby certify that the above and foregoing Resolution No. 2017- 01 was duly adopted and passed by the Board of Directors of the Mound Basin Groundwater Sustainability Agency at a meeting held on the 22nd day of June, 2017, by the following vote:

AYES: DIRECTORS MOBLEY, SHEPHARD, AND MCDERMOTT
NOES: NONE.
ABSENT: NONE.

Interim Board Chair
Mound Basin Groundwater Sustainability Agency

ATTEST:

Interim Executive Director
Mound Basin Groundwater Sustainability Agency

AYES:
NOES:
ABSENT:

Interim Board Chair
Mound Basin Groundwater Sustainability Agency

ATTEST:

Interim Executive Director
Mound Basin Groundwater Sustainability Agency

Certificate of Publication

Ad #1637550

In Matter of Publication of:

Public Notice

State of California)
))§
County of Ventura)

I, **Maria Rodriguez**, hereby certify that the **Ventura County Star Newspaper** has been adjudged a newspaper of general circulation by the Superior Court of California, County of Ventura within the provisions of the Government Code of the State of California, printed in the City of Camarillo, for circulation in the County of Ventura, State of California; that I am a clerk of the printer of said paper; that the annexed clipping is a true printed copy and publishing in said newspaper on the following dates to wit:

June 07, 14, 2017

I, Maria Rodriguez certify under penalty of perjury, that the foregoing is true and correct.

Dated this June 14, 2017; in Camarillo, California, County of Ventura.

Maria Rodriguez
(Signature)

NOTICE OF PUBLIC HEARING

NOTICE IS HEREBY GIVEN that a Public Hearing of the Mound Basin Groundwater Sustainability Agency Board of Directors will be held:

--June 22, 2017 at 10:00 am--
MOUND BASIN GROUNDWATER SUSTAINABILITY AGENCY
City of Ventura City Hall, Community Meeting Room
501 Poli Street, Ventura, California 93001

The purpose of this Public Hearing is to accept public comment regarding the Mound Basin Groundwater Sustainability Agency's ("Agency") election to become the designated Groundwater Sustainability Agency ("GSA") pursuant to the Sustainable Groundwater Management Act ("SGMA") for the Mound Groundwater Basin ("Basin"). It is expected the County of Ventura, United Water Conservation District, and the City of San Buenaventura will execute a Joint Exercise of Powers Agreement to form the Agency. Under SGMA, a local agency is required to elect to become a GSA for the Basin by June 30, 2017. Failure to comply with this deadline subjects the Basin to state intervention under SGMA. Once a GSA is formed for the Basin, the GSA will begin holding public meetings to discuss development of a Groundwater Sustainability Plan. Additional information can be found at www.water.ca.gov/groundwater/sgm or by contacting:

Jeff Pratt, Public Works Agency Director, County of Ventura
Jeff.Pratt@ventura.org, 805-654-2073

Tony Morgan, Deputy General Manager for Groundwater & Water Resources, United Water Conservation District
tonym@unitedwater.org, 805-525-4431

Joe McDermott, Ventura Water Acting General Manager, City of San Buenaventura
jmcdermott@cityofventura.ca.gov, 805-654-7828

Publish: June 7, 2017 and June 14, 2017 Ad No.1637550

JOINT EXERCISE OF POWERS AGREEMENT

by and among

THE CITY OF SAN BUENAVENTURA

THE COUNTY OF VENTURA

and

UNITED WATER CONSERVATION DISTRICT

creating

THE MOUND BASIN GROUNDWATER SUSTAINABILITY AGENCY

JUNE 2017

Table of Contents

JOINT EXERCISE OF POWERS AGREEMENT
THE MOUND BASIN GROUNDWATER SUSTAINABILITY AGENCY

This **Joint Exercise of Powers Agreement ("Agreement")** is made and effective on the last date executed ("**Effective Date**"), by and among the City of San Buenaventura, the County of Ventura, and United Water Conservation District, sometimes referred to herein individually as a "**Member**" and collectively as the "**Members**" for purposes of forming the Mound Basin Groundwater Sustainability Agency ("**Authority**") and setting forth the terms pursuant to which the Authority shall operate. Capitalized defined terms used herein shall have the meanings given to them in Article 1 of this Agreement.

RECITALS

A. Each of the Members is a local agency, as defined by the Sustainable Groundwater Management Act of 2014 ("**SGMA**"), duly organized and existing under and by virtue of the laws of the State of California, and each Member can exercise powers related to groundwater management.

B. For groundwater basins designated by the Department of Water Resources ("**DWR**") as medium- and high-priority but that have not been designated by DWR as subject to critical conditions of overdraft, SGMA requires establishment of a groundwater sustainability agency ("**GSA**") by June 30, 2017 and adoption of a groundwater sustainability plan ("**GSP**") by January 31, 2022.

C. The Mound Basin (designated basin number 4-4.03 in the DWR's Bulletin No. 118) ("**Basin**") is designated as a medium-priority sub-basin of the Santa Clara River Valley Basin. DWR has not identified the Basin as being in a condition of critical overdraft.

D. Under SGMA, a combination of local agencies may form a GSA through a joint powers agreement.

E. The Members have determined that the sustainable management of the Basin pursuant to SGMA may best be achieved through the cooperation of the Members operating through a joint powers agreement.

F. The Joint Exercise of Powers Act of 2000 ("Act") authorizes the Members to create a joint powers authority, and to jointly exercise any power common to the Members and to exercise additional powers granted under the Act.

G. The Act, including the Marks-Roos Local Bond Pooling Act of 1985 (Government Code sections 6584, *et seq.*), authorizes an entity created pursuant to the Act to issue bonds, and under certain circumstances, to purchase bonds issued by, or to make loans to, the Members for financing public capital improvements, working capital, liability and other insurance needs or projects whenever doing so would result in significant public benefits, as determined by the Members. The Act further authorizes and empowers a joint powers authority to sell bonds so issued or purchased to public or private purchasers at public or negotiated sales.

H. Based on the foregoing legal authority, the Members desire to create a joint powers authority for the purpose of taking all actions deemed necessary by the joint powers authority to ensure sustainable management of the Basin as required by SGMA.

I. The governing body of each Member has determined it to be in the Member's best interest and in the public interest that this Agreement be executed.

TERMS OF AGREEMENT

In consideration of the mutual promises and covenants herein contained, the Members agree as follows:

ARTICLE 1
DEFINITIONS

The following terms have the following meanings for purposes of this Agreement:

1.1 "Act" means the Joint Exercise of Powers Act, set forth in Chapter 5 of Division 7 of Title 1 of the Government Code, sections 6500, *et seq.*, including all laws supplemental thereto.

1.2 "Agreement" has the meaning assigned thereto in the Preamble.

1.3 "Auditor" means the auditor of the financial affairs of the Authority appointed by the Board of Directors pursuant to Section 13.3 of this Agreement.

1.4 "Authority" has the meaning assigned thereto in the Preamble.

1.5 "Basin" has the meaning assigned thereto in Recital C.

1.6 "Board of Directors" or "Board" means the governing body of the Authority as established by Article 6 of this Agreement.

1.7 "Bylaws" means the bylaws, if any, adopted by the Board of Directors pursuant to Article 11 of this Agreement to govern the day-to-day operations of the Authority.

1.8 "Director" shall mean a Member or Stakeholder Director appointed pursuant to Article 6 of this Agreement.

1.9 "DWR" has the meaning assigned thereto in Recital B.

1.10 "Effective Date" has the meaning assigned thereto in the Preamble.

1.11 "Executive Director" means the chief administrative officer of the Authority to be appointed by the Board of Directors pursuant to Article 10 of this Agreement.

1.12 "Farm Bureau" means the Farm Bureau of Ventura County.

1.13 "GSA" has the meaning assigned thereto in Recital B.

1.14 "GSP" has the meaning assigned thereto in Recital B.

1.15 "Hazardous Materials Law" means any and all federal, state, or local laws, ordinances, rules, decrees, orders, regulations, or court decisions relating to hazardous substances, hazardous materials, hazardous waste, toxic substances, environmental conditions on, under or about any real property owned, leased, or controlled by the Authority, or soil and groundwater conditions, including, but not limited to, the Comprehensive Environmental Response, Compensation and Liability Act of 1980 ("CERCLA"), as amended, 42 U.S.C. § 9601, *et seq.*, the Resource Conservation and Recovery Act ("RCRA"), 42 U.S.C. § 6901, *et seq.*, the Hazardous Materials Transportation Act, 49 U.S.C. § 1801, *et seq.*, the California Hazardous Waste Control Act, Cal. Health and Safety Code § 25100, *et seq.*, the Carpenter-Presley-Tanner Hazardous Substances Account Act, Cal. Health and Safety Code § 25300, *et seq.*, the Safe Drinking Water and Toxic Enforcement Act, Cal. Health and Safety Code § 25249.5, *et seq.*, the Porter-Cologne Water Quality Control Act, Cal. Water Code § 13000, *et seq.*, any amendments to the foregoing, and any similar federal, state, or local laws, ordinances, rules, decrees, orders, or regulations.

1.16 "Hazardous Materials" means any chemical, compound, material, substance or other matter that: (a) is defined as a hazardous substance, hazardous material, hazardous waste or toxic substance under any Hazardous Materials Law; (b) is controlled or governed by any Hazardous Materials Law or gives rise to any reporting, notice or publication requirements hereunder, or gives rise to any liability, responsibility or duty on the part of the Authority, with respect to any third person hereunder; or (c) is flammable or explosive material, oil, asbestos, urea formaldehyde, radioactive material, nuclear medicine material, drug, vaccine, bacteria, virus, hazardous waste, toxic substance, or related injurious or potentially injurious material (by itself or in combination with other materials).

1.17 "MBAWG" means the Mound Basin Ag Water Group, a registered corporation in the State of California.

1.18 "Member" has the meaning assigned thereto in the Preamble and further means each party to this Agreement that satisfies the requirements of Section 5.1 of this Agreement, including any new members as may be authorized by the Board, pursuant to Section 5.2 of this Agreement.

1.19 "Member Director" means a Director appointed pursuant to Section 6.3 of this Agreement that represents a Member.

1.20 "Officer(s)" means the chair and vice chair/secretary to be appointed by the Board of Directors pursuant to Article 7 of this Agreement.

1.21 "SGMA" has the meaning assigned thereto in Recital A.

1.22 "Stakeholder Director" means a Director appointed pursuant to Section 6.3 that represents stakeholder interests.

1.23 "State" means the State of California.

1.24 "Representative" means an employee of the County of Ventura authorized to act on behalf of the Board of Supervisors or an employee of the City of San Buenaventura authorized to act on behalf of the City Council or an employee of United Water Conservation District authorized to act on behalf of the United Water Conservation District Board of Directors.

ARTICLE 2
CREATION OF THE AUTHORITY

2.1 Creation of Authority. There is hereby created pursuant to the Act a joint powers authority, which will be a public entity separate from the Members to this Agreement and shall be known as the Mound Basin Groundwater Sustainability Agency ("**Authority**"). Within thirty (30) days after the Effective Date of this Agreement and after any amendment, the Authority shall cause a notice of this Agreement or amendment to be prepared and filed with the office of the California Secretary of State containing the information required by Government Code section 6503.5. Within seventy (70) days after the Effective Date of this Agreement, the Authority shall cause a statement of the information concerning the Authority, required by Government Code section 53051, to be filed with the office of the California Secretary of State and with the County Clerk for the County of Ventura, setting forth the facts required to be stated pursuant to Government Code section 53051(a).

2.2 Purpose of the Authority. Each Member to this Agreement has in common the power to study, plan, develop, finance, acquire, construct, maintain, repair, manage, operate, control, and govern water supply projects and exercise groundwater management authority within the Basin either alone or in cooperation with other public or private non-member entities, and each is a local agency eligible to serve as the GSA in the Basin, either alone or jointly through a joint powers agreement as provided for by SGMA. This Agreement is being entered into in order to jointly exercise some or all of the foregoing common powers, as appropriate, and for the exercise of such additional powers as may be authorized by law in the manner herein set forth, in order to effectuate the purposes of this Agreement. The purpose of the Authority is to serve as the GSA for the Basin and to develop, adopt, and implement the GSP for the Basin pursuant to SGMA and other applicable provisions of law.

ARTICLE 3
TERM

This Agreement shall become effective upon execution by each of the Members and shall remain in effect until terminated pursuant to the provisions of Article 16 of this Agreement.

ARTICLE 4
POWERS

The Authority shall possess the power in its own name to exercise any and all common powers of its Members reasonably related to the purposes of the Authority, including but not limited to the powers set forth below, together with such other powers as are expressly set forth in the Act or in SGMA or as it may be amended in the future. For purposes of Government Code section 6509, and unless the Authority has adopted applicable rules, regulations, policies, bylaws and procedures, the powers of the Authority shall be exercised subject to the restrictions upon the manner of exercising such powers as are imposed on the County of Ventura, and in the event of the withdrawal of the County of Ventura as a Member under this Agreement, then the powers of the Authority shall be exercised subject to the restrictions upon the manner of exercising such powers as are imposed on the City of San Buenaventura.

4.1 To exercise all powers afforded to the Authority under SGMA or any amendment thereto, including without limitation:

4.1.1 To adopt rules, regulations, policies, bylaws and procedures governing the operation of the Authority.

4.1.2 To develop, adopt and implement a GSP for the Basin, and to exercise jointly the common powers of the Members in doing so.

4.1.3 To obtain rights, permits and other authorizations for, or pertaining to, implementation of a GSP for the Basin.

4.1.4 To collect and monitor data on the extraction of groundwater from, and the quality of groundwater in, the Basin.

4.1.5 To acquire property and other assets by grant, lease, purchase, bequest, devise, gift, or eminent domain, and to hold, enjoy, lease or sell, or otherwise dispose of, property, including real property, water rights, and personal property, necessary for the full exercise of the Authority's powers.

4.1.6 To establish and administer a conjunctive use program for the purposes of maintaining sustainable yields in the Basin consistent with the requirements of SGMA or any amendment thereto.

4.1.7 To exchange and distribute water.

4.1.8 To regulate groundwater extractions as permitted by SGMA.

4.1.9 To spread, sink and inject water into the Basin.

4.1.10 To store, transport, recapture, recycle, purify, treat or otherwise manage and control water for beneficial use.

4.1.11 To develop and facilitate market-based solutions for the use and management of water rights.

4.1.12 To impose assessments, groundwater extraction fees or other charges, and to undertake other means of financing the Authority as authorized by Chapter 8 of SGMA, commencing at section 10730 of the Water Code.

4.1.13 To perform other ancillary tasks relating to the operation of the Authority pursuant to SGMA, including without limitation, environmental review, engineering, and design.

4.2 To apply for, accept and receive licenses, permits, water rights, approvals, agreements, grants, loans, contributions, donations or other aid from any agency of the United States, the State of California or other public agencies or private persons or entities necessary for the Authority's purposes

4.3 To develop, collect, provide, and disseminate information that furthers the purposes of the Authority.

4.4 To make and enter contracts necessary to the full exercise of the Authority's power.

4.5 To employ, designate, or otherwise contract for the services of, agents, officers, employees, attorneys, engineers, planners, financial consultants, technical specialists, advisors, and independent contractors.

4.6 To incur debts, liabilities or obligations, to issue bonds, notes, certificates of participation, guarantees, equipment leases, reimbursement obligations and other indebtedness, as authorized by the Act.

4.7 To cooperate, act in conjunction and contract with the United States, the State of California, or any agency thereof, counties, municipalities, public and private corporations of any kind (including without limitation, investor-owned utilities), and individuals, or any of them, for any and all purposes necessary or convenient for the full exercise of the powers of the Authority.

4.8 To sue and be sued in the Authority's own name.

4.9 To provide for the prosecution of, defense of, or other participation in, actions or proceedings at law or in public hearings in which the Members, pursuant to this Agreement, have an interest and employ counsel and other expert assistance for these purposes.

4.10 To accumulate operating and reserve funds for the purposes herein stated.

4.11 To invest money that is not required for the immediate necessities of the Authority, as the Authority determines is advisable, in the same manner and upon the same conditions as Members, pursuant to Government Code section 53601, as that section now exists or may hereafter be amended.

4.12 To undertake any investigations, studies, and matters of general administration.

4.13 To perform all other acts necessary or proper to carry out fully the purposes of this Agreement.

ARTICLE 5
MEMBERSHIP

5.1 Members. The Members of the Authority shall be the City of San Buenaventura, the County of Ventura, and United Water Conservation District, as long as they have not, pursuant to the provisions hereof, withdrawn from this Agreement.

5.2 New Members. Any local agency (as defined by SGMA) that is not a Member on the Effective Date of this Agreement may become a Member upon appropriate amendment of this Agreement pursuant to Section 17.3.

ARTICLE 6
BOARD OF DIRECTORS

6.1 Formation of the Board of Directors. The Authority shall be governed by a Board of Directors ("**Board of Directors**" or "**Board**"). The Board shall consist of five (5) Directors comprised of representatives who shall be appointed in the manner set forth in Section 6.3.

6.1.1 Three (3) Member Directors appointed by the governing body of each Member.

6.1.2 One (1) Agricultural Stakeholder Director representative of agricultural interests within the Basin. The Agricultural Stakeholder Director need not be a member of the MBAWG or the Farm Bureau. The Agricultural Stakeholder Director shall meet either or both of the following qualifications:

a) Own, as an individual or shareholder, trustee, limited liability company member or manager, or as a member of any other owner entity, land overlying the Basin (at least partially) that is utilized for a commercial agricultural business that produces groundwater from the Basin for its agricultural operation; or

b) Operate a commercial agricultural business that itself produces groundwater from the Basin for its agricultural operations on land overlying the Basin and be an approved stakeholder representative by that property's owner.

6.1.3 One (1) Environmental Stakeholder Director representative of environmental interests within the Basin. The Environmental Stakeholder Director shall be an active member of a nonprofit, 501(c)(3) organization which has an adopted budget and, at the sole discretion of the Member Directors, meets the following requirements: (i) is currently active within lands overlying the Mound Basin; and (ii) has a mission that advances, or is furthered by, groundwater sustainability.

6.2 Duties of the Board of Directors. The business and affairs of the Authority, and all of the powers of the Authority, including without limitation all powers set forth in Article 4 (Powers), are reserved to and shall be exercised by and through the Board of Directors, except as may be expressly delegated to the Executive Director or others pursuant to this Agreement, Bylaws, or by specific action of the Board of Directors.

6.3 Appointment of Directors. The Directors shall be appointed as follows:

6.3.1 One (1) Member Director for the City of San Buenaventura shall be appointed by the City of San Buenaventura City Council. The Member Director will be a City Councilmember or Representative.

6.3.2 One (1) Member Director for the County of Ventura shall be appointed by the County of Ventura Board of Supervisors. The Member Director will be a County Supervisor or Representative.

6.3.3 One (1) Member Director for the United Water Conservation District shall be appointed by the United Water Conservation District Board of Directors. The Member Director will be a member of the United Water Conservation District Board of Directors or a Representative.

6.3.4 One (1) Agricultural Stakeholder Director unanimously selected by the Member Directors from a list of one or more qualified nominees submitted by the MBAWG, or the Farm Bureau if the MBAWG is unwilling or unable to nominate potential directors. The MBAWG, or the Farm Bureau, shall submit its nominee(s) to the Member Directors pursuant to a process specified in the Bylaws, unless directed otherwise by the Member Directors until such time as the Bylaws have been adopted. The Member Directors shall consider the nominee(s) at a regular meeting and at that meeting shall approve and appoint the Agricultural Stakeholder Director. In the absence of a unanimous vote of approval and appointment by the Member Directors, the Member Directors can request different nominations.

6.3.5 One (1) Environmental Stakeholder Director unanimously selected by the Member Directors from a nominee nominated by the following environmental organizations collectively:

1. Friends of the Santa Clara River
2. California Trout
3. National Audubon Society
4. Sierra Club
5. Santa Clara River Watershed Conservancy
6. Los Padres ForestWatch
7. Central Coast Alliance United for a Sustainable Economy
8. The Nature Conservancy
9. Wishtoyo Foundation
10. Keep Sespe Wild
11. Surfrider Foundation

12. CFROG (Citizens for Responsible Oil & Gas)

or, The Nature Conservancy if, and only if, the aforementioned list of organizations is unwilling or unable to nominate a potential Environmental Stakeholder Director. If the Member Directors do not accept a potential Environmental Stakeholder Director nominated by the aforementioned list of organizations or The Nature Conservancy, as applicable, the Member Directors shall request an additional nomination, as necessary. The aforementioned list of organizations shall submit its nominee to the Member Directors pursuant to a process specified in the Bylaws, unless directed otherwise by the Member Directors. The Member Directors shall consider the nominee(s) at a regular meeting and at that meeting shall approve and appoint the Environmental Stakeholder Director.

6.4 Director Terms and Removal. Each Member Director shall be appointed by resolution of that Member's governing body to serve for a term of two (2) years. To stagger the terms of the Directors, the initial terms of the Member Directors from the City of San Buenaventura and the United Water Conservation District shall be three (3) years. Subsequent terms for those Directors will be two (2) years. A Member's Director may be removed during his or her term or reappointed for multiple terms at the pleasure of the Member that appointed him or her. Stakeholder Directors shall serve for a term of one (1) year and may serve for more than one term.

6.5 Vacancies. A vacancy on the Board of Directors shall occur when a Director resigns or at the end of the Director's term as set forth in Section 6.4. For Member Directors, a vacancy shall also occur when he or she is (a) removed by his or her appointing Member; or (b) ceases to be a member of the Member's governing body; or (c) ceases to be an employee of the Member. Upon the vacancy of a Director, the seat shall remain vacant until a replacement Director is appointed as set forth in Section 6.3. Members shall submit any changes in Director positions to the Executive Director by written notice signed by an authorized representative of the Member. The written notice shall include a resolution of the governing body of the Member directing such change in the Director position.

6.6 Conflicts of Interest. Notwithstanding Section 8.5, no Director shall be allowed to participate in any matter before the Board in which he or she has a conflict of interest. A Member Director is deemed to have a conflict of interest and disqualified from participating in related matters before the Board if that Member Director (i) is personally, or (ii) was appointed by a Member that is, named as an adverse party in any litigation in which the Authority is a party. A Stakeholder Director is deemed to have a conflict of interest and disqualified from participating in related matters before the Board if that Stakeholder Director (i) is personally, (ii) is employed by, or (iii) acts as a manager or executive director to, or sits on the board of, an entity that is named as, an adverse party in litigation in which the Authority is a party, except that the Authority's intervention or participation in an "adjudication action," as defined by Water Code section 10721, shall not give rise to a conflict of interest under this section. In such an event, the Director shall be deemed disqualified in all matters related to the issue being litigated, shall not be eligible to receive confidential information relating to the litigation from the Authority or its legal counsel, and shall not be eligible to attend any closed session where the litigation is discussed. In the event a Director deemed to have a conflict of interest refuses to withdraw from matters related to the conflict, the other Directors shall jointly seek a court order preventing the conflicted Director from participating in those related matters.

ARTICLE 7
OFFICERS

7.1 Officers. Officers of the Authority shall be a chair and vice chair/secretary. An additional Officer of the Authority shall be a treasurer appointed consistent with the provisions of Section 13.3. The vice chair/secretary shall exercise all powers of the chair in the chair's absence or inability to act.

7.2 Appointment of Officers. Officers shall be elected annually by, and serve at the pleasure of, the Board of Directors. Officers shall be elected at the first Board meeting, and thereafter at the first Board meeting following January 1st of each year. An Officer may serve for multiple consecutive terms, with no term limit. Any Officer may resign at any time upon written notice to the Board, and may be removed and replaced by a simple majority vote of the full Board.

7.3 Principal Office. The principal office of the Authority shall be established by the Board of Directors, and may thereafter be changed by a simple majority vote of the full Board. The principal office of the Authority shall be located within the jurisdictional boundaries of one or more of the Members.

ARTICLE 8
DIRECTOR MEETINGS

8.1 Initial Meeting. The initial meeting of the Board of Directors shall be held in the County of Ventura, California within thirty (30) days of the Effective Date of this Agreement.

8.2 Time and Place. The Board of Directors shall meet at least quarterly, at a date, time and place set by the Board within the jurisdictional boundaries of one or more of the Members, and at such times as may be determined by the Board.

8.3 Special Meetings. Special meetings of the Board of Directors may be called in accordance with the Ralph M. Brown Act (Government Code sections 54950, *et seq.*).

8.4 Conduct. All meetings of the Board of Directors, including special meetings, shall be noticed, held, and conducted in accordance with the Ralph M. Brown Act (Government Code sections 54950, *et seq.*). The Board may use teleconferencing in connection with any meeting in conformance with and to the extent authorized by applicable law.

8.5 Local Conflict of Interest Code. The Board of Directors shall adopt a local conflict of interest code pursuant to the provisions of the Political Reform Act of 1974 (Government Code sections 81000, *et seq.*).

ARTICLE 9
VOTING

9.1 Quorum. A quorum of any meeting of the Board of Directors shall consist of a majority of the Directors. In the absence of a quorum, any meeting of the Directors may be adjourned by a vote of a simple majority of Directors present, but no other business may be transacted. For purposes of this Article, a Director shall be deemed present if the Director appears at the meeting in person or participates telephonically, provided the telephone appearance is consistent with the requirements of the Ralph M. Brown Act.

9.2 Director Votes. Voting by the Board of Directors shall be made on the basis of one vote for each Director. A Director may vote on all matters of Authority business unless disqualified because of a conflict of interest pursuant to California law or the local conflict of interest code adopted by the Board of Directors.

9.3 Affirmative Decisions of the Board of Directors. Except as otherwise specified in this Agreement, all decisions of the Board of Directors shall require the affirmative vote of a minimum of three (3) Directors, except for the following matters which require special voting procedures from the Board to pass: (i) the Authority's annual budget and amendments thereto; (ii) the GSP for the Basin or any amendments thereto; (iii) the Authority's adoption of groundwater extraction fees or charges; (iv) the Authority's adoption of any taxes, fees, or assessments subject to Proposition 218; or (v) any stipulation to resolve litigation concerning groundwater rights within, or groundwater management for, the Basin. For these matters requiring special voting procedures, the matter may be approved on the first reading of the matter pursuant to a unanimous vote of all Directors; if unanimity is not obtained on the first reading of a matter, the Board shall continue a final vote on the matter for a second reading at the next regular meeting of the Board, unless the Board votes to continue the second reading of the matter to another regular or special meeting of the Board; the matter may be approved on the second reading of the matter by the affirmative vote of a minimum of three (3) Directors, if, and only if, at least one (1) of the affirmative votes is by the City of San Buenaventura's Director or the Agricultural Stakeholder Director.

ARTICLE 10
EXECUTIVE DIRECTOR AND STAFF

10.1 Appointment. The Board of Directors shall appoint an Executive Director, who may be, though need not be, an officer, employee, or representative of one of the Members. The Executive Director's compensation, if any, shall be determined by the Board of Directors.

10.2 Duties. If appointed, the Executive Director shall be the chief administrative officer of the Authority, shall serve at the pleasure of the Board of Directors, and shall be responsible to the Board for the proper and efficient administration of the Authority. The Executive Director shall have the powers designated by the Board, or otherwise as set forth in the Bylaws.

10.3 Term and Termination. The Executive Director shall serve until he/she resigns or the Board of Directors terminates his/her appointment.

10.4 Staff and Services. The Executive Director may employ such additional full-time and/or part-time employees, assistants and independent contractors who may be necessary from time to time to accomplish the purposes of the Authority, subject to the approval of the Board of

Directors. The Authority may contract with a Member or other public agency or private entity for various services, including without limitation, those related to the Authority's finance, purchasing, risk management, information technology and human resources. A written agreement shall be entered between the Authority and the Member or other public agency or private entity contracting to provide such service, and that agreement shall specify the terms on which such services shall be provided, including without limitation, the compensation, if any, that shall be made for the provision of such services.

ARTICLE 11
BYLAWS

The Board of Directors shall cause to be drafted and approve Bylaws of the Authority to govern the day-to-day operations of the Authority. The Bylaws shall be adopted at or before the first anniversary of the Board's first meeting and may be amended from time to time.

ARTICLE 12
COMMITTEES

The Board of Directors may from time to time appoint one or more advisory committees or establish standing or ad hoc committees to assist in carrying out the purposes and objectives of the Authority. The Board shall determine the purpose and need for such committees and the necessary qualifications for individuals appointed to them. Each standing or ad hoc committee shall include a Director as the chair thereof. However, no committee or participant on such committee shall have any authority to act on behalf of the Authority.

ARTICLE 13
ACCOUNTING PRACTICES

13.1 General. The Board of Directors shall establish and maintain such funds and accounts as may be required by generally accepted public agency accounting practices. The Authority shall maintain strict accountability of all funds and report of all receipts and disbursements of the Authority.

13.2 Fiscal Year. Unless the Board of Directors decides otherwise, the fiscal year for the Authority shall run from July 1 to June 30.

13.3 Appointment of Treasurer and Auditor; Duties. The treasurer and Auditor shall be appointed in the manner, and shall perform such duties and responsibilities, specified in sections 6505, 6505.5 and 6505.6 of the Act. The treasurer shall be bonded in accordance with the provisions of section 6505.1 of the Act.

ARTICLE 14
BUDGET AND EXPENSES

14.1 Budget. Within one hundred and twenty (120) days after the first meeting of the Board of Directors, and thereafter prior to the commencement of each fiscal year, the Board shall adopt a budget for the Authority for the ensuing fiscal year. In the event that a budget is not so approved, the prior year's budget shall be deemed approved for the ensuing fiscal year, and any groundwater extraction fee or assessment(s) of contributions by Members, or both, approved by the Board during the prior fiscal year shall again be assessed in the same amount and terms for the ensuing fiscal year.

14.2 Authority Funding and Contributions. For the purpose of funding the expenses and ongoing operations of the Authority, the Board of Directors shall maintain a funding account in connection with the annual budget process. The Board of Directors may fund the Authority and the GSP as provided in Chapter 8 of SGMA (commencing with section 10730 of the Water Code), through voluntary contributions from Members. The Members agree that the Authority, and not the Members, have the sole responsibility to develop and implement a funding program to fiscally and fully implement the Authority's SGMA compliance efforts and ongoing operations.

14.3 Return of Contributions. In accordance with Government Code section 6512.1, the Authority may reimburse Members for all or any part of any contributions made by Members, and any revenues by the Authority may be distributed by the Board of Directors at such time and upon such terms as the Board of Directors may decide; provided that (1) any distributions shall be made in proportion to the contributions paid by each Member to the Authority, and (2) any capital contribution paid by a Member voluntarily, and without obligation to make such capital contribution pursuant to Section 14.2, shall be returned to the contributing Member, together with accrued interests at the annual rate published as the yield of the Local Agency Investment Fund administered by the California State Treasurer, before any other return of contributions to the Members is made. The Authority shall hold title to all funds and property acquired by the Authority during the term of this Agreement.

14.4 Issuance of Indebtedness. The Authority may issue bonds, notes or other forms of indebtedness, as permitted under Section 4.6, provided such issuance is approved at a meeting of the Board.

ARTICLE 15
LIABILITIES

15.1 Liability. In accordance with Government Code section 6507, the debt, liabilities and obligations of the Authority shall be the debts, liabilities and obligations of the Authority alone, and not the individual Members.

15.2 Indemnity. Funds of the Authority may be used to defend, indemnify, and hold harmless the Authority, each Member, each Director, and any officers, agents and employees of the Authority for their actions taken within the course and scope of their duties while acting on behalf of the Authority. To the fullest extent permitted by law, the Authority agrees to save, indemnify, defend and hold harmless each Member from any liability, claims, suits, actions, arbitration proceedings, administrative proceedings, regulatory proceedings, losses, expenses or costs of any kind, whether actual, alleged or threatened, including attorney's fees and costs, court costs, interest, defense costs, and expert witness fees, where the same arise out of, or are in any way attributable in whole or in part to, acts or omissions of the Authority or its employees, officers or agents or negligent acts or omissions (not including gross negligence or wrongful conduct) of the employees, officers or agents of any Member, while acting within the course and scope of a Member relationship with the Authority.

15.3 Privileges and Immunities. All of the privileges and immunities from liability, exemption from laws, ordinances and rules, all pension, relief, disability, workers compensation, and other benefits which apply to the activity of officers, agents, or employees of any of the Members when performing their respective functions shall apply to them to the same degree and extent while engaged in the performance of any of the functions and other duties under this Agreement. None of the officers, agents, or employees appointed by the Board of Directors shall be deemed, by reason of their employment by the Board of Directors, to be employed by any of the Members or, by reason of their employment by the Board of Directors to be subject to any of the requirements of such Members.

15.4 Hazardous Materials. The Authority shall indemnify, protect, defend, and hold harmless the Members (and their respective officers, directors, employees and agents) from and against any and all liabilities, claims, suits, judgments, actions, investigations, proceedings, costs and expenses (including reasonable attorneys' fees and court costs) to the extent arising out of or in connection with any breach of any provisions of this Section directly or indirectly arising out of the use, generation, storage, release, disposal or transportation of Hazardous Materials by the Authority, or any successor of the Authority, or their respective agents, contractors, employees, licensees, or invitees, including, but not limited to, all foreseeable and unforeseeable consequential damages and the cost of any Remedial Work. The foregoing indemnity shall be in addition to and not a limitation of the indemnification provisions of Section 15.2 hereof. The foregoing indemnity extends beyond the term of this Agreement and is intended to operate as an agreement pursuant to Section 107(e) of the Comprehensive Environmental Response, Compensation, and Liability Act, 'CERCLA,' 42 U.S.C. Section 9607(e), and California Health and Safety Code Section 25364, and their successor statutes, to insure, protect, defend, hold harmless, and indemnify the Members from liability.

15.5 Liability Insurance. The Board of Directors shall obtain, and maintain in effect, appropriate liability insurance to cover the activities of the Authority's Directors and staff in the ordinary course of their duties.

ARTICLE 16
WITHDRAWAL OF MEMBERS

16.1 Unilateral Withdrawal. Subject to the Dispute Resolution provisions set forth in Section 17.9, a Member may unilaterally withdraw from this Agreement without causing or requiring termination of this Agreement, effective upon sixty (60) days written notice to the Executive Director.

16.2 Rescission or Termination of Authority. This Agreement may be rescinded and the Authority terminated by unanimous written consent of all Members, except during the outstanding term of any Authority indebtedness.

16.3 Effect of Withdrawal or Termination. Upon termination of this Agreement or unilateral withdrawal, a Member shall remain obligated to pay its share of all debts, liabilities and obligations of the Authority required of the Member pursuant to terms of this Agreement, and that were incurred or accrued prior to the effective date of such termination or withdrawal, including, without limitation, those debts, liabilities and obligations pursuant to Sections 4.6 and 14.4. Any Member who withdraws from the Authority shall have no right to participate in the business and affairs of the Authority or to exercise any rights of a Member under this Agreement or the Act, but shall continue to share in distributions from the Authority on the same basis as if such Member had not withdrawn, provided that a Member that has withdrawn from the Authority shall not receive distributions in excess of the contributions made to the Authority while a Member. The right to share in distributions granted under this Section 16.3 shall be in lieu of any right the withdrawn Member may have to receive a distribution or payment of the fair value of the Member's interest in the Authority.

16.4 Return of Contribution. Upon termination of this Agreement, any surplus money on-hand shall be returned to the Members in proportion to their contributions made. The Board of Directors shall first offer any property, works, rights and interests of the Authority for sale to the Members on terms and conditions determined by the Board of Directors. If no such sale to Members is consummated, the Board of Directors shall offer the property, works, rights, and interest of the Authority for sale to any non-member for good and adequate consideration. The net proceeds from any sale shall be distributed among the Members in proportion to their contributions made.

ARTICLE 17
MISCELLANEOUS PROVISIONS

17.1 No Predetermination or Irretrievable Commitment of Resources. Nothing herein shall constitute a determination by the Authority or any of its Members that any action shall be undertaken or that any unconditional or irretrievable commitment of resources shall be made, until such time as the required compliance with all local, state, or federal laws, including without limitation the California Environmental Quality Act, National Environmental Policy Act, or permit requirements, as applicable, has been completed.

17.2 Notices. Notices to a Director or Member hereunder shall be sufficient if delivered to the Board Clerk, City Clerk or Board Secretary of the respective Director or Member and addressed to the Director or Member. Delivery may be accomplished by U.S. Postal Service, private mail service or electronic mail.

17.3 Amendments to Agreement. This Agreement may be amended or modified at any time only by subsequent written agreement approved and executed by all of the Members.

17.4 Agreement Complete. The foregoing constitutes the full and complete Agreement of the Members. This Agreement supersedes all prior agreements and understandings, whether in writing or oral, related to the subject matter of this Agreement that are not set forth in writing herein.

17.5 Severability. Should any part, term or provision of this Agreement be decided by a court of competent jurisdiction to be illegal or in conflict with any applicable Federal law or any law of the State of California, or otherwise be rendered unenforceable or ineffectual, the validity of the remaining parts, terms, or provisions hereof shall not be affected thereby, provided, however, that if the remaining parts, terms, or provisions do not comply with the Act, this Agreement shall terminate.

17.6 Withdrawal by Operation of Law. Should the participation of any Member to this Agreement be decided by the courts to be illegal or in excess of that Member's authority or in conflict with any law, the validity of the Agreement as to the remaining Members shall not be affected thereby.

17.7 Assignment. The rights and duties of the Members may not be assigned or delegated without the written consent of all other Members. Any attempt to assign or delegate such rights or duties in contravention of this Agreement shall be null and void.

17.8 Binding on Successors. This Agreement shall inure to the benefit of, and be binding upon, the successors and assigns of the Members.

17.9 Dispute Resolution. In the event that any dispute arises among the Members relating to (i) this Agreement, (ii) the rights and obligations arising from this Agreement, (iii) a Member proposing to withdraw from membership in the Authority, or (iv) a Member proposing to initiate litigation in relation to legal rights to groundwater within the Basin or the management of the Basin, the aggrieved Member or Members proposing to withdraw from membership shall provide written notice to the other Members of the controversy or proposal to withdraw from membership. Within forty-five (45) days after such written notice, the Members shall attempt in good faith to resolve the controversy through informal means. If the Members cannot agree upon a resolution of the controversy within forty-five (45) days from the providing of written notice specified above, the dispute shall be submitted to mediation prior to commencement of any legal action or prior to withdrawal of a Member proposing to withdraw from membership. The mediation shall be no less than a full day (unless agreed otherwise among the Members) and the cost of mediation shall be paid in equal proportion among the Members. The mediator shall be either voluntarily agreed to or appointed by the Superior Court upon a suit and motion for appointment of a neutral mediator. Upon completion of mediation, if the controversy has not been resolved, any Member may exercise all rights to bring a legal action relating to the controversy or withdraw from membership as otherwise authorized pursuant to this Agreement. The Authority may, at its discretion, participate in mediation upon request by a Stakeholder Director concerning a dispute alleged by the Stakeholder Director concerning the management of the Basin or rights to extract groundwater from the Basin, with the terms of such mediation to be determined in the sole discretion of the Member Directors.

17.10 Counterparts. This Agreement may be executed in counterparts. No counterpart shall be deemed to be an original or presumed delivered unless and until the counterpart executed by the other Members to this Agreement is in the physical possession of the Member seeking enforcement thereof.

17.11 Singular Includes Plural. Whenever used in this Agreement, the singular form of any term includes the plural form and the plural form includes the singular form.

17.12 No Third-Party Rights. Nothing in this Agreement, whether express or implied, is intended to confer any rights or remedies under, or by reason of, this Agreement on any person other than the Members and their respective successors and assigns, nor is anything in this

Agreement intended to relieve or discharge the obligations or liability of any third person to any Member, nor shall any provision give any third person any right of subrogation or action over or against any Member.

17.13 Member Authorization. The governing bodies of the Members have each authorized execution of this Agreement, as evidenced by the signatures below.

IN WITNESS WHEREOF, the Members hereto have executed this Agreement by authorized officials thereof on the dates indicated below, which Agreement may be executed in counterparts.

[Signatures on Following Page]

CITY OF SAN BUENAVENTURA

DATED: June 12, 2017

APPROVED AS TO FORM:

By: [signature]

Title: Mayor

By: [signature]

Title: Assistant City Attorney II

COUNTY OF VENTURA

DATED:____________________

APPROVED AS TO FORM:

By: ____________________________

Title:____________________________

By: ____________________________

Title:____________________________

UNITED WATER CONSERVATION DISTRICT

DATED:____________________

APPROVED AS TO FORM:

By: ____________________________

Title:____________________________

By: ____________________________

Title:____________________________

CITY OF SAN BUENAVENTURA

DATED:____________________

APPROVED AS TO FORM:

By: ________________________ By: ________________________

Title: ________________________ Title: ________________________

COUNTY OF VENTURA

DATED: 6/6/17

APPROVED AS TO FORM:

By: ________________________ By: ________________________

Title: Chair, Board of Supervisors Title: ________________________

UNITED WATER CONSERVATION DISTRICT

DATED: June 14, 2017

APPROVED AS TO FORM:

By: ________________________ By: ________________________

Title: UWCD Board President Title: UWCD Legal Counsel

BYLAWS

of the

Mound Basin Groundwater Sustainability Agency

August 16, 2018

Contents

PREAMBLE

These Bylaws are adopted and effective as of **[DATE]**, pursuant to the Joint Exercise of Powers Agreement of the Mound Basin Groundwater Sustainability Agency of June 2017 (the "Agreement" or “JPA”) by and among the City of San Buenaventura, County of Ventura, and United Water Conservation District (“Members”).

ARTICLE 1. THE AUTHORITY

1.1 NAME OF AUTHORITY. The name of the Authority created by the Agreement shall be the MOUND BASIN GROUNDWATER SUSTAINABILITY AGENCY ("Authority"). JPA, Preamble.

1.2 OFFICE OF AUTHORITY. The principal office of the Authority shall be [**ADDRESS]**, or at such other location as the Board may designate by resolution. JPA, 7.3.

1.3 POWERS. The powers of the Authority are vested in the governing board who reserve unto themselves the right to delegate by resolution such powers as are appropriate and permissible by law. JPA, Art. 4. The governing board (“Board” or “Board of Directors”) consists of: one (1) Member Director appointed by the City Council of the City of San Buenaventura who is a member of the City Council of San Buenaventura or a representative; one (1) Member Director appointed by the County of Ventura Board of Supervisors, who is a Supervisor or representative; one (1) Member Director appointed by the Board of Directors for United Water Conservation District, who is a member of United Water Conservation District’s Board of Directors or a representative; one (1) Agricultural Stakeholder Director; and one (1) Environmental Stakeholder Director, to be nominated by the environmental organizations outlined in the Article 6.3.5 of the Agreement and unanimously selected by the Member Directors. JPA, 6.3.1-3.5.

ARTICLE 2. BOARD OF DIRECTORS

2.1 BOARD. The Authority shall be governed by a Board of Directors ("Board of Directors" or "Board"). The Board shall consist of five (5) Directors comprised of representatives who shall be appointed in the manner set forth in Article 6 of the Agreement. JPA, 6.1, 6.3.

2.2 POWERS. The business and affairs of the Authority, and all of the powers of the Authority, including without limitation all powers set forth in Article 4 of the Agreement, are reserved to, and shall be exercised by and through the Board of Directors, except as may be expressly delegated to the Executive Director pursuant to the Bylaws, or by specific action of the Board of Directors.

2.3 MEMBER DIRECTORS.

2.3.1 Terms, Removal and Vacancies. Member Directors will be appointed to serve for a term of two (2) years, except as set forth in Section 6.4 of the Joint Exercise of Powers Agreement. A Member Director may be removed during his or her term or reappointed for multiple terms at the pleasure of the Member's governing agency. The Member Director shall cease to be a Director when he or she is no longer a member of their governing Agency's board or ceases to be an employee of the Member. JPA, 6.5. No individual Member Director may be removed in any other manner, including by affirmative vote of the other Directors. A Member Director vacancy shall occur when a Director resigns, at the end of the Director's term, or when he or she is removed by his or her appointing governing body. Upon the vacancy of a Member Director, the seat shall remain open and vacant until a replacement Director is appointed as set forth in Section 6.3 of the Joint Exercise of Powers Agreement. Members shall submit any changes in Director positions to the Executive Director by written notice signed by an authorized representative of the Member. The written notice shall include a resolution of the governing body of the Member directing such change in the Director position. JPA, 6.5.

2.4 AGRICULTURAL STAKEHOLDER DIRECTOR

2.4.1 Terms, Removal and Vacancies. The term for the Agricultural Stakeholder Director shall be one (1) year. A vacancy of an Agricultural Stakeholder Director's seat shall occur upon a Director's resignation or at the end of the Director's term. JPA, 6.5. Upon the vacancy of the Agricultural Stakeholder Director, the seat shall remain vacant until a replacement Director is appointed as set forth in Section 6.3 of the Joint Exercise of Powers Agreement. JPA, 6.5.

2.5 ENVIRONMENTAL STAKEHOLDER DIRECTORS

2.5.1 Terms, Removal and Vacancies. The term for the Environmental Stakeholder Director shall be one (1) year. JPA, 6.4. A vacancy of an Environmental Stakeholder Director's seat shall occur upon a Director's resignation or at the end of the Director's term. JPA, 6.5. Upon the vacancy of the Environmental Director, the seat shall remain vacant until a replacement Director is appointed as set forth in Section 6.3 of the Joint Exercise of Powers Agreement. JPA, 6.5.

ARTICLE 3. MEETINGS

3.1 REGULAR MEETINGS. The regular meetings of the Authority shall be held at least quarterly on a date and time which the Authority may designate as determined by the Board. The Board will set the time and place of meetings in accordance with Government Code Section 54954. JPA, 8.2.

3.2 QUORUM. A majority of the Directors of the Board shall constitute a quorum for the purpose of conducting Authority business, exercising Authority powers, and for all other purposes. However, a smaller number may adjourn from time-to-time until the quorum is obtained. JPA, 9.1.

3.3 AGENDA. Authority staff shall prepare the agenda. At least seventy-two hours before a regular meeting, or at least twenty-four hours prior to a special meeting, the Board Secretary shall post an agenda containing a brief, general description of each item of business to be transacted or discussed at the meeting, including the items to be discussed in closed session. The posting shall be freely accessible to the public. The agenda shall include the opportunity for the public to address the Board prior to taking action on any matter. The agenda for regular and adjourned regular meetings shall include the opportunity for the public to address the Board on matters within the jurisdiction of the Authority but not on the agenda. During public comment, a Director may request a matter be included on the agenda for a future meeting. Authority staff shall arrange for the matter to be placed on a future agenda as promptly as feasible. No action shall be taken on matters not shown on the posted agenda, except that Directors may briefly respond to statements made or questions posed during public comment; respond to a request for clarification; provide a reference to staff or other resources for factual information; request staff to report back to the Board at a subsequent meeting or direct staff to place a matter of business on a future agenda. The Board may add matters to the agenda upon a majority finding that an emergency exists or upon at least a two-thirds vote finding there is a need to take immediate action and the need for action came to the attention of the Authority subsequent to the posting of the agenda.

3.4 VOTING. Voting by the Board of Directors shall be made on the basis of one vote for each Director. All decisions of the Board shall require the affirmative vote of a minimum of three (3) Directors, except for the matters specified in Article 9.3 of the JPA which require special voting. JPA, 9.3.

3.5 RULES OF ORDER. All rules of order not otherwise provided for in the Bylaws shall be determined, to the extent practicable, in accordance with "Rosenberg's Rules of Order", provided, however, that no action shall be invalidated, or its legality otherwise affected by the failure or omission to observe or follow "Rosenberg's Rules of Order."

ARTICLE 4. OFFICERS

4.1 OFFICERS. The officers of the Authority shall consist of a Chair, a Vice Chair/Secretary, and a Treasurer. JPA, 7.1. Officers shall be elected annually by, and serve at the pleasure of, the Board of Directors. Officers shall be elected at the first Board meeting, and thereafter at the first Board meeting following January 1st of each year. JPA, 7.2.4.2 CHAIR. The Chair shall preside at meetings of the Authority. The Chair shall sign contracts, deeds, and other instruments made by the Authority.

4.3 VICE CHAIR. The Vice Chair shall perform the duties of the Chair in the absence or incapacity of the Chair. JPA, 7.1. The Vice Chair shall also act as Secretary and shall keep the administrative records of the Authority, act as secretary at meetings of the Authority, record all votes, and keep a record of the proceedings of the Authority to be kept for such purpose, and perform all duties incident to the Secretary's office. The Secretary shall maintain a record of all official proceedings of the board.

4.4 TREASURER AND AUDITOR. The Treasurer and Auditor shall be appointed in the manner, and shall perform those functions required by Government Code Sections 6505, 6505.5, and all other applicable laws and regulations, including any subsequent amendments thereto. The Treasurer shall be bonded in accordance with the provisions of section 6505.1. JPA, 13.3.

4.5 GENERAL COUNSEL. The General Counsel shall be the chief legal officer of the Authority. The General Counsel shall give advice or opinions in writing to the Chairman or other Authority officers and shall prepare proposed resolutions, laws, rules, contracts, and other legal documents for the Authority when requested to do so by the Authority. The General Counsel shall attend to all lawsuits and other matters to which the Authority is a part or in which the Authority may be legally interested and do such other things pertaining to the General Counsel's office as the Authority may request.

4.6 OFFICER COMPENSATION. The officers of the Authority shall receive such compensation as the Authority prescribes and in addition, shall receive their actual and necessary expenses, including traveling expenses incurred in the discharge of their duties.

4.7 EXPENSES. If previously approved by the Board, a Director shall receive actual, reasonable, and necessary reimbursement for travel, meals, lodging, registration, and similar expenses incurred on Authority business. The reimbursement rates for lodging shall not exceed the posted rates for a trade conference, but if a lodging at the posted rates is not available, the reimbursement rate shall be comparable to the posted rates. For travel of 250 miles or less, Directors shall be reimbursed at the IRS rate. For travel over 250 miles, Directors shall be reimbursed at the lowest available rate for public air transportation, as determined by the Administrator, or actual cost, whichever is less. As used herein, "transportation" includes travel to and from terminals. Automobile rental expenses shall be approved in advance. Reimbursement for meals, other than alcoholic beverages, shall be at the rate established by the IRS or actual reasonable cost not to exceed $60 per day. Directors may declare the amount of the meal under penalty of perjury in lieu of receipts if the amount is less than the IRS rate. Claims for expense reimbursement shall be submitted to the Administrator of the Board on forms provided by the Authority within 30-days after the expense has been incurred. The Administrator shall determine whether the claim satisfies the requirements of this section and if the claim is denied, the claimant may appeal to the Board.

ARTICLE 5. COMMITTEES

5.1 Pursuant to Article 12 of the Agreement, the Board of Directors may from time to time appoint one or more advisory committees or establish standing or ad hoc committees to assist in carrying out the purposes and objectives of the Authority. The Board shall determine the purpose and need for such committees and the necessary qualifications for individuals appointed to them. Each standing or ad hoc committee shall include a Director as the chair thereof. Other members of each committee may be composed of those individuals approved by the Board of Directors for participation on the committee. However, no committee or participant on such committee shall have any authority to act on behalf of the Authority. Permanent Committees will be given a specific role and, regardless of the number of Directors appointed, shall be subject to compliance with the Brown Act. All Committees will provide regular updates to the full Board about their activities and the progress of their work.

ARTICLE 6. EXECUTIVE DIRECTOR AND STAFF

6.1 EXECUTIVE DIRECTOR. The Board of Directors may appoint an Executive Director, who may be, though need not be an officer, employee, or representative of one of the Members. The Executive Director shall have general supervision over the administration of Authority business and affairs, subject to the direction of the Authority. The Executive Director shall have the powers designated by the Board, and may execute contracts, deeds, and other documents and instruments as authorized by the Authority. The Executive Director's compensation, if any, shall be determined by the Board of Directors. JPA, 10.1-10.2.

6.2 STAFF. The Executive Director may employ such additional full-time and/or part-time employees, assistants, and independent contractors who may be necessary from time to time to accomplish the purposes of the Authority, subject to the approval of the Board of Directors. JPA, 10.4.

ARTICLE 7. FINANCES

7.1 DEPOSIT AND DISBURSEMENT OF FUNDS. All funds of the Authority shall be deposited in one or more depository accounts as may be designated by the Board. Such accounts shall be independent of any account owned by or exclusively controlled by any of the Members. No disbursements of such funds shall be made unless the same shall have been approved in the annual operating budget, or otherwise specifically approved by the Board. Monthly, or at a time established by the Board, all disbursements shall be listed on a report by check number, vendor and amount, and approved by the Board prior to the issuance of a payment. All check disbursements shall require dual signature that will include the Treasurer and Board Chair or Vice Chair.

7.2 BUDGET. The Authority shall operate pursuant to an operating budget to be adopted prior to the beginning of each new fiscal year. JPA, 14.1. The Agency shall endeavor to operate each year pursuant to an annually balanced budget so that projected annual expenses do not exceed projected annual revenues. Budget adjustments to the annual budget shall be reviewed and acted upon by the Board at a regularly scheduled Board meeting occurring after January 1 of each calendar year. The Board may take action to amend the budget at other times if circumstances require more immediate action.

ARTICLE 8. DEBTS AND LIABILITIES

8.1 The debts, liabilities, and obligations of the Authority are not and will not be the debts, liabilities, or obligations of any or all of the Members. JPA, 15.1. However, nothing in this Article or in the Agreement prevents, or impairs the ability of, a Member or Members, from agreeing, in a separate agreement, to be jointly and/or severally liable, in whole or in part, for any debt, obligation, or liability of the Authority, including but not limited to, any bond or other debt instrument issued by the Authority.

ARTICLE 9. REGISTRATION OF FACILITIES

9.1 The Authority may require registration of all groundwater extraction facilities within its management area pursuant to Wat. Code, § 10725.6. The Authority shall keep a register of wells drilled within its management area. It shall be the policy of the Authority to have a standing request with the County of Ventura to be notified of any application or plan for a well or groundwater extraction facility within the Authority's jurisdiction.

ARTICLE 10. FEE ENFORCEMENT

10.1 Fee Enforcement is based on Wat. Code, § 10730.6:

(a) Groundwater fees will be due and payable to the Authority semi-annually by the Owner or Operator. If the Owner or Operator fails to pay a groundwater fee within thirty (30) days of it becoming due, the Owner or Operator shall be liable to the Authority for interest at the rate of one (1) percent per month on the delinquent amount of the groundwater fee and a ten (10) percent penalty.

(b) In the event of an overpayment of groundwater fees and charges by the Owner or Operator, unless the payor requests a refund, the Agency shall apply the overpaid amount to the Owner or Operator's next billing statement or payment cycle.

(c) Should the Authority decide not to bring suit, the Authority may collect any delinquent groundwater charge and any civil penalties and interest on the delinquent groundwater charge pursuant to the laws applicable to United Water Conservation District, County of Ventura, and City of Buenaventura. Collection shall be in the same manner as it would be applicable to the collection of delinquent assessments, water charges, or tolls.

(d) Additionally, the Authority may, after a public hearing, order an Owner or Operator to cease extraction of groundwater until all delinquent fees are paid. The Authority shall give notice to the Owner or Operator by certified mail at least fifteen (15) days in advance of the public hearing.

(e) All remedies specified in this section for collecting and enforcing fees are cumulative and may be pursued alternatively or may be used consecutively as determined by the Authority's Board of Directors.

(f) By an affirmative vote of three (3) Directors, the Authority may, in its sole discretion, waive any interest payments, penalties, or overdue fees.

ARTICLE 11. RECORDS RETENTION

11.1 MAINTENANCE OF THE AUTHORITY RECORDS. The Authority will keep:

(a) All public records, as defined in Cal. Gov. Code Section 6252.

(b) All such records will be kept at the Authority's principal office.

11.2 RECORDS RETENTION POLICY AND SCHEDULE. By December 31, 2018, the Board will review and adopt a Records Retention Policy and Schedule that specifies the retention period of different categories of materials. Implementation of this Policy will be the responsibility of Authority staff.

11.3 INSPECTION RIGHTS.

(a) Any member may inspect the accounting books and records and minutes of the proceedings of the Board and committees of the Board, at any reasonable time, for a purpose reasonably related to such person's interest.

(b) Any inspection and copying under this Section may be made in person or by an agent or attorney or the entity entitled thereto and the right of inspection includes the right to copy.

11.4 MAINTENANCE AND INSPECTION OF AGREEMENT AND BYLAWS. The Authority will keep at its principal executive office the original or copy of the Agreement and these Bylaws as amended to date, which will be open to inspection by the Authority or any Member at all reasonable times during office hours.11.5 INSPECTION BY DIRECTORS. Every Director has the absolute right at any reasonable time to inspect all non-confidential books, records, and documents of every kind and the physical properties of the Authority. This inspection by a Director may be made in person or by an agent or attorney, and the right of inspection includes the right to copy and make extracts of documents.

ARTICLE 12. CODE OF ETHICS AND CONFLICTS OF INTEREST

12.1 DECLARATION OF POLICY. The proper operation of democratic government requires that public officials and employees be independent, impartial and responsible to the people; that government decisions and policy be made in the proper channels of the governmental structure; that public office not be used for personal gain; and the public have confidence in the integrity of its government. In recognition of these goals, there is hereby established a Code of Ethics for all officers and employees, whether elected or appointed, paid or unpaid. This Article establishes ethical standards of conduct for Authority officers and employees by setting forth those acts or actions that are incompatible with the best interests of the Authority and by directing the officers' disclosure of private financial or other interests in matters affecting the Authority.

12.2 CONFLICT OF INTEREST CODE. The Political Reform Act (Government Code Section 81000, et seq.) requires state and local government agencies to adopt and promulgate conflict of interest codes. Pursuant to this, the Authority adopted and promulgated a Resolution which constitutes the Conflict of Interest Code for the Authority, and sets forth designations of officials and employees, and establishes economic disclosure categories. The Authority will review its Conflict of Interest Code every other year as required by the Political Reform Act.

12.3 RESPONSIBILITIES OF PUBLIC OFFICE. Public officials and employees are agents of public purpose and hold office for the benefit of the public. They are bound to uphold the United States and State Constitution and to carry out impartially the laws of the nation, State, and the Authority, thus to foster respect for all governments. They are bound to observe, in their official acts, the highest standards of performance and to discharge faithfully the duties of their office, regardless of personal considerations. Recognizing that the public interests must be their primary concern, their conduct in both their official and private affairs should be above reproach.

12.4 DEDICATED SERVICE. Officers and employees owe a duty of loyalty to the political objectives expressed by the electorate and the programs developed by the Board to attain those objectives. Appointive officers and employees should adhere to the rules of work and performance established as the standards for their positions by the appropriate Authority. Officers and employees should not exceed their Authority or breach the law, or ask others to do so, and owe a duty to cooperate fully with other public officers and employees unless prohibited from so doing by law or by the officially recognized confidentiality of their work.

12.5 FAIR AND EQUAL TREATMENT. Officers and employees shall not request or permit the use of Authority-owned vehicles, equipment, materials, or property for personal convenience or profit, except when such services are available to the public generally or are provided for the use of such officer or employee in the conduct of official business. Officers and employees shall not grant special consideration, treatment or advantage to a member of the public beyond what is available to every other member of the public.

12.6 POLITICAL ACTIVITIES. Officers and employees shall not solicit or participate in soliciting assessment; subscription of contribution to a political party during working hours on property owned by the Authority and shall conform to Government Code Sections 3202 and 3203. Officers and employees shall not promise appointment to a position with the Authority.

12.7 EX PARTE COMMUNICATIONS. Any written communication received by an officer or employee relating to a matter to be discussed by the Authority Board shall be made part of the record of decision. A communication concerning only the status of a pending matter shall not be regarded as an ex parte communication.

12.8 AVOIDANCE OF IMPRESSIONS OF CORRUPTIBILITY. Officers and employees shall conduct their official and private affairs so as not to give a reasonable basis for the impression that they can be improperly influenced in performance of public duties. Officers and employees should maintain public confidence in their performance of the public trust in the Authority. They should not be a source of embarrassment to the Authority and should avoid even the appearance of conflict between their public duties and private interests.

12.9 NO DISCRIMINATION IN APPOINTMENTS. No person shall be appointed to, removed from, or in any way favored or discriminated against with respect to any appointive administrative office because of such person's race, color, age, religion, gender identification, national origin, political opinions, affiliations, or functional limitation as defined by applicable State or federal laws, if otherwise qualified for the position or office. This provision shall not be construed to impair administrative discretion in determining the requirements of a position or in a job assignment of a person holding such a position, subject to review by the Board.

12.10 AUTHORITY ALLEGIANCE AND PROPER CONDUCT. Officers and employees shall not engage in or accept any private employment, or render services for private interest, when such employment or service is incompatible with proper discharge of official duties or would tend to impair independence or judgment or action in the performance of those duties. Officers and employees shall not disclose confidential information concerning the property, government, or affairs of the Authority and shall not use confidential information for personal financial gain. Officers and employees shall not accept a gift in excess of limits established by state law. Officers and employees shall not accept any gift contingent upon a specific action by the Board. Officers and employees shall not appear on behalf of business or private interests of another before the Board where such appearance would create a potential of having to abstain from officers participating on that matter or be incompatible with official duties. Officers and employees shall not represent a private interest of another person or entity in any action or proceeding against the interest of the Authority in any litigation to which the Authority is a party. A Director may appear before the Authority on behalf of constituents in the course of duties as a representative of the electorate or in the performance of public or civic obligations.

12.11 PENALTIES. In addition to any other penalties or remedies provided by law, violation of this Article shall constitute a cause for suspension, removal from office or employment or other disciplinary action after notice and hearing conducted by the appropriate appointing Member or, in the case of the Board, an affirmative vote of four (4) Directors, or three (3) Directors in the event a Director is absent, conflicted or prohibited from voting pursuant to 9.3 of the JPA agreement.

ARTICLE 13. AMENDMENT

13.1 These Bylaws may be amended from time to time by resolution of the Board duly adopted upon majority of the Board at a regular or special meeting of the Board, provided, however, that no such amendment shall be adopted unless at least thirty (30) days written notice thereof has previously been given to all members of the Board. Such notice shall identify the Article to be amended, the proposed amendment, and the reason for the proposed amendment. JPA, 11. The Board may, upon unanimous consent, waive the thirty (30) day written notice period.

ARTICLE 14. PURCHASING POLICY

14.1 POLICY. The Authority will procure Goods and Services in support of its administrative, operational and capital improvement requirements. It is the intent of the Authority to engage in procurements that ensure it will receive Goods and Services of the appropriate quantity, of a satisfactory level of quality, delivered in a timely manner, and at a price that represents the best value to the Authority, its Members, and other affected parties. Furthermore, it will employ procurement processes that are fair and equitable and will allow providers of Goods and Services the greatest opportunity to participate and compete for the Authority's procurement engagements.

14.2 DEFINITIONS.

The following definitions shall apply to this Article:

(a) Contract. A written document establishing terms and conditions between buyer and seller for the provision of Goods or Services, and includes Professional Service Agreements, General Service Agreements, and Purchase Orders.

(b) Critical Repairs. Services performed on Agency facilities that are unplanned, unexpected and which are essential to the continued operation of the facilities, but do not rise to the level of "Emergency."

(c) Formal Competitive Solicitation. The issuance of a written Request for Bids, proposals or quotations.

(d) Goods. Refers to all types of tangible personal property including materials, supplies, and equipment.

(e) Material Change. A change to essential terms in a contract including, not limited to, consideration, scope of Services, insurance and indemnity obligations, and assignment.

(f) Informal Competitive Solicitation. A written request for a bid, proposal, or quotation in accordance with written terms and conditions included in the request.

(g) Public Works Construction Agreement. Agreement for the erection, construction, alteration, repair, or improvement of any public structure, building, road, or other public improvement of any kind and awarded in compliance with competitive bidding statutes.

(h) Requisition. A document generated by staff to identify and establish a requirement for, and request authorization of, the procurement of Goods and Services.

(i) Service(s). The labor, intellectual property or other work product provided by a Contractor or Consultant that is not tangible personal property.

14.3 PROCUREMENT OF GOODS AND SERVICES.

(a) Procurement Authority. Procurement authority shall be exercised and performed by the Board of Directors through the approval of warrants presented to the Board. This authority includes both the authority to approve procurements and the authority to commit the Agency to procurements. The Board of Directors may delegate certain authorities to the Agency's management and staff. These delegated authorities shall be exercised and performed in accordance with applicable federal, state, and local laws and the polices contained herein.

(b) Procurement of Goods, Professional Services and Non-Professional Services. The Agency may procure Goods and Services as authorized below:

(1) Procurements of Goods, Professional Services and Non-Professional Services Less than $500:

(i) The Executive Director may expend up to $500 to purchase necessary supplies and equipment without secondary approval.

(2) Procurement of Goods, Professional Services and Non-Professional Services over $500:

(i) Requires Board approval of a Purchase Order.

(ii) Signed by both the Board Chair and Treasurer.

(3) Amendments/ Change Orders / Revisions: Material Changes to a contract document require authorization. Approval and execution is subject to the thresholds established above and based on the final value of the Contract document after the change is incorporated.

(c) Leasing of Goods. Leasing of Goods is subject to the same requirements established for the procurement of Goods, as defined in section (b).

(d) Public Works. The procurement of Goods and Services for the construction of public works by the Agency shall be governed by California Public Contract Code sections 20640 et seq.

(e) Amendments/ Change Orders/ Revisions: Material Changes to a Contract document require authorization. Approval and execution is subject to the thresholds established above and based on the final value of the Contract document after the change is incorporated. Change Orders within preapproved funding amounts require execution by the Board of Directors.

14.4 EMERGENCY PURCHASES AND SERVICES. In the event of an emergency, the Executive Director may make immediate purchases of Goods and Services pursuant to California Public Contract Code section 20640 *et seq*. Emergency purchases include any purchase required to prevent imminent danger or to prevent or mitigate the loss or impairment of life, health, property, or essential public services. Every effort shall be made to obtain advance approvals or to obtain approvals as soon as possible following the purchase.

14.5 PROCUREMENT OF CRITICAL GOODS AND SERVICES. When expenditures are made for the procurement of Critical Goods and Services, staff will use its best efforts to conform to the Informal Solicitation process, and shall not exceed $1,000 per each critical repair or critical acquisition. Any expenditure for these types of repairs will be brought to the Board of Directors at the next regularly scheduled Board meeting for ratification.

ARTICLE 15. DEFINITIONS AND CONSTRUCTION

15.1 Unless specifically defined in these Bylaws, all defined terms shall have the same meaning ascribed to them in the Agreement. If any term of these Bylaws conflicts with any term of the Agreement, the Agreement's terms shall prevail, and these Bylaws shall be amended to eliminate such conflict of terms. Unless the context or reference to the Agreement requires otherwise, the general provisions, rules of construction, and definitions in the California Civil Code will govern the construction of these Bylaws.

EFFECT. These bylaws shall take effect immediately upon adoption.

PASSED, APPROVED AND ADOPTED on August 16, 2018, by the following votes:

AYES: Four (Brown, Chambers, Mobley, Shephard)

NOES: None

ABSTAIN: None

ABSENT: one (Everts)

[signature]
Chair

ATTEST:

[signature]
Secretary

[Seal]

LIST OF ALL BENEFICIAL USES AND USERS OF GROUNDWATER

Pursuant to Water Code Sections 10723.8(a)(4) and 10723.2, the Agency will consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing a Groundwater Sustainability Plan ("Plan").

The Mound Basin Groundwater Sustainability Agency ("Agency") has engaged stakeholders in the development of the Agency to serve as the groundwater sustainability agency ("GSA"). For example, during development of the joint powers authority agreement ("JPA Agreement") forming the Agency, the signatory members held public meetings to educate stakeholders within the Mound Basin ("Basin") about the requirements of the Sustainable Groundwater Management Act ("SGMA"), the JPA Agreement, and the Agency's intention to form a GSA for the Basin. In addition to the Agency's public outreach efforts, it also designated two seats on its five-seat Board of Directors for Stakeholder Directors: one seat is reserved for an Agricultural Stakeholder Director and one seat is reserved for an Environmental Stakeholder Director.

The Agency plans to continue its practice of seeking broad stakeholder engagement in management of the Basin's groundwater resources as it undertakes the process to develop and implement the Plan for the Basin over the next several years. The Agency will solicit and welcome participation from the following stakeholder groups:

Holders of Overlying Groundwater Rights, including:

- **Agricultural Users.** There are agricultural users of groundwater operating on land overlying the Basin. To account for these users' interests, the Agency designated a seat on its five-member governing board to be filled by an Agricultural Stakeholder Director. The Agricultural Stakeholder Director will be appointed from nominations received by the Mound Basin Ag Water Group (MBAWG) or the Ventura County Farm Bureau. The Agricultural Stakeholder Director is responsible for engaging the Basin's agricultural users of groundwater and representing their interests before the Agency.
- **Domestic Well Owners.** There are domestic wells overlying the Basin. It is believed that the majority of these domestic well owners are de minimus users, as defined by SGMA. The Agency anticipates that the Plan will address the collective interests of domestic users of groundwater wells and plans to engage in outreach to domestic well owners throughout the development of the Plan through inviting their participation in the Agency's public meetings.

Municipal Well Operators. The Agency is a joint powers authority created by three local public agencies. Two of the Agency's signatory members—the City of San Buenaventura and the County of Ventura (irrigation)—operate wells within the Basin and are represented on the Agency's Board of Directors.

Public Water Systems. The following public water systems are located within the Agency's boundaries:

- Ventura Water (City of San Buenaventura)

The City of San Buenaventura is a signatory member to the JPA Agreement forming the Agency and is represented on the Agency's Board of Directors.

Local Land Use Planning Agencies. Both the County of Ventura ("County") and the City of San Buenaventura have land use planning authority on land overlying the Basin. Both are signatory members to the JPA Agreement forming the Agency and are represented on the Agency's Board of Directors.

Environmental Users of Groundwater. There are several environmental organizations dedicated to preserving and maintaining environmental values operating within the boundaries of the Basin. To account for these users' interests, the Agency designated a seat on its five-member governing board to be filled by an Environmental Stakeholder Director. The Environmental Stakeholder Director will be appointed from nominations received from local environmental nonprofit organizations supportive of the Basin's groundwater sustainability. The Environmental Stakeholder Director is responsible for engaging stakeholders within the Basin and representing environmental interests before the Agency.

Surface Water Users, if there is a hydrologic connection between surface and groundwater bodies. N/A.

Federal Government, including, but not limited to, the military and managers of federal lands. N/A. No land overlying the Basin is managed by the Federal Government.

California Native American Tribes. The Agency will ensure that a representative of overlying California Native American tribes is on the Agency's interested parties list, in order to receive notices of all Agency meetings and other stakeholder involvement opportunities.

Disadvantaged Communities, including, but not limited to those served by private domestic wells or small community water systems. N/A.

Entities Listed in Section 10927 that are Monitoring and Reporting Groundwater Elevations in all or a part of the Groundwater Basin Managed by the GSA. The County is the designated California Statewide Groundwater Elevation Monitoring ("CASGEM") entity for the Basin. The County is a signatory member to the JPA Agreement forming the Agency and represented on the Agency's Board of Directors.

The Agency's and other stakeholders' roles and responsibilities will be further developed and defined in the Sustainability Plan. The Agency's staff welcomes feedback during this process from the State, any of the agencies or organizations listed herein, and any other interested stakeholders.

If the Department of Water Resources ("DWR") requires anything further prior to the acceptance of this notification of the Agency's election to serve as the GSA for the Basin, please address your inquiry to:

Jennifer Tribo, Interim Executive Director
Mound Basin GSA
501 Poli Street
Ventura, California 93001

Appendix D

MBGSA Stakeholder Engagement Plan

STAKEHOLDER ENGAGEMENT PLAN

MOUND BASIN

(4-004.03) VENTURA COUNTY, CALIFORNIA

SUSTAINABLE GROUNDWATER MANAGEMENT ACT (SGMA) PROGRAM

PREPARED BY THE MOUND BASIN GROUNDWATER SUSTAINABILITY AGENCY

UPDATED AND ADOPTED OCTOBER 21, 2021

Table of Contents

1 INTRODUCTION

This Stakeholder Engagement Plan (Engagement Plan) summarizes the strategies to educate and involve stakeholders (those individuals and representatives of organizations who have a direct stake in the outcome of the planning process) and other interested parties in the preparation and implementation of a Groundwater Sustainability Plan (GSP) for the Mound Basin – Department of Water Resources (DWR) Basin No. 4-004.03 (Figure 1). This GSP will be prepared in accordance with the Sustainable Groundwater Management Act (SGMA), which was signed by Governor Brown in September 2014 and became effective January 1, 2015.

SGMA provides a framework to regulate groundwater for the first time in California's history. SGMA's intent is to strengthen local management of specified groundwater basins that are most critical to the state's water needs by regulating groundwater and land use management activities. SGMA also aims to preserve the jurisdictional authorities of cities, counties and water agencies within groundwater basins while protecting existing surface water and groundwater rights.

The Mound Basin Groundwater Sustainability Agency (MBGSA or Agency), a Groundwater Sustainability Agency (GSA), was formed by three local agencies: County of Ventura (County), City of San Buenaventura (City), and United Water Conservation District (UWCD). There was extensive stakeholder engagement during that process. The governing board consists of one representative from each of those agencies plus two stakeholder directors representing environmental and agricultural interests. The GSA is responsible for developing a GSP for the Mound Basin to achieve long-term groundwater sustainability. Additionally, SGMA requires and directs GSAs to encourage active involvement of stakeholders and interested parties in the process to sustainability manage the basin.

2 PURPOSE

The purpose of the outreach activities described in this Engagement Plan is to encourage the active involvement of individual stakeholders and stakeholder organizations, and other interested parties in the development and implementation of the GSP for the Mound Basin. This GSP is required under SGMA to be completed no later than January 31, 2022. The projects and management actions necessary to implement the GSP could affect individuals and groups who have a stake in ensuring the basin is sustainably managed as required by SGMA.

In an effort to understand and involve stakeholders and their interests in the decision- making and activities, the MBGSA has prepared this Engagement Plan to encourage broad, enduring and productive involvement during the GSP development and implementation phases. This Engagement Plan will assist the MBGSA in providing timely information to stakeholders and receive input from interested parties during GSP development. This Engagement Plan will identify stakeholders who have an interest in groundwater in the Mound Basin, and recommend outreach, education, and communication strategies for engaging those stakeholders during the development and implementation of the GSP. The plan also includes an approach for evaluating the overall success of stakeholder engagement and education of both stakeholders and the public. In consideration of the interests of all beneficial uses and users of groundwater in the basin, this Engagement Plan has been developed pursuant to California Water Code Section 10723.2. Additionally, this Engagement Plan has been developed to encourage the active involvement of diverse social, cultural, and economic elements of the population within the Mound Basin, in accordance with GSP Regulations Section 354.10.

3 GENERAL INFORMATION

The following personnel will serve as contacts for the public during GSA formation and GSP preparation.

3.1 Clerk of the Board

For general information about MBGSA and the GSP status, contact:

Jackie Lozano, Clerk of the Board, (805) 525-4431, email jackiel@unitedwater.org.

3.2 Executive Director

MBGSA's Executive Director will be available for stakeholders and the public seeking specific detailed information about the GSP, contact:

Bryan Bondy, Executive Director, (805) 212-0484, email bryan@bondygroundwater.com.

4 OUTREACH ACTIVITIES

MBGSA will implement the following outreach activities to maximize stakeholder involvement during the development of the GSP and throughout SGMA implementation.

4.1 Public Notices

To ensure that the general public is apprised of local activities and allow stakeholders to access information, SGMA specifies several public notice requirements for GSAs. Refer to Table 1 in Appendix A for a summary of statutory requirements. Three sections of the California Water Code require public notice before establishing a GSA, adopting (or amending) a GSP, or imposing or increasing fees:

- Section 10723(b). "Before electing to be a groundwater sustainability agency, and after publication of notice pursuant to Section 6066 of the Government Code, the local agency or agencies shall hold a public hearing in the county or counties overlying the basin." In accordance with California Water Code Section 10723(b), the following was noticed to the public: On June 22, 2017, the MBGSA held a public hearing to consider becoming a GSA for the Mound Basin. The public hearing was noticed in the *Ventura County Star* in accordance with Government Code Section 6066.
- Section 10728.4. "A groundwater sustainability agency may adopt or amend a groundwater sustainability plan after a public hearing, held at least 90 days after providing notice to a city or county within the area of the proposed plan or amendment. …"
- Section 10730(b)(1). "Prior to imposing or increasing a fee, a groundwater sustainability agency shall hold at least one public meeting, at which oral or written presentations may be made as part of the meeting....(3) At least 10 days prior to the meeting, the groundwater sustainability agency shall make available to the public data upon which the proposed fee is based." In accordance with California Water Code Section 10730(b)(1), the following was noticed to the public: On August 23, 2018, the MBGSA held a public hearing to consider establishing a groundwater extraction fee. The public hearing was noticed in the *Ventura County Star* in accordance with Government Code Section 6066 and data upon which the fee is based was posted to the MBGSA website and mailed to all entities on the interested parties list prior to the meeting.
- Future noticing will occur as required by SGMA.

4.2 Stakeholder Identification

Pursuant to Water Code Sections 10723.8(a)(4) and 10723.2, the Agency will consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing a GSP.

MBGSA has engaged stakeholders in the development of the Agency to serve as the GSA. For example, during development of the joint powers authority agreement ("JPA Agreement") forming the Agency, the signatory members held numerous public meetings to discuss important terms to be included in the JPA Agreement. The signatory members also held multiple stakeholder outreach meetings to engage and educate stakeholders within the Mound Basin about the SGMA requirements the JPA Agreement, and the Agency's intention to form a GSA for the Mound Basin. In addition to the Agency's public outreach efforts, it also designated two seats on its five-seat Board of Directors for Stakeholder Directors: one seat is reserved for an Agricultural Stakeholder Director and one seat is reserved for an Environmental Stakeholder Director.

The Agency plans to continue its practice of seeking broad stakeholder engagement in management of the Mound Basin's groundwater resources as it undertakes the process to develop and implement the Plan for the Mound Basin over the next several years.

SGMA mandates that a GSA establish and maintain a list of persons interested in receiving notices regarding plan preparation, meeting announcements, and availability of draft plans, maps, and other relevant documents. The MBGSA compiled a list of interested persons for this purpose that will be maintained throughout the GSA formation and GSP development phases. An initial list of stakeholders and interested parties include, but are not limited to, the following:

a) Holders of overlying groundwater rights, including:

    1) Agricultural well owners - There are agricultural users of groundwater operating on land overlying the Basin. To account for these users' interests, the Agency designated a seat on its five-member governing board to be filled by an Agricultural Stakeholder Director. The Agricultural Stakeholder Director will be appointed from nominations received by the Mound Basin Ag Water Group (MBAWG) or the Ventura County Farm Bureau. The Agricultural Stakeholder Director is responsible for engaging the Basin's agricultural users of groundwater and representing their interests before the Agency.

    2) Domestic well owners - There are no domestic wells overlying the Basin.

    3) Industrial well owners - Two industrial wells have been identified in the basin: Saticoy Lemon Association (lemon packing facility cooperative) and Ivy Lawn Cemetery Association. Given Saticoy Lemon Association's ties to agriculture, the Agricultural Stakeholder Director will be responsible for engaging this stakeholder. The Executive Director will be responsible for engaging Ivy Lawn Memorial.

    4) Other - The County of Ventura operates a well for landscape irrigation at the County Government Center. The County is represented on the Agency's Board of Directors.

b) Municipal Well Operators - The Agency is a joint powers authority created by three local public agencies. One of the Agency's signatory members—the City of San Buenaventura operates municipal wells within the Basin and is represented on the Agency's Board of Directors.

c) Public water systems

1) Ventura Water (City of San Buenaventura)

The City of San Buenaventura is a signatory member to the JPA Agreement forming the Agency and is represented on the Agency's Board of Directors.

d) Local land use planning agencies - Both the County of Ventura ("County") and the City of San Buenaventura have land use planning authority on land overlying the Basin. Both are signatory members to the JPA Agreement forming the Agency and are represented on the Agency's Board of Directors.

e) Environmental - There are several environmental organizations dedicated to preserving and maintaining environmental values operating within the boundaries of the Basin. To account for these users' interests, the Agency designated a seat on its five-member governing board to be filled by an Environmental Stakeholder Director. The Environmental Stakeholder Director will be appointed from nominations received from local environmental nonprofit organizations supportive of the Basin's groundwater sustainability. The Environmental Stakeholder Director is responsible for engaging stakeholders within the Basin and representing environmental interests before the Agency.

f) Surface Water Users There are no permitted or licenses surface water diversions within the Basin.

g) The federal government - No land overlying the Mound Basin is managed by the Federal Government.

h) California Native American Tribes – There are no tribal trust lands located within the Basin. However, the Mound Basin lies within the traditional tribal territory of the Chumash. The Agency will ensure that a Chumash representative is on the Agency's interested parties list, in order to receive notices of all Agency meetings and other stakeholder involvement opportunities.

i) Disadvantaged communities - There are no disadvantaged communities served by private domestic wells or small community water systems located within the Basin. The City of San Buenaventura (City) serves the areas indicated by DWR as Disadvantaged Communities (DACs) and Severely Disadvantaged Communities (SDACs). Outreach to DAC's shall be accomplished via bill stuffers or other means through the City's water department (Ventura Water), including materials provided in Spanish.

j) Entities listed in Section 10927 that are monitoring and reporting groundwater elevations in all or a part of a groundwater basin managed by the groundwater sustainability agency. The County is the designated California Statewide Groundwater Elevation Monitoring ("CASGEM") entity for the Basin. The County is a signatory member to the JPA Agreement forming the Agency and represented on the Agency's Board of Directors.

k) Casitas Municipal Water District (CMWD) - CMWD is a wholesale water agency that provides a portion of the potable water supplied by Ventura Water within the Basin. CMWD does not operate any facilities in the Basin. CMWD's service area overlaps with a western portion of the Basin.

MBGSA intends to work cooperatively with partner agencies, stakeholders, and interested parties to develop and implement the GSP for the Mound Basin and will maintain a list of stakeholders and interested parties to be included in the formation of the GSP.

A person can be added to the interested parties list by submitting an inquiry via the MBGSA website: http://moundbasingsa.org/contact-us/ or by contacting the Clerk of the Board.

4.3 Integrated Regional Water Management

The Watershed Coalition of Ventura County (WCVC) prepared an Integrated Regional Water Management Plan in 2006 and has been updated multiple times since. The Santa Clara River Watershed Committee, a sub organization of WCVC, is actively involved in the community on a wide range of issues affecting the watershed, including the Mound Basin. Since this group provides a forum for the discussion of issues that are important to the community, it is important for this group to be well informed throughout GSP development. Representatives from the MBGSA attend Council meetings and provide up-to-date information and hear feedback from Council members.

4.4 Public Hearings/Meetings

4.4.1 Planning Commission

Periodic updates on SGMA implementation will be provided to the City of Ventura Planning Commission and the Ventura County Planning Commission and the public will be invited to listen.

4.4.2 Public Meetings

Comprehensive stakeholder involvement will include regularly scheduled public meetings to aid in developing and implementing the GSP. Logical subdivisions of the GSP will be the subject of public meetings to receive comments prior to approval. In addition to signing up to receive information about GSP development at the MBGSA webpage, interested parties may participate in the development and implementation of the GSP by attending and participating in public meetings (Water Code Section 10727.8(a)). Public meetings are generally been held at Ventura City Hall, 501 Poli Street, Ventura, California 93001. Future public meetings will generally be held at this location, although some meetings may be moved to other locations depending on meeting room availability. Each meeting will have a scheduled time for public comments. While the California Governor's Executive Stay at Home Order and the County of Ventura Health Officer Declared Local Health Emergency and Be Well at Home Order remain in effect, meetings will be held on-line. When appropriate, on-line meetings will include polling features to facilitate stakeholder input. Information about upcoming meetings can be found on the MBGSA website: http://moundbasingsa.org.

4.4.3 Local Agency Meetings

To ensure their constituency is kept informed of the progress of GSP development and implementation, the Directors representing MBGSA member agencies, which consist of County of Ventura, City of San Buenaventura, and United Water Conservation District have committed to providing periodic updates during their regularly scheduled board meetings. These meetings offer a chance for the public to receive information and provide comment. Information about upcoming meetings is provided on the following agency websites, or by the means each agency currently meets its legal noticing requirements, whichever is appropriate:

http://cityofventura.ca.gov

http://ventura.org (Board of Supervisors)

https://www.unitedwater.org/

4.5 Direct Mailings/Email

Public meetings and project information will be disseminated through email, from the Agency office, or direct mail under special circumstances if requested. This communication will provide information for the community, public agencies, and other interested persons/organizations about milestones, meetings, and the progress of GSP development. Property owners with groundwater wells within the basin are notified via email and/or direct mailings about the establishment of an interested persons list and given the opportunity to receive future notices.

4.6 Newsletters/Columns

Periodic GSP newsletters will be developed and sent to the interested parties and posted on the website. Periodic updates may be provided to the *Ventura County Star* newspapers to advise, educate, and inform the public on SGMA implementation.

4.7 MBGSA Website

Regular updates on the GSP development and implementation will be provided on the MBGSA website. This information will include maps, timelines, frequently asked questions, groundwater information, and schedules/agenda of upcoming meetings and milestones. This information will be accessible on the MBGSA website: http://moundbasingsa.org. MBGSA staff will update the website regularly and invite users to request information or be added to the interested persons list. In addition, general information about SGMA and groundwater conditions will be available on UWCD's website.

4.8 Database

To distribute information about GSP development, an email list has been compiled into a database of interested persons and stakeholders. The database will be updated regularly to add names of attendees at public meetings along with those requesting information via email or the through the MBGSA website.

4.9 Tribal Engagement

There are no tribal trust lands located within the Basin. However, the Mound Basin lies within the traditional tribal territory of the Chumash. MBGSA will inform the Tribal Elder, Julie Tumamait, and Tribal representative Walter Viar throughout the GSP development process and GSP implementation.

4.10 Additional Opportunities

Additional opportunities for stakeholder participation (e.g., an advisory committee) will be considered as GSP development progresses and as stakeholder interests evolve.

5 EVALUATION

To determine the level of success of the Engagement Plan, the MBGSA will implement the following measures:

5.1 Attendance/Participation

A record of those attending public meetings will be maintained throughout the GSP development process. MBGSA will utilize sign-in sheets and request feedback from attendees to determine adequacy of public education and productive engagement in the GSP development and implementation process. Meeting minutes will also be prepared and will be provided on the MBGSA website once approved.

5.2 Polling

Polls will be used to determine how stakeholders are receiving notices about GSP status and meetings and if any stakeholder categories require additional outreach. Polls will also be used to determine topics of most interest and the level of information that is desired for specific topics. Outreach methods will be tailored based on polling response.

5.3 Adherence to Schedule

Public participation in developing sustainable management criteria and projects and management actions for inclusion in the GSP is instrumental to the success of the GSP. Keeping these tasks on schedule will be an important indicator of stakeholder involvement. GSP development updates will be provided at each Regular Board of Directors meeting. A GSP development schedule will be developed and updated monthly.

5.4 Plan Update

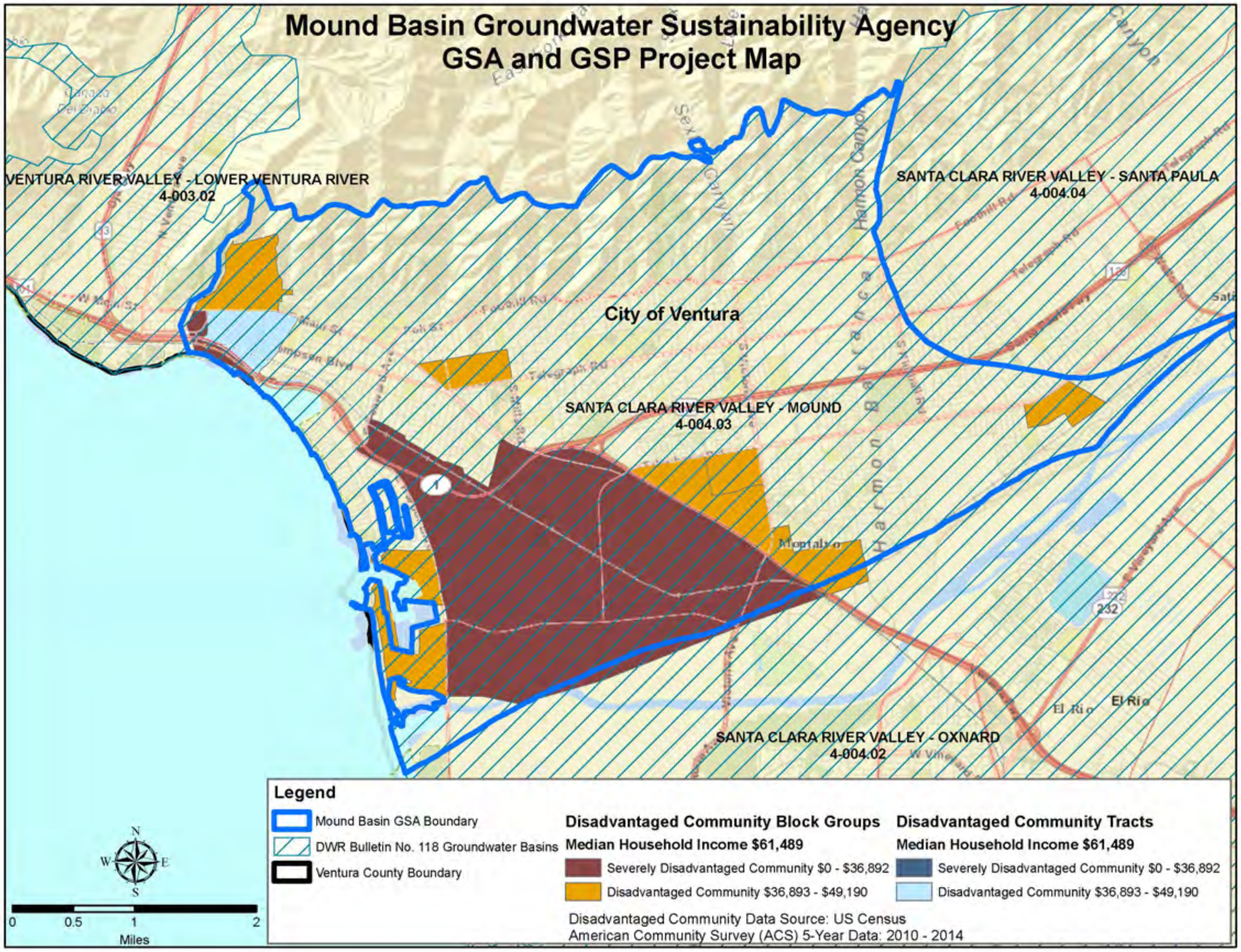
This Plan will be updated at least annually.

APPENDIX A

TABLE 1

During GSA Formation:	
"Before electing to be a groundwater sustainability agency... the local agency or agencies shall hold a public hearing."	Water Code Sec. 10723 (b)
"A list of interested parties [shall be] developed [along with] an explanation of how their interests will be considered."	Water Code Sec. 10723.8.(a)(4)
During GSP Development and Implementation:	
"A groundwater sustainability agency may adopt or amend a groundwater sustainability plan after a public hearing."	Water Code Sec. 10728.4
"Prior to imposing or increasing a fee, a groundwater sustainability agency shall hold at least one public meeting."	Water Code Sec. 10730(b)(1)
"The groundwater sustainability agency shall establish and maintain a list of persons interested in receiving notices regarding plan preparation, meeting announcements, and availability of draft plans, maps, and other relevant documents."	Water Code Sec. 10723.4
"Any federally recognized Indian Tribe... may voluntarily agree to participate in the preparation or administration of a groundwater sustainability plan or groundwater management plan... A participating Tribe shall be eligible to participate fully in planning, financing, and management under this part."	Water Code Sec. 10720.3(c)
"The groundwater sustainability agency shall make available to the public and the department a written statement describing the manner in which interested parties may participate in the development and implementation of the groundwater sustainability plan."	Water Code Sec. 10727.8(a)
Throughout SGMA Implementation:	
"The groundwater sustainability agency shall consider the interests of all beneficial uses and users of groundwater."	Water Code Sec. 10723.2
"The groundwater sustainability agency shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the groundwater basin."	Water Code Sec. 10727.8(a)

FIGURE 1



Mound Basin Groundwater Sustainability Agency
GSA and GSP Project Map
VENTURA RIVER VALLEY - LOWER VENTURA RIVER
4-003.02
SANTA CLARA RIVER VALLEY - SANTA PAULA
4-004.04
City of Ventura
SANTA CLARA RIVER VALLEY - MOUND
4-004.03
SANTA CLARA RIVER VALLEY - OXNARD
4-004.02
Montalvo
El Rio
Harmon Canyon
Legend
Mound Basin GSA Boundary
DWR Bulletin No. 118 Groundwater Basins
Ventura County Boundary
Disadvantaged Community Block Groups
Median Household Income $61,489
Severely Disadvantaged Community $0 - $36,892
Disadvantaged Community $36,893 - $49,190
Disadvantaged Community Tracts
Median Household Income $61,489
Severely Disadvantaged Community $0 - $36,892
Disadvantaged Community $36,893 - $49,190
Disadvantaged Community Data Source: US Census
American Community Survey (ACS) 5-Year Data: 2010 - 2014
0
0.5
1
2
Miles

Appendix E

List of Public Meetings (Reg. §354.10)

Post Office Box 3544
Ventura, CA 93006-3544
(805) 525-4431
www.moundbasingsa.org

Groundwater Sustainability Plan (GSP)

Historical Information on Public Meetings Related to the GSP Development

(Time Period: 2018-October through 2021-November)

MEETING DATE	MEETING TYPE (Regular, Special, Workshop)	ITEM TYPE (Informational or Motion)	TOPIC (Agenda Item Title)	RECOMMENDED ACTION (Agenda Item Description)	ACTION TAKEN (Approved, No Motion, Deferred, Continued)
2018-10-18	Regular	Motion	Approval of Stakeholder Engagement Plan	The Board will consider approving the proposed Stakeholder Engagement Plan.	Approved
2018-10-18	Regular	Informational	GSP Development Options	Executive Director Bryan Bondy will lead the Directors in a discussion of the various options relating to the development of the Agency's Groundwater Sustainability Plan.	No motion
2019-01-17	Regular	Motion	GSP Development Options (Grant Category (c): Planning Activities; Task 2: Organizational Activities)	The Executive Director will provide an update on discussions with United Water Conservation District (UWCD) concerning technical support services for the GSP, discuss options for servicing various GSP elements, and provide direction to staff.	Approved
2019-01-17	Regular	Motion	Isotope Study (Grant Category (b): Models and Studies)	The Board will consider approving professional services by S.S. Papadopulos and Associates to assist the Agency with completing the isotope study described in the GSP Grant application.	Approved
2019-02-21	Regular	Motion	Agreement with United Water Conservation District for GSP Technical Services	The Board will consider conditionally authorizing the Chair to execute an agreement with United Water Conservation District for groundwater modeling and other technical services related to GSP development.	Approved
2019-03-21	Regular	Motion	GSP As-Needed Support Services (Grant Category (c): Planning Activities; Task 2: Organizational Activities)	Board will consider authorizing the Chair to execute a professional services agreement with Intera, Inc., subject to negotiation of agreement terms to the satisfaction of the Chair, Agency Counsel, and Executive Director.	Approved

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Groundwater Sustainability Plan (GSP)

Historical Information on Public Meetings Related to the GSP Development

(Time Period: 2018-October through 2021-November)

MEETING DATE	MEETING TYPE (Regular, Special, Workshop)	ITEM TYPE (Informational or Motion)	TOPIC (Agenda Item Title)	RECOMMENDED ACTION (Agenda Item Description)	ACTION TAKEN (Approved, No Motion, Deferred, Continued)
2019-05-16	Regular	Motion	Approval of Intera Work Order No. 1	The Board will consider approving Work Order No. 1 for Intera, for the review of background information, creation of a GSP document template, and other preparatory activities outlined in work order.	Approved
2019-10-17	Regular and Public Hearing	Motion	GSP Development Update	The Board will receive an update from the Executive Director concerning GSP development and consider providing feedback to staff.	Approved
2019-10-17	Regular and Public Hearing	Motion	Approval of Intera, Inc. Work Order Nos. 2 and 3	The Board will consider approving two work orders for Inter, Inc. Work Order No. 2 will address development of options for a MBGSA data management system, a required element of the GSP. Work Order No. 3 will provide budget for Intera, Inc. to review the hydrogeologic conceptual model (HCM) developed by UWCD, support the Executive Director with preliminary review of sustainability management criteria, and assit with a public workshop concerning the aforementioned topics.	Approved
2019-12-19	Regular	Motion	Approval of Intera, Inc. Work Order No. 4	The Board will consider approving Intera Work Order No. 4 for an amount not-to-exceed $15,640 to develop the MBGSA Data Management System and populate it with data for GSP development and up to $5,000 in contingency, to be authorized at the discretion of the Executive Director.	Approved

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Groundwater Sustainability Plan (GSP)

Historical Information on Public Meetings Related to the GSP Development

(Time Period: 2018-October through 2021-November)

MEETING DATE	MEETING TYPE (Regular, Special, Workshop)	ITEM TYPE (Informational or Motion)	TOPIC (Agenda Item Title)	RECOMMENDED ACTION (Agenda Item Description)	ACTION TAKEN (Approved, No Motion, Deferred, Continued)
2020-02-20	Regular	Informational	Executive Director Update	Executive Director will provide an informational update on Agency activities since the previous Board meeting, including a recurring GSP Development update.	No motion required.
2020-02-20	Regular	Informational	GSP Monthly Update (Grant Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan and may provide feedback or direction to staff.	No motion required.
2020-02-20	Regular	Motion	Data Management System Update (Grant Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's data management system and may provide feedback or direction to staff.	No motion required.
2020-02-20	Regular	Motion	Isotope Study Report (Grant Category (b))	The Board will consider receiving and filing the Isotope study report.	Approved
2020-04-16	Regular	Motion	GSP Monthly Update (Grant Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan and grant status. The Board may provide feedback or direction to staff.	Approved
2020-05-21	Regular	Motion	GSP Monthly Update (Grant Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan and grant status. The Board may provide feedback or direction to staff.	Approved
2020-05-21	Regular	Motion	Intera Work Order No. 5 for GSP Development (Grant Category (d), Task 4)	The Board will consider approving Work Order No. 5 for Intera for an amount not to exceed $256,760 for GSP development.	Approved

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Groundwater Sustainability Plan (GSP)

Historical Information on Public Meetings Related to the GSP Development

(Time Period: 2018-October through 2021-November)

MEETING DATE	MEETING TYPE (Regular, Special, Workshop)	ITEM TYPE (Informational or Motion)	TOPIC (Agenda Item Title)	RECOMMENDED ACTION (Agenda Item Description)	ACTION TAKEN (Approved, No Motion, Deferred, Continued)
2020-06-18	Regular and Public Hearing	Informational	Executive Director Update	Executive Director will provide an informational update on Agency activities since the previous Board meeting, including a recurring GSP Development update.	No motion required.
2020-06-18	Regular and Public Hearing	Motion	GSP Monthly Update (Grant Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan and grant status. The Board may provide feedback or direction to staff.	Approved
2020-06-18	Regular and Public Hearing	Motion	Sustainable Management Criteria Overview and Sustainability Goal Discussion (Grant Category (d), Task 4)	The Board will receive background information concerning development of sustainable management criteria and consider approving a process for developing the sustainability goal description.	Approved
2020-07-16	Regular	Informational	Executive Director Update	Executive Director will provide an informational update on Agency activities since the previous Board meeting, including a recurring GSP Development update.	No motion required.
2020-07-16	Regular	Motion	GSP Monthly Update (Grant Category (c), Task 3 and Category (d), Task 4) *Note: Draft Newsletter, July 2020, Volume 1, Issue 2 included with GSP Monthly Update*	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan and grant status. The Board may provide feedback or direction to staff.	Approved
2020-07-16	Regular	Motion	Sustainability Goal Public Draft Release (Grant Category (d), Task 4)	The Board will consider approving the draft sustainability goal description for public comment release.	Approved

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Groundwater Sustainability Plan (GSP)

Historical Information on Public Meetings Related to the GSP Development

(Time Period: 2018-October through 2021-November)

MEETING DATE	MEETING TYPE (Regular, Special, Workshop)	ITEM TYPE (Informational or Motion)	TOPIC (Agenda Item Title)	RECOMMENDED ACTION (Agenda Item Description)	ACTION TAKEN (Approved, No Motion, Deferred, Continued)
2020-07-16	Regular	Motion	Set Date and Time for GSP Stakeholder Workshop - Webinar (Grant Category (c), Task 3)	The Board will consider setting the date and time for Stakeholder Workshop No. 1.	Approved
2020-08-20	Regular	Informational	Groundwater Model Presentation	The Board will receive a presentation from United Water Conservation District staff concerning groundwater model development.	No motion required.
2020-08-20	Regular	Motion	GSP Monthly Update (Grant Category (c), Task 3 and Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan and grant status. The Board may provide feedback or direction to staff.	Approved
2020-08-20	Regular	Motion	Sustainability Goal (Grant Category (d), Task 4)	The Board will consider approving the sustainability goal for the Agency's Groundwater Sustainability Plan.	Continued
2020-08-20	Regular	Motion	Sustainable Management Criteria Screening (Grant Category (d), Task 4)	The Board will review sustainable management criteria screening results and consider providing feedback to staff.	Approved
2020-08-20	Regular	Motion	GSP Stakeholder Workshop Webinar Agenda (Grant Category (c), Task 3)	The Board will discuss the draft agenda for Stakeholder Workshop No. 1 and consider providing feedback to staff.	No motion required.
2020-09-30	Workshop	Informational	Mound Basin Groundwater Sustainability Plan (GSP) Online Public Workshop No. 1	Presented to public/stakeholders: • Introduction to SGMA and GSPs • Overview of Basin Setting • Groundwater Model Summary • Next Steps for GSP Development • Stakeholder Questions and Feedback • Director Comments • Q&A built in throughout	No motion required.
2020-09-17	Regular	Informational	GSP Stakeholder Workshop No. 1 Recap (Grant Category (c), Task 3)	The Executive Director will summarize insights gained from GSP Workshop No. 1.	No motion required.

Groundwater Sustainability Plan (GSP)

MoundBasin GROUNDWATER SUSTAINABILITY AGENCY

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Historical Information on Public Meetings Related to the GSP Development
(Time Period: 2018-October through 2021-November)

MEETING DATE	MEETING TYPE (Regular, Special, Workshop)	ITEM TYPE (Informational or Motion)	TOPIC (Agenda Item Title)	RECOMMENDED ACTION (Agenda Item Description)	ACTION TAKEN (Approved, No Motion, Deferred, Continued)
2020-09-17	Regular	Motion	GSP Monthly Update (Grant Category (c), Task 3 and Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan and grant status. The Board may provide feedback or direction to staff.	Approved
2020-09-17	Regular	Motion	Sustainability Goal (Grant Category (d), Task 4)	The Board will consider approving the sustainability goal for the Agency's Groundwater Sustainability Plan.	Approved
2020-10-15	Regular	Motion	GSP Monthly Update (Grant Category (c), Task 3 and Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan and grant status. The Board may provide feedback or direction to staff.	Approved
2020-11-19	Regular	Motion	GSP Monthly Update (Grant Category (c), Task 3 and Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan and grant status. The Board may provide feedback or direction to staff.	Approved
2020-12-17	Regular	Motion	GSP Monthly Update (Grant Category (c), Task 3 and Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan and grant status. The Board may provide feedback or direction to staff.	Approved
2020-12-17	Regular	Motion	Degraded Water Quality Sustainable Management Criteria	The Board will discuss proposed sustainable management criteria for the water quality sustainability indicator and consider providing feedback to staff.	Approved

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MEETING DATE	MEETING TYPE (Regular, Special, Workshop)	ITEM TYPE (Informational or Motion)	TOPIC (Agenda Item Title)	RECOMMENDED ACTION (Agenda Item Description)	ACTION TAKEN (Approved, No Motion, Deferred, Continued)
2021-01-21	Regular	Motion	GSP Monthly Update (Grant Category (c), Task 3 and Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan and grant status. The Board may provide feedback or direction to staff.	Approved
2021-01-21	Regular	Motion	GSP Workshop No. 2 (Grant Category (c); Task 3: Stakeholder Outreach and Engagement)	The Board will consider scheduling the second GSP public workshop.	Approved
2021-01-21	Regular	Motion	GSP Newsletter Volume 2, Issue 1 (Grant Category (c); Task 3: Stakeholder Outreach and Engagement)	The Board will consider approving GSP Newsletter Volume 2, Issue 1 for public release.	Approved
2021-02-18	Regular	Motion	Review of Future Groundwater Conditions Modeling Results and Implications for Sustainable Management (Grant Category (c), Task 3 and Category (d), Task 4)	The Board will receive a presentation from the GSP Development Team concerning modeling results and implications for sustainable management. The Board will consider providing feedback or direction to staff concerning sustainable management criteria.	Approved
2021-02-18	Regular	Motion	GSP Monthly Update (Grant Category (c), Task 3 and Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan and grant status. The Board may provide feedback or direction to staff.	Approved

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MEETING DATE	MEETING TYPE (Regular, Special, Workshop)	ITEM TYPE (Informational or Motion)	TOPIC (Agenda Item Title)	RECOMMENDED ACTION (Agenda Item Description)	ACTION TAKEN (Approved, No Motion, Deferred, Continued)
2021-03-04	Workshop	Informational	Mound Basin Groundwater Sustainability Plan (GSP) Online Public Workshop No. 2	Presented to public/stakeholders: • Introduction to Sustainable Management Criteria • Groundwater Modeling and Water Budgets • Proposed Sustainable Management Criteria • Stakeholder Questions and Feedback • Director Comments • Q&A built in throughout	No motion required.
2021-03-18	Regular	Motion	GSP Monthly Update (Grant Category (c), Task 3 and Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan and grant status. The Board may provide feedback or direction to staff.	Approved
2021-03-18	Regular	Motion	Sustainable Management Criteria (Category (d), Task 4)	The Board will consider directing staff to prepare the draft groundwater sustainability plan using the proposed sustainable management criteria or provide other direction.	Approved
2021-04-15	Regular	Motion	GSP Monthly Update (Grant Category (c), Task 3 and Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan and grant status. The Board may provide feedback or direction to staff.	Approved
2021-05-20	Regular	Motion	GSP Monthly Update (Grant Category (c), Task 3 and Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan and grant status. The Board may provide feedback or direction to staff.	Approved

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(Time Period: 2018-October through 2021-November)

MEETING DATE	MEETING TYPE (Regular, Special, Workshop)	ITEM TYPE (Informational or Motion)	TOPIC (Agenda Item Title)	RECOMMENDED ACTION (Agenda Item Description)	ACTION TAKEN (Approved, No Motion, Deferred, Continued)
2021-05-20	Regular	Motion	GSP 20-Year Implementation Budget Projection, Fiscal Year 2021/2022 Budget, and Multi-Year Budget Projection	The Board will review a 20-year GSP implementation budget projection, consider approving the Fiscal Year 2021/2022 budget and the multi-year budget projection, and consider scheduling a public hearing to consider adoption of groundwater extraction fees for Fiscal Year 2021/2022.	Approved
2021-05-20	Regular	Motion	Monitoring Well Access Agreement	The Board will review a draft access agreement for the planned monitoring well at the Ventura Water Reclamation Facility and consider authorizing the Executive Director or Board Officer to execute a final access agreement, subject to terms agreeable to Agency Counsel.	Approved
2021-06-17	Regular	Motion	GSP Monthly Update (Grant Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan and grant status. The Board may provide feedback or direction to staff.	Approved
2021-06-17	Regular	Motion	Review of Preliminary Draft GSP, Schedule Draft GSP Public Comment Period, and Schedule GSP Workshop (Grant Category (d), Task 4)	The Board will discuss the preliminary draft GSP and consider scheduling a 60-day public comment period for the draft GSP and a public workshop.	Approved

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(Time Period: 2018-October through 2021-November)

MEETING DATE	MEETING TYPE (Regular, Special, Workshop)	ITEM TYPE (Informational or Motion)	TOPIC (Agenda Item Title)	RECOMMENDED ACTION (Agenda Item Description)	ACTION TAKEN (Approved, No Motion, Deferred, Continued)
2021-06-17	Regular	Resolution	PUBLIC HEARING	Resolution 2021-01: A Resolution of the Board of Directors of the Mound Basin Groundwater Sustainability Agency Determining and Establishing Groundwater Extraction Fees Against All Persons Operating Groundwater Extraction Facilities Within the Mound Basin for the 8th and 9th Semiannual Billing Periods (JulyDecember 2021 and January-June 2022).	Approved
2021-06-17	Regular	Motion	PUBLIC HEARING	The Board will open a PUBLIC HEARING to discuss potential extraction fees, based on the Fiscal Year 2020-21 Budget and the updated 5-year financial projection posted on the Agency's website. The Board welcomes public comment and testimony regarding the proposed groundwater extraction fees. After receiving public comment and testimony, the Board will close the PUBLIC HEARING and consider adopting Resolution 2021-01 establishing the proposed groundwater extraction fees within the Mound Basin for the 8th and 9th Semiannual Billing Periods (July-December 2021 and January-June 2022).	Approved

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(Time Period: 2018-October through 2021-November)

MEETING DATE	MEETING TYPE (Regular, Special, Workshop)	ITEM TYPE (Informational or Motion)	TOPIC (Agenda Item Title)	RECOMMENDED ACTION (Agenda Item Description)	ACTION TAKEN (Approved, No Motion, Deferred, Continued)
2021-07-15	Regular and Public GSP Workshop	Motion	Technical Support Services Agreement	The Board will consider authorizing the Executive Director to finalize and execute an agreement with the State of California Department of Water Resources for the Technical Support Services Monitoring Well.	Approved
2021-07-15	Regular and Public GSP Workshop	Motion	Site Use Agreement for the Technical Support Services Monitoring Well	The Board will consider authorizing the Executive Director to finalize and execute a site use agreement for the Technical Support Services Monitoring Well.	Approved
2021-07-15	Regular and Public GSP Workshop	Motion	GSP Monthly Update (Grant Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan (GSP) and grant status. The Board may provide feedback or direction to staff.	Approved
2021-07-15	Regular and Public GSP Workshop	Informational	Mound Basin Groundwater Sustainability Plan (GSP) Online Public Workshop No. 3	The GSP Public Workshop No. 3 will provide an overview of the draft GSP contents. The workshop is an opportunity for the public and Board members to ask questions and give verbal feedback on the draft GSP. Presented to public/stakeholders: • Introduction to SGMA and GSPs • Summary of Draft GSP Comments • Questions and Stakeholder Feedback	No motion required.
2021-08-19	Regular	Motion	GSP Monthly Update (Grant Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan (GSP) and grant status. The Board may provide feedback or direction to staff.	Approved

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Historical Information on Public Meetings Related to the GSP Development

(Time Period: 2018-October through 2021-November)

MEETING DATE	MEETING TYPE (Regular, Special, Workshop)	ITEM TYPE (Informational or Motion)	TOPIC (Agenda Item Title)	RECOMMENDED ACTION (Agenda Item Description)	ACTION TAKEN (Approved, No Motion, Deferred, Continued)
2021-09-02	Special	Motion	Rincon Consultants, Inc. Master Services Agreement and Work Order No. 1 for GSP Development Support (Grant Category (d), Task 4)	The Board will consider authorizing the Executive Director and Agency Counsel to negotiate and execute a master services agreement with Rincon Consultants, Inc., and issue Work Order No. 1 for GSP development support for an amount not-to exceed $25,000.	Approved
2021-09-16	Regular	Motion	GSP Monthly Update (Grant Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan (GSP) and grant status. The Board may provide feedback or direction to staff.	Approved
2021-10-21	Regular	Motion	GSP Monthly Update (Grant Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan (GSP) and grant status. The Board may provide feedback or direction to staff.	Approved
2021-10-21	Regular	Motion	Schedule Public Hearing for GSP Adoption (Grant Category (c), Task 3 and d), Task 4)	The Board will consider setting a date and time for a public hearing concerning adoption of the GSP.	Approved
2021-11-18	Regular	Motion	GSP Monthly Update (Grant Category (d), Task 4)	The Board will receive an update from the Executive Director concerning development of the Agency's Groundwater Sustainability Plan (GSP) and grant status. The Board may provide feedback or direction to staff.	Approved
2021-11-18	Regular	Resolution	PUBLIC HEARING	Resolution 2021- 03: A Resolution of the Board of Directors of the Mound Basin Groundwater Sustainability Agency Adopting a Groundwater Sustainability Plan (GSP) for the Mound Basin.	Approved

Appendix F

GSP Comments and Responses (Reg. §354.10)

Appendix F

GSP Comments and Responses

This appendix documents comments received on the draft Groundwater Sustainability Plan (GSP) and a summary of responses by Mound Basin Groundwater Sustainability Agency (MBGSA), as required pursuant to GSP Emergency Regulations Section 354.10(c). Included below is a summary of responses to major comment themes shared between the California Department of Fish and Wildlife (CDFW), National Marine Fisheries Service (NMFS), and a consortium of non-governmental organizations (NGOs). In addition, a comment matrix is attached to this appendix (Attachment F-1), which includes detailed responses to comments from all reviewers; however, the comments which share the major themes from the three aforementioned parties are not included in the comment matrix due to their volume and repetition and are otherwise introduced in the discussion below and addressed in a new appendix to the draft GSP (Appendix G). In order to distinguish the comments from CDFW, NGOs, and NMFS, which do not follow the major themes discussed below, they have been identified and labeled with numbers and boxes in each of their respective comment letter (see Attachment F-2) and correspond with the numbers in the comment matrix table (see Attachment F-1 comments #6-9 [CDFW], #10-16 [NGOs], and #31-48 [NMFS]).

Major Comment Themes and Summary Response

Major Comment Theme No. 1:
In general, the comments from CDFW, NMFS, and NGOs express shared concerns about the draft GSP's treatment of shallow groundwater occurring within the Shallow Alluvial Deposits and interconnected surface water of the Santa Clara River and its estuary, including related potential groundwater dependent ecosystems (GDEs) as beneficial uses and users of groundwater and surface water. In summary, the comments expressed concerns about the absence of sustainable management criteria (SMC) and limited monitoring of the Shallow Alluvial Deposits to address concerns about GDEs, both riparian and aquatic, including the "depletions of interconnected surface water" sustainability indicator.

Summary Response No. 1:
The Draft GSP explained that the riparian GDEs may, in some cases, utilize groundwater from the Shallow Alluvial Deposits (particularly within the floodplain of the Santa Clara River). Similarly, the Draft GSP stated that the Shallow Alluvial Deposits discharge minor amounts of groundwater to Santa Clara River and its estuary. However, the Draft GSP also explained that there is no current or planned groundwater extraction from wells screened in the Shallow Alluvial Deposits and that groundwater extractions from the deep, confined aquifers of the Basin do not materially affect groundwater levels in the Shallow Alluvial Deposits or surface flows in the Santa Clara River. For this reason, there are no impacts to the riparian and aquatic GDE beneficial uses that needed to be considered during SMC formulation. Similarly, owing to the lack of impacts, the need for detailed monitoring of Shallow Alluvial Deposits and Santa Clara River flows is limited.

In review of the comments, it was clear that the Draft GSP could be improved by providing more information about groundwater conditions in the Shallow Alluvial Deposits and further information to support the conclusion that shallow groundwater levels and Santa Clara River flows are not materially affected by groundwater pumping in the Mound Basin. To address this need, MBGSA developed and added Appendix G to the final GSP to provide further information and clarification around these issues. Appendix G provided additional documentation of the technical data that support the conclusions that the Shallow Alluvial Deposits hydrostratigraphic unit (HSU) is not a principal aquifer and that shallow groundwater levels and Santa Clara River flows are not materially affected by groundwater pumping in the Mound Basin. Specifically, Appendix G provides the following information:

1. The characteristics of the Shallow Alluvial Deposits HSU and explanation of why it is not considered a principal aquifer in Mound Basin.

2. Additional evidence supporting the conclusion that there is a lack of material hydraulic connection between the shallow groundwater with the much deeper principal aquifers used for water supply in Mound Basin (the Mugu and Hueneme aquifers).

3. Additional evidence supporting the conclusion that there is a lack of material hydraulic connection between the Santa Clara River (and its estuary) and the principal aquifers used for water supply in Mound Basin (the Mugu and Hueneme aquifers).

In addition, an interim study consisting of shallow groundwater data collection via City of Ventura shallow monitoring wells has been added to the GSP to help confirm the conclusions presented in Appendix G (See updated GSP Sections 5.3.1 and 6.6).

Major Comment Theme No. 2:
Several commenters (CDFW, NGOs, California Trout, and NMFS) expressed concerns about the determination that potential GDEs in Area Nos. 1 through 10 are not actual GDEs.

Summary Response No. 2:
MBGSA reviewed the screening results in light of the comments and hired Rincon Consultants, Inc., to further investigate the potential GDEs, including site visits to each publicly accessible area. The field visits and historical air photo reviews provide additional evidence that the vegetation in Area Nos. 1 through 10 are not likely groundwater dependent. This information was added to the updated GSP and Appendix H (formerly Appendix G in prior draft versions).

Attachment F-1

Comment Matrix

Attachment F-1

Groundwater Sustainability Plan
Public Comment Period: June 23 through August 23, 2021
Updated October 14, 2021

Note: comments which share the major themes from the Appendix F introduction are not included in the comment matrix below due to their volume and repetition and are addressed in a new appendix to the GSP (Appendix G). In order to distinguish the comments from CDFW, NGOs, and NMFS, which do not follow the major themes discussed below, they have been identified and labeled with numbers and boxes in each of their respective comment letters (provided following this table) and correspond with the numbers in the comment matrix table below (see comments #6-9 [CDFW], #10-16 [NGOs], and #31-48 [NMFS]).

MoundBasin GROUNDWATER SUSTAINABILITY AGENCY

Comment Number	Entry Date	First Name	Last Name	Email Address	Phone Number	Mailing Address	GSP Referenced	Comment/Question	Response
1	26-Jul-21	Burt	Handy	burthandy@gmail.com			Section 3.1 Hydrogeologic Conceptual Model	On Figures 3.1-03 and 3.1-04 the Ventura-Santa Clara River Syncline are shown on different locations on these Figures; The Ventura-Santa Clara River Syncline and the Montalvo-South Mtn -Oak Ridge Fault Anticline are not shown on figures (Ventura Syncline) B-3.1-06, C 3.1-07, D 3.1-08 (Montalvo Anticline) b-3.1-06, 3.1-07	Synclines/anticlines labeled.
2	16-Aug-21	Michael Kelley	Flood Dyer	mflood@casitaswater.com kdyer@casitaswater.com	805-649-2251 ext. 111	Casitas Municipal Water District 1055 Ventura Ave. Oak View, CA 93022	ES 2.2.1 Summary of Jurisdictional Areas and Other Features	Page ES-iii second paragraph, the City of Ventura's Ventura River surface diversions should also be mentioned here (Note: this relationship is correctly mentioned in paragraph six on page 32 and the last paragraph on page 73). Page ES-vi, fourth paragraph the City of Ventura's Ventura River surface diversions should also be mentioned here. Page 7, fourth paragraph, the City of Ventura's Ventura River surface diversions should also be mentioned here.	The City of Ventura operates wells, including a subsurface intake, in the Ventura River floodplain, which is already noted in this paragraph. Page 32, "surface" deleted. Page 73, edits to clarify Foster Park facilities are groundwater extraction facilities.
3	16-Aug-21	Michael Kelley	Flood Dyer	mflood@casitaswater.com kdyer@casitaswater.com	805-649-2251 ext. 111	Casitas Municipal Water District 1055 Ventura Ave. Oak View, CA 93022	Section 2.2.2.2 Existing Water Resource Management Programs	Page 10, second section (Casitas MWD Urban Water Management and Agricultural Water Management Plan), Casitas recently adopted its 2020 Urban Water Management Plan (UWMP), elements of which should be included in this section (link: https://www.casitaswater.org/your-water/urban-water-management-plans).	The 2020 WSCP and UWMP for City of Ventura (Kennedy/Jenks, 2021a&b) and the 2020 UWMP for CMWD (CMWD, 2021) have been included in the GSP and the text has been updated to reflect the differences/updates.
4	16-Aug-21	Michael Kelley	Flood Dyer	mflood@casitaswater.com kdyer@casitaswater.com	805-649-2251 ext. 111	Casitas Municipal Water District 1055 Ventura Ave. Oak View, CA 93022	Section 2.3.1 Beneficial Uses and Users	Page 24, first paragraph states: "As a wholesale water provider to Ventura Water, Casitas MWD's interests were represented via the City's participation on the MGBSA Board of Directors". No proof of this statement has been located by Casitas Staff and thus it should be removed. Further, as a separate Special District of the State of California, Casitas MWD has a responsibility to its stakeholders that is separate to that of the City of Ventura and it should not be seen as Casitas MWD surrendering this authority without an action of the Casitas Board of Directors. Although Casitas does not have facilities within the Mound Basin currently nor sit on the MB GSA Board of Directors, it should still be viewed as an active stakeholder in the basin.	Sentence in question was deleted.
5	16-Aug-21	Michael Kelley	Flood Dyer	mflood@casitaswater.com kdyer@casitaswater.com	805-649-2251 ext. 111	Casitas Municipal Water District 1055 Ventura Ave. Oak View, CA 93022	Section 3.3.1.2 Reliability of Historical Surface Water Supplies	Page 83, fourth paragraph notes 'exceptional drought' from 2012 to 2016. This is an accurate statewide metric but not for the local drought conditions that have caused a relatively steady decline in Lake Casitas' storage levels from 2011 through the present day. Mandated conservation goals along with the associated penalties should also be mentioned as reasons for lowering of demands.	Sentence added: "The lower than anticipated surface water deliveries were related to a combination of factors, including mandated conservation goals along with the associated penalties."
6	17-Aug-21	Erinn Steven	Wilson-Olgin Slack	steven.slack@wildlife.ca.gov	805-467-4201	CA Dept. of Fish and Wildlife 2493 Portola Rd # B, Ventura, CA 93003	n/a	**COMMENT OVERVIEW** CDFW supports ecosystem preservation and enhancement in compliance with SGMA and its implementing regulations based on CDFW expertise and best available information and science. CDFW understands the Mound basin (Basin) and is adjacent to the Santa Paula basin and the Oxnard basin. These three basins sit within the larger Oxnard Plain area. CDFW offers the following comments and recommendations below to assist MB-GSA in identifying and evaluating impacts on biological resources including GDEs within the adjacent groundwater basins. Additional suggestions are included for MB-GSA's consideration during revisions of the Draft GSP.	Comment noted. The Mound and Santa Paula Basins are not part of "the larger Oxnard Plain area". No such area is recognized by DWR or others to MGGSA's knowledge.

Comment Number	Entry Date	First Name	Last Name	Email Address	Phone Number	Mailing Address	GSP Referenced	Comment/Question	Response
7	17-Aug-21	Erinn Steven	Wilson-Olgin Slack	steven.slack@wildlife.ca.gov	805-467-4201	CA Dept. of Fish and Wildlife 2493 Portola Rd # B, Ventura, CA 93003	Section 3.3 Water Budget	**Comment #3:** Impacts of United Water Conservation District's Diversion Operations at the Vern Freeman Diversion on the SCRE (Water Budget Section 3.3 Starting on Page 70) **Issue:** The SCRE is located at the western portion of the Basin and is the terminus of the SCR. The protection and preservation of the SCRE for many species is a high priority for CDFW. United Water Conservation District's (UWCD) Vern Freeman Diversion (VFD), which is located in the Santa Paula Subbasin, plays a major role in limiting the amount of surface water that ultimately reaches the SCRE in the Mound Subbasin. As previously mentioned in Comment #2, GDEs do exist in the Basin and the VFD and recharge operations negatively impact these ecosystems. The VFD diverts surface water that would have continued to flow into the Mound Subbasin, but the water is instead diverted to the Oxnard Subbasin for groundwater storage. The water budget does not consider or analyze the VFD amounts in the Draft GSP. **Concern:** The SCRE provides open water, sand dune, nearshore, riparian, mudflat, and other habitats that support a number of sensitive species throughout their life cycles, including the tidewater goby (Eucclogobius newberryi), steelhead, California least tern (Sterna antillarum browni), and western snowy plover (Charadrius nivosus) (CDFW 2019). SCRE is a core resource area strategically located along the coast that provides food, shelter, stopover, and safety for wildlife. The Ventura Wastewater Reclamation Facility (VWRF) currently discharges recycled water into the SCRE but will be reducing the amount of effluent discharge (from 4.7 MGD to 1.9 MGD) into the SCRE in the near future. Discharge reduction has the potential to significantly improve water quality conditions in the SCRE at the expense of a reduction in open water habitat. The surface water diverted from the VFD reduces flows needed to sustain the open water habitat for the SCRE. The VFD and spreading basin has altered the natural surface flow and groundwater recharge patterns in the SCR watershed (NMFS 2020, p.3). **Comment #3 Recommendation:** CDFW recommends the amounts and timing of streamflow depletions at the Vern Freeman Diversion should be included in the Draft GSP to complete the water budget. Additionally, CDFW recommends the MB-GSA identify the estimated quantity and timing of streamflow depletions in the subbasin. If this information is not available, CDFW recommends the MB-GSA identify a proposed plan to estimate these values. The final GSP should address the UWCD VFD diversion and recharge operations and their effects on surface flows and groundwater elevations along the SCR and SCRE.	GSP Emergency Regulations only require MBGSA to quantify the "total surface water entering and leaving a basin by water source type." (GSP Emerg. Regs. 354.18(b)(1)). MBGSA is not required to quantify diversions upstream or outside of the Basin in the GSP; however, the VFD is inherently included because it is a component of the regional numerical groundwater model used to quantify the water budget. Text was added to Section 3.3 to make clear that the water budget accounts for Vern Freeman Diversion operations. It is noted that the commenter incorrectly refers to surface water diversions as depletions. In the SGMA context, "depletions" are caused by groundwater use (GSP Emerg. Regs. 354.28(c)(6)).
8	17-Aug-21	Erinn Steven	Wilson-Olgin Slack	steven.slack@wildlife.ca.gov	805-467-4201	CA Dept. of Fish and Wildlife 2493 Portola Rd # B, Ventura, CA 93003	Section 6.0 Projects and Management Actions	CDFW recommends that the MB-GSA commit to Arundo (Arundo donax) removal in the SCRE and along the SCR within the Basin to improve groundwater supply and enhance habitat quality for nesting birds. Arundo removal is one example of a project and management action to minimize groundwater overdraft. If groundwater depletion results in reduced streamflow due to interconnected surface waters, the nesting and foraging success of the SSC yellow warbler (Dendroica petechia), the SSC yellow breasted chat (Icteria virens), least Bell's vireo, southwestern willow flycatcher and other bird species may be diminished due to the reduced nesting habitat and food availability.	The GSP concludes that the Basin is not in overdraft (Section 3.3.4.1) and groundwater extraction does not have a material influence on shallow groundwater levels or Santa Clara River flows (see new Appendix G for expanded information on this topic). Further, MBGSA is not responsible for habitat improvement. Therefore, it is unclear why MBGSA would pursue this costly project.

Attachment F-1

Comment Number	Entry Date	First Name	Last Name	Email Address	Phone Number	Mailing Address	GSP Referenced	Comment/Question	Response
9	17-Aug-21	Erinn Steven	Wilson-Olgin Slack	steven.slack@wildlife.ca.gov	805-467-4201	CA Dept. of Fish and Wildlife 2493 Portola Rd # B, Ventura, CA 93003	n/a	**CONCLUSION** In conclusion, the Draft GSP does not comply with all aspects of SGMA statute and regulations, and CDFW deems the Draft GSP inadequate to protect fish and wildlife beneficial users of groundwater for the following reasons: 1. The assumptions, criteria, findings, and objectives, including the sustainability goal, undesirable results, minimum thresholds, measurable objectives, and interim milestones are not reasonable and/or not supported by the best available information and best available science. [CCR § 355.4(b)(1)] (See Comments # 1, 2, and 3); 2. The Draft GSP does not identify reasonable measures and schedules to eliminate data gaps. [CCR § 355.4(b)(2)] (See Comments # 1, 2, and 3); 3. The sustainable management criteria and projects and management actions are not commensurate with the level of understanding of the basin setting, based on the level of uncertainty, as reflected in the Draft GSP. [CCR § 355.4(b)(3)] (See Comments # 1, 2, and 3); and, 4. The interests of the beneficial uses that are potentially affected by the use of groundwater in the basin, have not been considered. [CCR § 355.4(b)(4)] (See Comments # 1, 2, 3 and see Additional Comments).	While MBGSA, understands CDFW's concerns about habitat and species, MGGSA disagrees with the conclusion that the Draft GSP does not comply with SGMA. The GSP was developed consistent with SGMA regulations and requirements with specific regulatory text highlighted in each section. MBGSA has added an appendix (Appendix G) providing further technical data to more clearly demonstrate the lack of a material effect of groundwater extraction on shallow groundwater levels and Santa Clara River flows. Given the lack of a material relationship between groundwater pumping and shallow groundwater levels and Santa Clara River flows, it is not necessary to include criteria or data gaps for GDEs or interconnected surface water in the GSP.
10	18-Aug-21	Ngodoo Water Policy Analyst	Atume	ngos.sgma@gmail.com		NGO Consortium	n/a	Based on our review, we have significant concerns regarding the treatment of key beneficial users in the Draft GSP and consider the GSP to be **insufficient** under SGMA. We highlight the following findings: 1. Beneficial uses and users **are not sufficiently** considered in GSP development. a. Human Right to Water considerations **are not sufficiently** incorporated. b. Public trust resources **are not sufficiently** considered. c. Impacts of Minimum Thresholds, Measurable Objectives and Undesirable Results on beneficial uses and users **are not sufficiently** analyzed. 2. Climate change **is not sufficiently** considered. 3. Data gaps **are not sufficiently** identified and the GSP does not have a plan to eliminate them. 4. Projects and Management Actions **do not sufficiently** consider potential impacts or benefits to beneficial uses and users.	1. Beneficial uses and users have been incorporated in the Draft GSP according to each SGMA requirement (CCR §354.10, §354.16, §354.18, §354.26, §354.28, §354.34, §354.38). a. Assembly bill 685 applies to DWR. §350.4(g) states, "The Department shall consider the state policy regarding the human right to water when implementing these regulations". MBGSA is not responsible for water supply and no active domestic wells are located in the Basin. However, the established MTs and MOs were designed to protect the beneficial use of groundwater. b. The GSP demonstrates that surface water and the Shallow Alluvial Deposits that riparian habitats rely on are not materially affected by groundwater extraction or proposed GSP projects (see new Appendix G); therefore, there are no public trust issues to consider in the Mound Basin. c. SGMA regulations §354.28(b)(4) [how Minimum Thresholds affect beneficial uses/users] and §354.26(b)(3) [Undesirable Results potential effects on beneficial uses/users] are addressed in Chapter 4. 2. Climate change was addressed in accordance with §354.18 in section 3.3. 3. Data gaps are identified in sections 5.3, 5.4, 5.5, 5.6, and 5.7, and cover the requirements of §354.38. 4. MBGSA provided all the information for each project and management action in the Basin based on the requirements under §354.44 in Section 6.0.

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11	18-Aug-21	Ngodoo Water Policy Analyst	Atume			NGO Consortium	Section 2.0 Administrative Information	**Disadvantaged Communities, Drinking Water Users, and Tribes** The identification of Disadvantaged Communities (DACs), drinking water users, and tribes is **insufficient**. We note the following deficiencies with the identification of these key beneficial users. ● The GSP provides a map of DAC block groups and DAC tracts within the basin (Figure 1 in Appendix D) but does not include any other identifying information for DACs. ● The adopted Stakeholder Engagement Plan (Appendix D) states that there are domestic wells overlying the basin; however, the main body of the GSP states that there are no domestic wells within the basin due to availability of potable water from Ventura Water. The GSP does not provide the location and depth of the domestic wells within the basin, nor does it provide a well density map of domestic wells in the basin. Additionally, the GSP fails to identify the population dependent on groundwater as their source of drinking water in the basin. ● The GSP states that portions of the Barbareno-Ventureno Band of Chumash are located within the Mound Basin, but does not include a map of tribal areas within the basin. These missing elements are required for the GSA to fully understand the specific interests and water demands of these beneficial users, to support the development of water budgets using the best available information, and to support the development of sustainable management criteria and projects and management actions (PMAs) that are protective of these users. **RECOMMENDATIONS** ● Provide clarification on the status of domestic wells within the basin. DWR Well Completion Report Map 1 shows that there are some domestic wells within the basin. Include a map showing the domestic wells in the basin by location and depth. even if they are not currently in use. Wells previously in use may have been impacted by poor water quality or declining groundwater elevations. ● Provide an estimate of the population dependent on groundwater within the Mound Basin. The GSP states that "The City of Ventura (Ventura Water) serves the areas indicated by DWR as Disadvantaged Communities (DACs) and Severely Disadvantaged Communities (SDACs)." The GSP does not, however, currently provide clear information on how and to what extent DAC members rely on groundwater. ● Include a map of tribal lands within the basin.	DACs are shown on Figure 1 in the SEP (Appendix D). Drinking water in the Basin is provided by the City of Ventura, as shown on Figures 2.1-01, 2.1-03, and 2.2-01. The City of Ventura has a diverse water supply portfolio (Section 3.1.1), meaning that no potable water users are exclusively dependent on Mound Basin groundwater. There are no domestic wells currently being used in the Basin (see Section 2.3.1). MBGSA has verified this with Ventura County Watershed Protection District (8/24/2021 email communication with James Maxwell and Kim Loeb of VCWPD). There are no tribal trust lands within the Basin (see Section 2.2.1).
12	18-Aug-21	Ngodoo Water Policy Analyst	Atume	ngos.sgma@gmail.com		NGO Consortium	Section 3.3 Water Budget	**Native Vegetation** Native vegetation is a water use sector that is required 2 , 3 to be included into the water budget. The integration of this ecosystem into the water budget is **insufficient**. The water budget did not include the current, historical, and projected demands of native vegetation. The omission of explicit water demands for native vegetation is problematic because key environmental uses of groundwater are not being accounted for as water supply decisions are made using this budget, nor will they likely be considered in project and management actions. **RECOMMENDATIONS** Quantify and present all water use sector demands in the historical, current, and projected water budgets with individual line items for each water use sector, including native vegetation.	Native vegetation is included in the evapotranspiration term of the water budget.

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13	18-Aug-21	Ngodoo Water Policy Analyst	Atume	ngos.sgma@gmail.com		NGO Consortium	Appendix D - MBGSA Stakeholder Engagement Plan	**Stakeholder Engagement during GSP Development** Stakeholder engagement during GSP development is **insufficient**. SGMA's requirement for public notice and engagement of stakeholders is not fully met by the description in the Stakeholder Engagement Plan included in the GSP (Appendix D). We acknowledge and commend the clear description of the inclusion of an environmental stakeholder on the governing board of the GSA. The Environmental Stakeholder Director is responsible for engaging environmental stakeholders within the Basin and representing environmental interests before the GSA, including during GSP implementation. However, the engagement plan describes only a minimum amount of outreach to DACs. Stakeholder engagement has primarily occurred via Ventura Water bill stuffers and newsletters, including materials provided in Spanish. Noted deficiencies in the stakeholder engagement process include: • As the water supplier for DACs in the Basin, the City represented DAC interests through its participation on the MBGSA Board of Directors. However, it does not give more information about how their interests were represented. ● The opportunities for public involvement and engagement are limited to MBGSA regular board meetings, review of the MBGSA's website, and providing comments via the website. ● The GSP states that the GSA "has held several public workshops to provide in-depth discussion of the GSP and obtain stakeholder feedback. The workshops include polls to help facilitate public input on key issues and identify which outreach methods are most effective." The GSP gives no further information about how the workshops were advertised or if DACs were engaged to attend. ● The GSP states that portions of the Barbareno-Ventureno Band of Chumash are located within the Mound Basin and the MBGSA will inform the Tribal Elder, Julie Tumamait, throughout the GSP development process and GSP implementation. However, there are no further details on the engagement with the tribe. ● Domestic well owners are specifically mentioned in the Stakeholder Engagement Plan as holders of overlying groundwater rights, however no information is provided other than stating that their participation is invited in the Agency's public meetings.● The Stakeholder Engagement Plan does not include a plan for continual opportunities for engagement through the implementation phase of the GSP for DACs. **RECOMMENDATIONS** • Include a more detailed and robust Stakeholder Engagement Plan that details how the GSA will actively target and engage DAC community members during the remainder of the GSP development process and throughout the GSP implementation phase. Include plans to directly engage the DAC population for inclusion on the Board of Directors instead of having DACs represented by the City of Ventura. Refer to Attachment B for specific recommendations on Stakeholder Communication and Engagement. ● Conduct outreach at frequented locations such as farmers markets and schools across the plan area, providing translation services and technical assistance where needed.Refer to Attachment B for specific recommendations on how to actively engage community stakeholders. ● Consult and engage with the Barbareno-Ventureno Band of Chumash Tribe. Refer to "DWR guidance for engagement with tribal governments" for specific guidance.	MBGSA has met or exceeded the SGMA requirements for stakeholder outreach and engagement. MBGSA will consider the recommended enhancements offered in the comment going forward during GSP implementation. There are no active or recently active domestic wells in the Basin (see Section 2.3.1). There are no tribal trust lands within the Basin (see Section 2.2.1).

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14	18-Aug-21	Ngodoo Water Policy Analyst	Atume	ngos.sgma@gmail.com		NGO Consortium	Section 4.0 Sustainable Management Criteria	**Considering Beneficial Uses and Users When Establishing Sustainable Management Criteria and Analyzing Impacts on Beneficial Uses and Users** The consideration of beneficial uses and users when establishing sustainable management criteria (SMC) is **insufficient**. The consideration of potential impacts on all beneficial users of groundwater in the basin are required when defining undesirable results6 and establishing minimum thresholds7 , 8 **Disadvantaged Communities and Drinking Water Users** The GSP states that the City of Ventura (Ventura Water) serves DAC communities in the basin. It also states that there are domestic wells in the basin, but that the majority of these domestic well owners are de minimus users. It does not provide the location of the domestic wells, the screened interval, or the most recent reported date of well usage. Because the location of domestic wells is not provided in the GSP, the impacts to the domestic well user population are unknown. Because the GSP has not established SMC for the shallow principal aquifer, the GSP neither describes nor analyzes direct or indirect impacts on DACs or domestic drinking wells when defining undesirable results for chronic lowering of groundwater levels or water quality. Therefore, the SMC provided in the GSP are not protective of domestic drinking water well users. **RECOMMENDATIONS** **Chronic Lowering of Groundwater Levels** ● Establish chronic lowering of groundwater level SMC for the shallow principal aquifer that are protective of DACs and domestic well users. Even though the shallow principal aquifer is not currently pumped or treated for domestic drinking water, it could be in the future. ● Consider and evaluate the impacts of selected minimum thresholds and measurable objectives on drinking water users within the basin. **Degraded Water Quality** ● Establish water quality SMC for the shallow principal aquifer that are protective of drinking water users. Even though the shallow principal aquifer is not currently pumped or treated for domestic drinking water, it could be in the future. ● Establish minimum thresholds at the representative monitoring wells that avoid the specific undesirable result of impacting water quality for potable use. For each of the two deep principal aquifers, the GSP states that undesirable results occur when all representative monitoring wells in a principal aquifer exceed the minimum threshold concentration for a constituent for two consecutive years. Because the minimum thresholds are set to the MCL, or in some cases higher than the Secondary MCL (see Table 4.1-02), this does not appear to satisfy the stated minimum threshold goal of protecting water quality for potable uses. ● Evaluate the cumulative or indirect impacts of proposed minimum thresholds on drinking water users, including domestic wells and municipal water suppliers. The GSP states that potential effects on municipal beneficial uses would be increased costs for treatment or blending to meet drinking water standards, however this is the only impact discussed.	There are no active or recently active domestic wells in the Basin and all DACs in the Basin are served water by the City of Ventura, which has a diverse water supply portfolio of several sources in addition to Mound Basin wells (see Section 3.1.1.3). Therefore, there are no impacts to DACs and drinking water uses for the GSP to consider at this time. SMC for the shallow aquifer are not required because it is not a principal aquifer (see Appendix G). There are no wells that extract groundwater from the shallow aquifer in the Basin. SMC can be added during GSP updates, as needed, if significant pumping from the shallow aquifer is initiated in the future. Minimum thresholds that are equal to or in excess of water quality standards in the principal aquifers are not an issue because there are no direct potable uses of groundwater and the City of Ventura manages water quality through blending within its system.

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15	18-Aug-21	Ngodoo Water Policy Analyst	Atume	ngos.sgma@gmail.com		NGO Consortium	Section 3.3 Water Budget	**Climate Change** The SGMA statute identifies climate change as a significant threat to groundwater resources and one that must be examined and incorporated in the GSPs. The GSP Regulations13 require integration of climate change into the projected water budget to ensure that projects and management actions sufficiently account for the range of potential climate futures.The integration of climate change into the projected water budget is **insufficient.** The GSP does incorporate climate change into the projected water budget using DWR change factors for 2030 and 2070. However, the GSP did not consider the 2070 extremely wet and extremely dry climate scenarios in the projected water budget. The GSP should clearly and transparently incorporate the extremely wet and dry scenarios provided by DWR into projected water budgets or select more appropriate extreme scenarios for their basins. While these extreme scenarios may have a lower likelihood of occurring, their consequences could be significant, therefore they should be included in groundwater planning.We acknowledge and commend the inclusion of climate change into key inputs (precipitation, evaporation, surface water flow, and sea level inputs) of the projected water budget. Additionally, the sustainable yield is calculated based on the projected pumping for all three future projections (baseline, 2030, and 2070). However, if the water budgets are incomplete, including the omission of extremely wet and dry scenarios, then there is increased uncertainty in virtually every subsequent calculation used to plan for projects, derive measurable objectives, and set minimum thresholds. Plans that do not adequately include climate change projections may underestimate future impacts on vulnerable beneficial users of groundwater such as ecosystems and domestic well owners. **RECOMMENDATIONS** • Integrate extreme wet and dry scenarios into the projected water budget to form the basis for development of sustainable management criteria and projects andmanagement actions. ● Climate change was addressed when describing the minimum threshold for seawater intrusion. We recommend incorporating climate change considerations into other projects and management actions.	SGMA regulations §354.18(c)(3)(A),(d)(3),(e) are covered in the Water Budget section 3.3 which provides climate change impacts for historical, current, and projected quantities. The extremely dry/wet climate change scenarios are "recommended", but not "required" per SGMA regulations and BMP (Climate Change Guidance) and the Draft GSP included the DWR-provided scenarios (see Section 3.3). Furthermore, the relative insensitivity of the calculated water budget components to the climate change scenarios (e.g., the 2070 scenario) included in the Draft GSP indicates that a similar insensitivity would be observed under the extremely dry/wet scenarios and would therefore not be informative. MBGSA will assess the need for additional uncertainty analysis for climate change impacts every 5 years.

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16	18-Aug-21	Ngodoo Water Policy Analyst	Atume	ngos.sgma@gmail.com		NGO Consortium	Section 6.0 Projects and Management Actions	**Addressing Beneficial Users in Projects and Management Actions** The consideration of beneficial users when developing projects and management actions is **insufficient.** The GSP states there is no need for project and management actions to address gaps between current and projected sustainable yield. However, groundwater sustainability under SGMA is defined not just by sustainable yield, but by the avoidance of undesirable results for all beneficial users. These beneficial users such as GDEs, aquatic habitats, surface water users, DACs, and drinking water users were not sufficiently identified in the GSP. Therefore, potential project and management actions have not been designed or proposed to protect these vulnerable users of the shallow principal aquifer. **RECOMMENDATIONS** Because GDEs, aquatic habitats, surface water users, DACs, and shallow domestic well water users were not sufficiently identified in the GSP, please consider including the following related to potential project and management actions in the GSP: ● For GDEs and ISWs, recharge ponds, reservoirs and facilities for managed stormwater recharge can be designed as multi-benefit projects to include elements that act functionally as wetlands and provide a benefit for wildlife and aquatic species. For guidance on how to integrate multi-benefit recharge projects into your GSP refer to the "Multi-Benefit Recharge Project Methodology Guidance Document"15. ● For DACs, monitor the impacts of projects and management actions on communities and drinking water users. For example, provide locations of the improperly constructed or abandoned wells, as discussed in Section 6.5, that create conduits for migration of poor-quality water from shallow water-bearing units into the principal aquifers. Discuss how sealing these wells will benefit DACs and domestic wells users. ● For DACs and domestic well owners, take a full accounting of the locations and screened intervals of domestic wells in the basin, even those with de minimus use. Implement a drinking water well mitigation program to protect drinking water users. ● Develop management actions that incorporate climate and water delivery uncertainties to address future water demand and prevent future undesirable results.	GDEs that rely on shallow groundwater and surface water (located at or adjacent to the Santa Clara River) are not materially impacted by pumping in the Basin (see Appendix G); therefore, no projects or management actions are needed to prevent significant and unreasonable effects to those beneficial uses. DACs are supplied water by the City of Ventura, which has multiple sources of water in addition Mound Basin groundwater. There are no known active or recently active domestic wells in the Basin (see Section 2.3.1).
17	19-Aug-21	John	Lindquist	johnl@unitedwater.org	805-525-4431	United Water Conservation District 1701 N. Lombard St. Suite 200 Oxnard, CA 93030	Section 1.0	The Mound Basin GSP is well organized and written—United staff found the text boxes describing required plan elements at the beginning of each GSP section to be especially helpful for understanding the context of the text, tables, and figures that follow.	Thank you for your comments. MBGSA agrees that it is important to be clear about what SGMA requirements are addressed in each section.
18	19-Aug-21	John	Lindquist	johnl@unitedwater.org	805-525-4431	United Water Conservation District 1701 N. Lombard St. Suite 200 Oxnard, CA 93030	Section 3.0	United staff appreciated the opportunity to contribute to the data summary and analysis provided in Section 3. As new data become available in the future, we look forward to collaborating with the Mound Basin GSA to continually improve our understanding of groundwater conditions and refine the hydrogeologic conceptual model for the basin, as appropriate.	Thank you for the collaboration to make the Draft GSP a local community effort.

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19	19-Aug-21	John	Lindquist	johnl@unitedwater.org	805-525-4431	United Water Conservation District 1701 N. Lombard St.Suite 200Oxnard, CA 93030	Section 4.0	United staff believe the sustainable management criteria described in the GSP, including measurable objectives and minimum thresholds, are well-defined and reasonable. Although the current understanding of present-day and future groundwater uses in Mound Basin does not suggest that significant and unreasonable impacts should be expected for the six SGMA sustainability indicators, we were impressed to see measurable objectives and minimum thresholds for relevant indicators included in the GSP, in case conditions change in the future. We agree that "depletion of inter-connected surface water" is not an applicable sustainable management criterion in Mound Basin as described in Section 3 of the GSP, for several reasons, including:1) Historical records indicate that no pumping from the shallow alluvial aquifer (the sole aquifer that is potentially in hydraulic connection with perennial or intermittent surface water bodies or GDEs in Mound Basin) has occurred since 1983 and we are not aware of any plans to resume pumping from that aquifer in the future;2) A low-permeability aquitard (the fine-grained Pleistocene deposits) that is 100 to 400 feet thick in most areas of Mound Basin separates the shallow alluvial aquifer from the underlying principal aquifers (primarily Mugu and Hueneme Aquifers) that are pumped for water supply;3) Data from City of Ventura monitoring wells screened in the shallow alluvial aquifer near the Santa Clara River estuary (wells GW-1, GW-2, and GW-3 [data are presented in the Stillwater Sciences report referenced in the GSP]) indicate that groundwater level changes in the shallow alluvial aquifer did not discernibly change in response to significant declines in groundwater levels in the underlying principal aquifers during the 2012-16 drought (this may be worth further discussion in the GSP); and4) Modeling results shown in the GSP (Figure 3.3-02) indicate no discernible relationship between groundwater extractions from the principal aquifers within Mound Basin and interaction of surface water in the Santa Clara River with the shallow alluvial aquifer. This lack of a discernible relationship is consistent with the observation that groundwater elevations in the principal aquifers do not appear to have significant impacts on groundwater elevations (which could theoretically impact surface water flows) in the shallow alluvial aquifer. Furthermore, groundwater withdrawals in Mound Basin have diminished during the past 20 years and there are no plans to significantly increase pumping from the basin in the future. Stable or reduced extractions relative to past pumping rates seem like they could only have a net positive impact on groundwater and surface-water conditions in the basin.	Thank you for your comments. An appendix has been added to further document the technical data that demonstrate, 1) the characteristics of the Shallow Alluvial Deposits, which do not fit the definition of a "principal aquifer", and 2) the lack of material influence by pumping in the principal aquifers (Mugu and Hueneme Aquifers) on shallow groundwater levels and flows in the Santa Clara River or the Santa Clara River Estuary.
20	19-Aug-21	John	Lindquist	johnl@unitedwater.org	805-525-4431	United Water Conservation District 1701 N. Lombard St. Suite 200 Oxnard, CA 93030	Section 5.0	United staff agree with the proposed locations, frequency, and potential expansion of the monitoring network for the five sustainable management criteria for which sustainable management criteria have been developed, and look forward to supporting efforts to collect additional data in the future.	Thank you for your comments. The monitoring network expansion is intended to provide additional data to ensure the sustainability of the groundwater resources for the Basin.
21	19-Aug-21	John	Lindquist	johnl@unitedwater.org	805-525-4431	United Water Conservation District 1701 N. Lombard St. Suite 200 Oxnard, CA 93030	Section 6.0	United staff agree with the GSP's proposed "Projects and Management Actions." Specifically, we agree that it is prudent to develop contingency plans for seawater intrusion and land subsidence, and to coordinate with Ventura County's Watershed Protection District to identify and address improperly constructed or abandoned wells that potentially create conduits for vertical migration of poor-quality groundwater within Mound Basin.	Thank you for your comments.
22	23-Aug-21	Kimball GW Mgr.	Loeb	kim.loeb@ventura.org	805-650-4083	Fox Canyon GMA 800 S. Victoria Ave. Ventura, CA 93009	ES	**Executive Summary**: **Page ES-v:** There is a typo "The principal aquifers are believed to be ~~projected~~ protected from seawater…." **Page ES-vii:** Discussion of "increasing the sustainable yield of the Mound Basin" includes additional production that could impact the sustainable management of the adjacent basin, so that increased pumping is "not included in the sustainable yield estimate at this time." Does this mean additional pumping may be considered in the future? If so, that pumping must be assessed to determine impacts to adjacent basins, consistent with CCR Title 23 §354.28. **Page ES-xviii:** There is a typo "Fox Canyon Groundwater Management ~~Area~~ Agency."	Typo corrections made. Any increase in pumping relative to the projections included in the GSP will be evaluated during the required GSP assessments.

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23	23-Aug-21	KimballGW Mgr.	Loeb	kim.loeb@ventura.org	805-650-4083	Fox Canyon GMA 800 S. Victoria Ave.Ventura, CA 93009	Section 3.3 Water Budget	**Section 3.3 – Water BudgetsSection 3.1.1.3 Imported Water:** Discussion is missing of groundwater imported from the Oxnard Subbasin into the Mound Basin by Jam Mutual Water Company, Coastal Berry Farms and operators of the farmland owned by The Nature Conservancy which straddles the boundary separating the basins.Jam Mutual Water Company (JMWC) has been in existence since at least 1975 and is currently associated with a 318- acre service area which is split approximately 50/50 between the Mound and Oxnard subbasins. JMWC operates two wells in the Oxnard subbasin to provide water for irrigation within its service area. Since 1985 the average annual groundwater extractions from the Oxnard Subbasin are 555.371 acre-feet per year (AFY).Coastal Berry Farms is a FCGMA recognized exporter of groundwater extracted from the Oxnard Subbasin and used to irrigate approximately 29 acres in the Mound Subbasin. Coastal Berry Farms has been exporting water to the Mound Subbasin since before the establishment of the FCGMA. The land owned by The Nature Conservancy and operated by Ocean Breeze Ag Management LLC irrigate approximately 93 acres, split approximately 50/50 between the subbasins, utilizing groundwater extracted from the Oxnard and Mound subbasins.	Text added: "Jam Mutual Water Company (agricultural) and several ranches straddle the basin boundary shared with the Oxnard Basin. It is assumed that small quantities of groundwater move across the basin boundary within these entities/parcels. The details of water movement across the basin boundary within these entities/parcels is not known."
24	23-Aug-21	Kimball GW Mgr.	Loeb	kim.loeb@ventura.org	805-650-4083	Fox Canyon GMA 800 S. Victoria Ave. Ventura, CA 93009	Section 3.3 Water Budget	**Page 37:** There is a typo in the first paragraph of the bullet at the top of the page "Fox Canyon Groundwater Management ~~Area~~ Agency." **Page 73 Imported Water:** The first sentence mentions that groundwater is imported from adjacent basins, but the remainder of the paragraph discusses surface water imported by water purveyors. There is no direct discussion of water imported from the Oxnard Subbasin. Groundwater pumped in the Oxnard Subbasin and imported to the Mound Basin is not specifically called out in any of the water budget tables. **Table 3.3-03:** Average flow between the Mound Basin and the Oxnard Subbasin in the Upper Aquifer System (UAS) matches reasonably well between the models used for each GSP. The Oxnard Subbasin GSP indicates average flow from 1986-2015 is 207 AFY from Oxnard to Mound. The Mound Basin GSP indicates average flow from 1986-2015 is 983 AFY from Mound to Oxnard. The two GSPs are off by about 1,200 AFY on average. The discrepancy appears to occur during drought years when the Mound Basin GSP shows higher outflows to the Oxnard Subbasin than the Oxnard GSP reports as inflows. Overall, the Mound Basin inflows/outflows are more varied in the Mound GSP than in the Oxnard GSP. [SEE GRAPH, PG 2 of LETTER] **Table 3.3-08**: In the Mound GSP, the average UAS flow between the Mound Basin and the Oxnard Subbasin in the future baseline scenario is anticipated to be 3,252 AFY from the Oxnard Subbasin to the Mound Basin in the first through 20th year of implementation, and 3,842 AFY from the Oxnard Subbasin to the Mound Basin in the 30-year sustaining period. However, in the Oxnard GSP scenarios the range of UAS outflows projected from the Oxnard Subbasin is ~1,000 AFY (in the baseline scenarios) to ~1,500 AFY (in the projects and reduction scenarios). This leaves ~1,500 AFY to 2,000 AFY of water that both basins appear to be relying on in the UAS. The projected flows in the Lower Aquifer System (LAS) appears to be closer, but the Mound Basin doesn't include the Fox Canyon Aquifer as a primary aquifer for the GSP. **Table 3.3-12**: The average UAS flow in the 2030 climate change and sea level rise scenario is 3,180 AFY in year one through 20, and 3,841 AFY in the following 30-year sustaining period. These are similar to the flows without the climate change factors. The 2070 flows are also similar (Table 3.3-14).	Typo corrections made. The discrepancy between the water budget estimates is due to several factors. First, different model versions being used for the Oxnard and Mound GSPs (i.e., the groundwater model used for quantification has been updated for Mound Basin). In addition, the time periods for the projected water budgets are not equivalent. There is a different sequence of historical hydrology for Mound Basin. For these reasons the baseline quantities are not comparable.

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25	23-Aug-21	KimballG W Mgr.	Loeb	kim.loeb@ventura.org	805-650-4083	Fox Canyon GMA 800 S. Victoria Ave.Ventura, CA 93009	4.4.2.3 Minimum Thresholds in Relation to Adjacent Basins	**Section 4.4.2.3 Minimum Thresholds in Relation to Adjacent Basins**: The draft Mound GSP states "deeper groundwater levels could potentially increase underflow into the Mound Basin from the Oxnard and/or Santa Paula Basins (or decrease underflow to the Oxnard Basin), which could potentially contribute to undesirable results in those Basins." First, the average anticipated flow in the future in the draft Mound GSP is from the Oxnard Subbasin to the Mound Basin, so decreasing underflow from the Mound Basin to the Oxnard Subbasin is less of a concern than continuing to increase the flows from the Oxnard Subbasin to the Mound Basin in the GSP scenarios. Second, the minimum thresholds for the Mound Basin adjacent to the Oxnard Subbasin are 15 to 90 feet lower than the minimum thresholds in the Oxnard Subbasin Forebay in the Oxnard GSP. [SEE TABLE, PG 3 of LETTER] Note – The difference between minimum thresholds is calculated between one Mound Basin well in the Mugu Aquifer and two Mugu Aquifer wells in the Oxnard Subbasin; and between three Mound Basin wells in the Hueneme Aquifer and one Oxnard Subbasin well in the Hueneme Aquifer. The Oxnard Subbasin well in the Hueneme Aquifer is the lowest of the three screened in the Forebay, with the highest Hueneme Aquifer well in the Forebay having a minimum threshold of 17 ft MSL. Additionally, the minimum thresholds set for the Mound Basin wells listed in the table are (with the exception of 02N22W16K01) for land subsidence. The Mound GSP has lower minimum thresholds for chronic declines in groundwater levels. Presumably, if the water levels reach the thresholds for subsidence and subsidence is not observed the Mound Basin would argue that it could have water levels decline even lower. The difference of 15 feet between the minimum thresholds in the Hueneme Aquifer is not much of a concern, but the difference of greater than 80 feet in the Mugu Aquifer and greater than 90 feet for one well adjacent to the Forebay is of concern to the Agency. There is a significant chance the proposed minimum thresholds in the Mound GSP could negatively impact the ability of the Agency achieving its sustainability goal in the Oxnard Subbasin.	Minimum thresholds for the chronic lowering of groundwater levels have been updated to be equal to the historical low groundwater levels, which are much shallower than the previous values. The combination of minimum threshold exceedances, which lead to undesirable results is >50% of monitoring wells in either aquifer. This will prevent groundwater levels from lowering to elevations that could significantly impact the Oxnard Subbasin.
26	23-Aug-21	Russell Senior Project Manager	Marlow	rmarlow@caltrout.org		California Trout, Inc. 360 Pine St., Floor 4 San Francisco, CA 94104	Appendix G - Review of Areas Mapped as Containing iGDEs	The Santa Clara River Estuary (Estuary) and immediate upstream portion of the Santa Clara River (River) are clearly identified as falling within the basin boundary of the Mound Basin Groundwater Sustainability Agency (MBGSA) management area. However, not once does the MBGSA Groundwater Sustainability Plan (MBGSP) even acknowledge the presence of federally listed Southern California Steelhead in these vital ecosystems. This plan also fails to indicate that both of these groundwater dependent ecosystems (GDEs) are protected critical habitat for southern steelhead and essential habitat for other native species. Both the Estuary and River serve as important public resources with multiple beneficial uses and users and must be accounted for and protected from adverse impacts associated with groundwater pumping.	The draft GSP concluded that surface water beneficial uses, such as steelhead, are not impacted because there is no pumping of shallow groundwater and deeper aquifer pumping does not significantly impact surface water flows (see Appendix G); therefore, detailed discussion of the beneficial uses of surface water was not warranted. Nonetheless, the GDE Appendix (now Appendix H) has been updated to include additional details on species within the habitat of the River and Estuary.

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27	23-Aug-21	Russell Senior Project Manager	Marlow	rmarlow@caltrout.org		California Trout, Inc. 360 Pine St., Floor 4 San Francisco, CA 94104	Section 3.2.6 Interconnected Surface Water Systems	The MBGSP must meet the requirements of the California Sustainability Groundwater Management Act (SGMA), at this time CalTrout does not find this plan to meet the state specified standards. SMGA clearly specifics the requirement to identify and consider impacts to GDEs that have significant and unreasonable adverse impacts for all recognized beneficial uses and users of groundwater including aquatic ecosystems and species dependent on interconnected waters. If hydrologic connectivity exists between a terrestrial aquatic ecosystem and groundwater, then this habitat is a potential GDE and must be identified in a GSP. That this GSP does not identify a single GDE within its boundaries is illogical and not supported by data. The MBGSP clearly acknowledges that they are not able to characterize the interconnection of the surface water and groundwater that fall within their basin boundary due to lack of data. This acknowledgement by the MBGSP establishes that the MBGSA does not have the information needed to make any determination on what is or isn't a GDE in their basin boundary. Without be able to fully characterize the nature and condition of these hydrologically connected systems, this MBGSP cannot ensure that significant and unreasonable adverse impacts from groundwater depletion are avoided.	The commentor erroneously concludes that no GDEs are identified within the GSP. Area 11 (riparian and aquatic habitat associated with the Santa Clara River) is clearly identified as a GDE in the GSP. The GSP identifies that shallow groundwater and the surface water of the Santa Clara River, and its estuary are interconnected. The shallow groundwater system (Shallow Alluvial Deposits) are comprised of several distinct geologic formations. Statements about the uncertainty concerning which specific young formation is interconnected with surface water are being taken out of context here to claim that the GSP cannot conclude whether there are GDEs. This is not the case, as the GSP clearly identifies Area 11 as a GDE and that shallow groundwater is interconnected with surface water of the Santa Clara River. The GSP does not focus on the Area 11 GDE and interconnected surface water because groundwater pumping does not materially impact it either. An appendix (Appendix G) has been added to further document the technical data that demonstrate the lack of material influence by pumping in the principal aquifers (Mugu and Hueneme Aquifers) on shallow groundwater levels and flows in the Santa Clara River or the Santa Clara River Estuary. Furthermore, there are no wells in the Basin that extract from the Shallow Alluvial Deposits. Given the lack of material influence of pumping on GDEs associated with the Santa Clara River, there is no potential for significant and unreasonable impacts on the GDEs at present. Given the lack of a material relationship and hydrological connection between groundwater pumping and shallow groundwater and Santa Clara River flows, it is not necessary to focus criteria or data gaps for GDEs or interconnected surface water in the GSP. Simply stated, it is not a priority of the MBGSA to study aspects of the Basin that do not active require management. Having said this, the GSP has been updated to include interim shallow groundwater data collection in GDE Area No. 11 to provide data to further demonstrate the points made above (see Section 6.6).

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28	23-Aug-21	Russell Senior Project Manager	Marlow	rmarlow@caltrout.org		California Trout, Inc. 360 Pine St., Floor 4 San Francisco, CA 94104	Section 3.3 Water Budget	The surface water diversion operations by United Water Conservation District (UWCD) at Vern Freeman Diversion (VFD) have drastically altered the natural stream flow conditions and groundwater recharge patterns in the lower Santa Clara River watershed. The diversion operations at VFD have adverse impacts on the aquatic environment and water-dependent species. These effects are longitudinally connected to the sections of the River and Estuary that fall within the MBGSA. This plan also does not address that UWCD has been federally mandated to provide for effective and efficient passage at VFD and the changes in regional groundwater management that will be a part of this project. The Federal Courts has repeatedly reiterated that the restoration plan at VFD that most fully meets National Marine Fisheries Service and California Department of Fish and Game recommendations for passage restoration is the harden ramp option. This option will significantly change UWCD operations within the Fox Canyon Groundwater Agency boundary. The MBGSP does not acknowledge this federally mandated change will need to be prepared for and actively managed by the MBGSA. The change at VFD will alter the MBGSA's proposed water budget and will have a profound effect on GDEs within their basin. The installation of a harden ramp at VFD will partially restore the natural flow regime of the lower River corridor to the benefit of the lower River reaches, Estuary, and community.	The Vern Freeman Diversion is included in the regional numerical model used for the GSP, so diversions are reflected in the water budget for the Basin (section 3.3). Text was added to Section 3.3 to make clear that the water budget accounts for Vern Freeman Diversion operations. Potential changes in Freeman Diversion operations and the resulting impact on the Mound Basin water budget will be evaluated during each required GSP assessment.
29	23-Aug-21	Russell Senior Project Manager	Marlow	rmarlow@caltrout.org		California Trout, Inc.360 Pine St., Floor 4San Francisco, CA 94104	Section 3.2.6 Interconnected Surface Water Systems Section 3.2.7 Groundwater Dependent Ecosystems Appendix G - Review of Areas Mapped as Containing iGDEs	The MBGSA decision that the shallow surface aquifer is a groundwater resource that falls within their discretion are not connected to their "principal" aquifer is a failure to meet the requirements of SGMA. This decision again is not supported by the data they don't have and seems counter intuitive to the water budget they have presented. The MBGSA identifies significant inputs in their water budget from both areal recharge and stream channel recharge, both of which will pass through the shallow surface aquifer first before entering their "principal" aquifer. This signifies that groundwater level in the "principal" aquifer is partial dependent on the condition and management of the shallow water aquifer. Additionally, management of a groundwater source is not contingent upon the current use, but potential for use in the time horizon established under SGMA. Sustainability as SGMA outlines it captures the need to address increasing impacts from climate crisis and the requirement to build in resiliency of groundwater processes to mitigate for adverse impacts for all beneficial uses and users. That the GSA does not want to account for the shallow water aquifer in the MBGSP would seem to be an expedient choice to dismiss the presence of GDEs and the potential for adverse impacts to these habitats. This choice is a serious harm to the public by failing to protect aquatic habitats, native species, and the long-term groundwater integrity. CalTrout is focused on advancing process-based watershed restoration to support the recovery of southern steelhead through collaborated decision making. We find this plan fails to meet the requirement for ensuring groundwater sustainability or protecting groundwater dependent ecosystems. We look forward to the next draft of the plan where the MBGSA outlines how they will collect the data needed to clearly understand inter-connected waters in their basin and what management actions they will take to protect vital GDEs in this basin.	As mentioned in the above response, the new appendix (Appendix G) presents additional information pertaining to the Shallow Alluvial Deposits. The appendix provides further discussion of the technical data that demonstrate, 1) the characteristics of the Shallow Alluvial Deposits, which do not fit the definition of a "principal aquifer", and 2) the lack of material influence by pumping in the principal aquifers (Mugu and Hueneme Aquifers) on shallow groundwater levels and flows in the Santa Clara River or the Santa Clara River Estuary. Pumping effects on shallow groundwater and surface water will be evaluated during each required GSP assessment. The GSP can be updated, as needed, if significant pumping from the shallow aquifer is initiated in the future. Given the lack of material influence of pumping on GDEs associated with the Santa Clara River, there is no potential for significant and unreasonable impacts on the GDEs at present. Given the lack of a material relationship and hydrological connection between groundwater pumping and shallow groundwater and Santa Clara River flows, it is not necessary to focus criteria or data gaps for GDEs or interconnected surface water in the GSP. Simply stated, it is not a priority of the MBGSA to study aspects of the Basin that do not active require management. Having said this, the GSP has been updated to include interim shallow groundwater data collection in GDE Area No. 11 to provide data to further demonstrate the points made above (see Section 6.6).

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30	23-Aug-21	Merrill CFROG Board Chair	Berge	merrillberge@gmail.com	805-208-6058	Climate First: Replacing Oil and Gas PO Box 114 Ojai, CA 93024	Section 3.2.4 Groundwater Quality Impacts Section 3.2.3 Seawater Intrusion	With oil well infrastructure in Ventura County existing in close proximity to our groundwater supplies and oftentimes intersecting with aquifers directly, we are submitting the attached map and information to include in the MBGSP for a comprehensive consideration of the Mound Basin setting. [SEE Map, attachment to LETTER] This map illustrates the proximity of Mound Basin water wells to abandoned oil well sites in the Mound Basin area specifically. The sources for the data is: **1.** Department of Conservation, Geologic Energy Management Decision (CalGEM). "Oil and Gas Wells GIS, California." Gis.conservation.ca.gov, 14 Aug. 2021, gis.conservation.ca.gov/portal/home/item.html?id=335e036c6a4f4cc39148ca2a9e0389c7 **2.** Department of Conservation, Geologic Energy Management Division (CalGEM). WellFinder (WellSTAR), maps.conservation.ca.gov/doggr/wellfinder **Of note:** **1.** 30 abandoned well sites located in the vicinity of the Mound Basin water wells have been designated as poorly abandoned due to age. **2.** 8 of those wells have documented problems as reported in the CalGEM WellSTAR (Well Statewide Tracking and Reporting System). These older abandoned oil wells were not capped to today's standards. As they continue to age, they are at greater risk of cracks and leaks due to cement degradation; possibly providing for migratory pathways through the layers of caprock. As noted in the United States Geological Survey (USGS) "Supplemental Information to the Groundwater Quality of Aquifers Overlying the Oxnard Oil Field, Ventura County, CA" to the "Groundwater quality results from the Regional Monitoring Program study of the Oxnard oil field" published in 2019: Additional pathways of poor water quality from the semi-perched zone to the Oxnard aquifer include movement through abandoned or improperly constructed wells (Izbicki,1996), and lateral seawater intrusion along the coast resulting from landward pressure gradients (United Water Conservation District, 2016). With seawater intrusion, earthquake faults, contamination sites and plumes referenced and/or reviewed in the MBGSP, in order to reflect the Mound Basin setting in its entirety, it is critically important that oil well infrastructure information also be included in the MBGSP.	Contamination plumes have not been identified in the Mound Basin principal aquifers (see Section 3.2.4). GSP assessments will reflect any new contamination issues that may arise in the future. Mound Basin does not show evidence of seawater intrusion (see Section 3.2.3).
31	23-Aug-21	Anthony VIA: Mark Andres	Spina Capelli Ticlavilca	mark.capelli@noaa.gov andres.ticlavilca@noaa.gov	805-963-6478	U.S. Dept. of Commerce - NOAA - National Marine Fisheries Service West Coast Region 501 West Ocean Blvd, Suite 4200 Long Beach, CA 90802-4213	ES-1 Plan Area, Land Use, and Water Sources (pp. ES-ii-iii)	**Specific Comments** "The beneficial uses of groundwater extracted from the principal aquifers of Mound Basin include municipal, industrial, and agricultural water supply corresponding to the land use categories above." The listed beneficial uses within the boundaries of the Mound Groundwater Basin include only out-of-stream beneficial uses, and largely ignores the instream beneficial uses, including those linked to with GDE, including, but not limited to Area 11 (i.e., the lower Santa Clara River and Santa Clara River Estuary). The Draft GSP should be revised to explicitly acknowledge the instream beneficial uses supported by the groundwater basin, including the GDE associated with the lower Santa Clara River and Santa Clara River Estuary. The recognized instream beneficial uses for the portion of the lower Santa Clara River within the Mound Basin include: warm freshwater habitat, cold freshwater habitat, wildlife habitat, habitat for rare, threatened and endangered species, fish migration, and wetland habitat. Santa Clara River Estuary instream beneficial uses include: estuarine habitat, marine habitat, wildlife habitat, habitat for rare, threatened and endangered species, fish migration, spawning habitat, and wetland habitat.	The beneficial uses in question were not detailed in the GSP because there is no pumping from the shallow groundwater system and principal aquifer pumping does not have a material effect on shallow groundwater (GDEs) or interconnected surface water (Santa Clara River) flows. The GSP has been updated to note the beneficial uses described in the comment exist relative to the Shallow Alluvial Deposits (See ES-1, ES-2 and Section 2.3.1). However, it is noted that the Shallow Alluvial Deposits are not a principal aquifer, are not pumped, and groundwater pumping form the principal aquifers in the Basin do not materially affect the GDEs or deplete interconnected surface water. Please see new appendix (Appendix G) for further information.

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32	23-Aug-21	Anthony VIA: Mark Andres	Spina Capelli Ticlavilca	mark.capelli@noaa.gov andres.ticlavilca@noaa.gov	805-963-6478	U.S. Dept. of Commerce - NOAA - National Marine Fisheries Service West Coast Region 501 West Ocean Blvd, Suite 4200 Long Beach, CA 90802-4213	ES-2 Basin Setting and Groundwater Conditions (pp. ES-iii-iv)	"Despite the interconnection with shallow groundwater, there is no depletion of interconnected surface water in the Basin because there are no groundwater extractions from the shallow groundwater units and groundwater in the principal aquifers is physically separated from the surface water bodies by several hundred feet of fine-grained materials. No groundwater dependent ecosystems (GDEs) have been identified in the Basin that appear to be relying on groundwater from a principal aquifer." The regulations governing SGMA do not stipulate that the provisions of SGMA cover only "principal aquifers" as the Draft GSP appears to presume. The regulations define interconnected surface water as "surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water . . ." (23 CCR Section 351(0). Significantly, "continuous" refers specifically to hydrologic connection, not a continuous temporal connection. The Draft GSP does not adequately recognize the potential role of groundwater in the lower reaches of the Santa Clara River or the Santa Clara River Estuary, or the role of groundwater elevations in ensuring surface flows water surface elevations and supporting the life-cycle of steelhead, including their migratory, spawning and rearing phases (See additional comments on Appendix A to the Draft Mound Basin GSP below.). Both the Santa Clara River estuary and the portion of the Santa Clara River upstream of Harbor Boulevard within the boundaries of the Oxnard Subbasin should be fully addressed in the revised Draft GSP. Further, because groundwater-management activities within the Santa Clara River watershed involve the United Water Conservation District's (UWCD) diversion operations at the Vern Freeman Diversion, the relationship between these diversion activities and groundwater elevations along the affected portion of the Santa Clara River (and estuary) should be addressed in the revised Draft GSP.	The draft GSP recognizes the Santa Clara River and Estuary as interconnected with the Shallow Alluvial Deposits (see Section 3.1.4.2); however, there is no pumping of shallow groundwater in the Basin and neither the surface water nor the shallow groundwater is materially affected by principal aquifer pumping. The new appendix (Appendix G) provides further details concerning these topics. Given the lack of material influence of pumping on GDEs associated with the Santa Clara River, there is no potential for significant and unreasonable impacts on the GDEs at present. Given the lack of a material relationship and hydrological connection between groundwater pumping and shallow groundwater and Santa Clara River flows, it is not necessary to focus criteria or data gaps for GDEs or interconnected surface water in the GSP. Simply stated, it is not a priority of the MBGSA to study aspects of the Basin that do not active require management. Having said this, the GSP has been updated to include interim shallow groundwater data collection in GDE Area No. 11 to provide data to further demonstrate the points made above (see Section 6.6). The Vern Freeman diversion is located outside of the Mound Basin, so an evaluation of its impacts to the streamflow are not required; however, the diversions are included in the numerical model, so flows are accounted for in the water budget (Draft GSP Section 3.3). Text was added to Section 3.3 to make clear that the water budget accounts for Vern Freeman Diversion operations.
33	23-Aug-21	Anthony VIA: Mark Andres	Spina Capelli Ticlavilca	mark.capelli@noaa.gov andres.ticlavilca@noaa.gov	805-963-6478	U.S. Dept. of Commerce - NOAA - National Marine Fisheries Service West Coast Region 501 West Ocean Blvd, Suite 4200 Long Beach, CA 90802-4213	ES-3 Water Budget (pp. ES-vi-vii)	"The primary sources of recharge to the Mound Basin groundwater system are underflow from the Santa Paula Basin, areal recharge (the sum of infiltration of precipitation, M&I return flows, and agricultural irrigation return flows), and mountain-front recharge. Stream channel recharge is a minor component." The revised Draft GSP should acknowledge that both the direct surface flow and the underflow from the Santa Paula Basin are influenced by the upstream diversion of surface flows in the Santa Clara River watershed and the artificial recharge of ground water as a result of the Vern Freeman Diversion located approximately 10 miles upstream of the Mound Basin.	Please see responses regarding the Vern Freeman diversion for other comments.

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34	23-Aug-21	Anthony VIA: Mark Andres	Spina Capelli Ticlavilca	mark.capelli@noaa.gov andres.ticlavilca@noaa.gov	805-963-6478	U.S. Dept. of Commerce - NOAA - National Marine Fisheries Service West Coast Region 501 West Ocean Blvd, Suite 4200 Long Beach, CA 90802-4213	ES-4 Sustainable Management Criteria (pp. ES-vii-x)	The sustainable criteria are expressed explicitly and exclusively in terms of groundwater levels, water chemistry, and land subsidence, and do not explicitly recognize the important relationship between groundwater levels and the surface flows (particularly base flows) or water quality parameters (such as temperature, dissolved oxygen, etc.) that contribute to the maintenance of GDE within the Mound Basin (including, but not limited to, the lower Santa Clara River and the Santa Clara River Estuary). There is no specific criterion in the Draft Criteria that deals with the GDE associated with the federally listed species (or the designated critical habitat) which utilize the Mount Basin3. In fact, the word "steelhead", "trout", or even "fish" do not appear in the Draft GSP. This is an important omission that should be corrected in the revised Draft GSP because GDE for the Mound Basin includes the use of surface flow by the federally listed endangered southern California steelhead for migration, spawning and rearing. Specifically, the revised Draft GSP should include a description of the extent of designated critical habitat for endangered steelhead (as well as other listed or recognized sensitive species) that occur within the boundaries of the Mound Basin (See Figures 1 and 3).	The GSP and GDE appendix (now Appendix H) have been revised to provide additional details around the iGDE habitats. Following the TNC guidance, each of the iGDEs within Area 11 was analyzed and slightly revised to reflect the vegetation communities and critical habitats more accurately. The GSP does not focus on the Area 11 GDE and interconnected surface water in the sustainable management criteria formulation because groundwater pumping does not materially impact either. There is no shallow groundwater pumping in the Basin. An appendix (Appendix G) has been added to further document the technical data that demonstrate the lack of material influence by pumping in the principal aquifers (Mugu and Hueneme Aquifers) on shallow groundwater levels and flows in the Santa Clara River or the Santa Clara River Estuary. Given the lack of material influence of pumping on GDEs (riparian or aquatic) associated with the Santa Clara River, there is no potential for significant and unreasonable impacts on the GDEs at present. A map showing critical habit has been added to the GDE appendix (Appendix G).
35	23-Aug-21	Anthony VIA: Mark Andres	Spina Capelli Ticlavilca	mark.capelli@noaa.gov andres.ticlavilca@noaa.gov	805-963-6478	U.S. Dept. of Commerce - NOAA - National Marine Fisheries Service West Coast Region 501 West Ocean Blvd, Suite 4200 Long Beach, CA 90802-4213	2.2.2.2 Existing Water Resource Management Programs [§354.8(c) and (d)] Pages 9-11.	One of the largest and most significant water-resource-management program within the Santa Clara River watershed, the UWCD's groundwater recharge program, consisting of the combined facilities of the Santa Felicia Dam, Piru Diversion, Vern Freeman Diversion and a series of groundwater settling basins. This program and its related facilities should be included in this section because it affects not only the artificial recharge to the Fox Canyon aquifer, but the natural recharge to the other groundwater basins on the Oxnard Plain, including the Mound and Santa Paula Basins; see NMFS comments on the Fox Canyon GSP (2020)	The facilities mentioned in the comment are not located within the Basin and do not operate within the Basin, which is why they are not mentioned here.
36	23-Aug-21	Anthony VIA: Mark Andres	Spina Capelli Ticlavilca	mark.capelli@noaa.gov andres.ticlavilca@noaa.gov	805-963-6478	U.S. Dept. of Commerce - NOAA - National Marine Fisheries Service West Coast Region 501 West Ocean Blvd, Suite 4200 Long Beach, CA 90802-4213	2.2.2.3 Conjunctive Use Programs [§354.8(e)] Page 11	The City of Ventura's water supply includes groundwater extractions (as well as surface diversions) that are subject to a separate GSP, and this fact should be noted in the revised Draft Mound GSP.	MBGSA recognizes the City of Ventura's water supply sources but is not required (per SGMA regulations) to mention other basin's GSPs. Nonetheless, the City of Ventura's other water supply sources are noted in the GSP (see Section 3.1.1.3). Any changes to those supplies and the associated impact, if any, on its Mound Basin groundwater pumping demands will be addressed during the required periodic GSP assessments.
37	23-Aug-21	Anthony VIA: Mark Andres	Spina Capelli Ticlavilca	mark.capelli@noaa.gov andres.ticlavilca@noaa.gov	805-963-6478	U.S. Dept. of Commerce - NOAA - National Marine Fisheries Service West Coast Region 501 West Ocean Blvd, Suite 4200 Long Beach, CA 90802-4213	2.3 Notice and Communication [§354.10] Page 22-24	The Draft GSP is focused out-of-stream users of the Mound Basin and does not adequately recognize the public trust natural resources that may be affected by the extractions of groundwater from the Mound Basin, and therefore be of interest to state and federal natural resource regulatory agencies such as NMFS, U.,S. Fish and Wildlife Service, and the California Department of Fish and Wildlife, and the California Department of Parks and Recreation (which owns a portion of the Santa Clara River Estuary wetlands).	The GSP demonstrates that surface water and Shallow Alluvial Deposits groundwater that riparian habitats may rely on are not materially affected by pumping or proposed GSP projects (see new Appendix G), so there are no public trust issues to consider in the Mound Basin.

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38	23-Aug-21	Anthony VIA: Mark Andres	Spina Capelli Ticlavilca	mark.capelli@noaa.gov andres.ticlavilca@noaa.gov	805-963-6478	U.S. Dept. of Commerce - NOAA - National Marine Fisheries Service West Coast Region 501 West Ocean Blvd, Suite 4200 Long Beach, CA 90802-4213	2.3.1 Beneficial Uses and Users [§354.10(a)] Pages 23-24	We would note that the listed beneficial uses within the boundaries of the Mound Basin identify only out-of-stream beneficial uses, and largely ignore instream beneficial uses. The revised Draft GSP should be revised to explicitly acknowledge the instream beneficial uses supported by the groundwater basin, including, but not limited to, the GDE associated with the lower Santa Clara River and Santa Clara River Estuary. See comment above.	The beneficial uses in question were not detailed in the GSP because there is no pumping from the shallow groundwater system and principal aquifer pumping does not have a material effect on shallow groundwater (GDEs) or interconnected surface water (Santa Clara River) flows. The GSP has been updated to note the beneficial uses described in the comment exist relative to the Shallow Alluvial Deposits (See ES-1, ES-2 and Section 2.3.1). However, it is noted that the Shallow Alluvial Deposits are not a principal aquifer, are not pumped, and groundwater pumping form the principal aquifers in the Basin do not materially affect the GDEs or deplete interconnected surface water. Please see new appendix (Appendix G) for further information.
39	23-Aug-21	Anthony VIA: Mark Andres	Spina Capelli Ticlavilca	mark.capelli@noaa.gov andres.ticlavilca@noaa.gov	805-963-6478	U.S. Dept. of Commerce - NOAA - National Marine Fisheries Service West Coast Region 501 West Ocean Blvd, Suite 4200 Long Beach, CA 90802-4213	3.1.4.1 Physical Properties of Aquifers and Aquitards Pages 36-45	"At the time of writing of this GSP, no aquifer test results for hydraulic conductivity or storativity were found in available references. However, well information collected over the past several decades by United . . . is considered the best available information concerning aquifer and aquitard properties. . . However, it is recognized that on a local scale, hydraulic conductivity can vary by orders of magnitude over short distances, and there may be areas in Mound Basin where hydraulic conductivity is higher or lower than the values shown on Table 3.1-01." The lack of specific information regarding hydraulic conductivity or storativity in the Mound Basin and the overlying shallow alluvial aquifer does not allow the categorical conclusions relied upon in the Draft GSP to eliminate consideration of GDE within the Mound Basin. The information and model used by United was focused on water conductivity and storativity that is more relevant to out-of-stream water supply and beneficial uses than the smaller values that may be relevant to support GDE. Without . . . field-based measurements it is impossible to conduct credible aquifer simulations such as the one found in the Draft GSP dealing with groundwater levels driven by climate-change scenarios through 2070 (See, e.g., Figure 4.6-03 of the Draft GSP.)	The GSP does not focus on the Area 11 GDE and interconnected surface water in the sustainable management criteria formulation because groundwater pumping does not materially impact either. There is no shallow groundwater pumping in the Basin. An appendix (Appendix G) has been added to further document the technical data that demonstrate the lack of material influence by pumping in the principal aquifers (Mugu and Hueneme Aquifers) on shallow groundwater levels and flows in the Santa Clara River or the Santa Clara River Estuary. Given the lack of material influence of pumping on GDEs (riparian or aquatic) associated with the Santa Clara River, there is no potential for significant and unreasonable impacts on the GDEs at present.

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40	23-Aug-21	Anthony VIA: Mark Andres	Spina Capelli Ticlavilca	mark.capelli@noaa.gov andres.ticlavilca@noaa.gov	805-963-6478	U.S. Dept. of Commerce - NOAA - National Marine Fisheries Service West Coast Region 501 West Ocean Blvd, Suite 4200 Long Beach, CA 90802-4213	3.1.4.2 Groundwater Recharge and Discharge Areas [§354.14(d)(4)] Page 45	"The Santa Clara River is the only major stream in Mound Basin, and the reach of the Santa Clara River in [the] Mound Basin is considered to usually be the site of groundwater discharge, rather than recharge (Stillwater Sciences, 2011[b]; United, 2018). However, the lower Santa Clara River in the area of its estuary is reported to fluctuate from gaining to losing cycles as water levels rise and fall in response to breaching of the barrier sand at the mouth of the river (Stillwater Sciences, 2011[b[). When the elevation of surface water in the estuary rises (following closure of the barrier bar), some of the rising water infiltrates (recharges) the shallow deposits adjacent to the river. Then, typically in the following winter or spring, a large storm will produce sufficient flows in the river that it will breach the barrier bar and cause rapid decline of surface water levels in the estuary, causing groundwater in the adjacent shallow deposits to discharge back into the river over a sustained period." First, the distinction between discharge and recharge is misleading; the surface flows in the lower reaches of the Santa Clara River are in direct contact with the alluvial aquifer (which is described elsewhere in the draft GSP as being up to a 100 feet thick). Second, river discharge (particularly base flows influence by underlying groundwater levels in the Mound Basin) support the GDE in this portion of the Mound Basin. Third, recharge is not limited to periods when the water surface elevations in the estuary rises following the closure of the sand bar at the mouth of the Santa Clara River Estuary. Lastly, the draft GSP does not accurately characterize the groundwater contribution to the Santa Clara River Estuary or the lower reaches of the Santa Clara River. According to a water balance assessment conducted by Stillwater Sciences (2011a, 2011b) for the fall/winter period of 2010, "groundwater was estimated to contribute approximately 15% of the inflow volume . . .". For the summer/spring 2010 period, "the groundwater contribution was estimated at 10 percent . . ." The Stillwater study also indicates that in the "Santa Clara River reach upstream of the estuary, groundwater provides the dry summer baseflow, if it exists, and is a quarter of the winter flow, based on the 2010 water year assessment." (TNC 2017, pp. 3-4).	MBGSA respectfully disagrees and believes the quoted text appropriately describes the dynamics of the Santa Clara River within the Mound Basin.
41	23-Aug-21	Anthony VIA: Mark Andres	Spina Capelli Ticlavilca	mark.capelli@noaa.gov andres.ticlavilca@noaa.gov	805-963-6478	U.S. Dept. of Commerce - NOAA - National Marine Fisheries Service West Coast Region 501 West Ocean Blvd, Suite 4200 Long Beach, CA 90802-4213	3.2 Groundwater Conditions [§354.16] p. 54	"Groundwater elevation data are available for nearly 60 wells located within Mound Basin. However, not all of these wells are being monitored at present. The distribution of wells is heavily skewed towards the southern half of the Basin, with relatively few wells existing in the northern half of the Basin (north of Highway 126)." The Draft GSP does not provide details regarding the well construction showing the intervals of the well through which groundwater enters the wells. Also, it is unclear if there are "sanitary plugs" installed in the wells that retard or prevent flow through shallow and deep aquifers. See comment above regarding the assertion that "No data gaps or significant uncertainties were identified."	The monitoring network well construction information is provided in the Draft GSP Table 5.3-01, water levels are presented in Appendix I (formerly Appendix H), and cross-sectional views of the aquifers are presented in the Draft GSP Section 3.1.2 – together these provide all the available information for the wells in relation to the groundwater and hydrostratigraphic units.
42	23-Aug-21	Anthony VIA: Mark Andres	Spina Capelli Ticlavilca	mark.capelli@noaa.gov andres.ticlavilca@noaa.gov	805-963-6478	U.S. Dept. of Commerce - NOAA - National Marine Fisheries Service West Coast Region 501 West Ocean Blvd, Suite 4200 Long Beach, CA 90802-4213	3.2.1 Groundwater Elevations [§354.16(a)] p. 54	"The contouring of groundwater levels in Mound Basin is complicated by the sparse data, particularly in the northern portion of the Basin." See comment above regarding the assertion that "No data gaps or significant uncertainties were identified."	There is no groundwater production in these portions of the basins, so this is not considered to be a significant data limitation for the GSP and sustainable management of the Basin.

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43	23-Aug-21	Anthony VIA: Mark Andres	Spina Capelli Ticlavilca	mark.capelli@noaa.gov andres.ticlavilca@noaa.gov	805-963-6478	U.S. Dept. of Commerce - NOAA - National Marine Fisheries Service West Coast Region 501 West Ocean Blvd, Suite 4200 Long Beach, CA 90802-4213	3.2.2 Change in Storage [§354.16(b)] p. 60	"Similar to contouring of groundwater levels in Mound Basin (as described above), estimation of historical changes in groundwater stored in the Basin is complicated by sparse groundwater elevation data, particularly in the northern portion of the Basin and in HSUs with few monitoring points. Due to these limitations, annual and cumulative changes in groundwater in storage were estimated using United's (2018 and 2021a, 2021b) groundwater flow model, which is generally well calibrated on a regional scale to groundwater elevation measurements." Groundwater models that are aimed at a "regional scale" are not likely to adequately describe changes in groundwater and surface water elevations (particularly base flows) that support localized GDE such as those associated with the lower Santa Clara River and the Santa Clara River Estuary, as well as other GDE within the Mound Basin identified by the California Department of Fish and Wildlife (2021). See comment above regarding the assertion that "No data gaps or significant uncertainties were identified."	Detailed consideration of the groundwater – surface water interaction is not warranted for this GSP because groundwater pumping does not materially impact shallow groundwater or interconnected surface water flows. There is no shallow groundwater pumping in the Basin. An appendix (Appendix G) has been added to further document the technical data that demonstrate the lack of material influence by pumping in the principal aquifers (Mugu and Hueneme Aquifers) on shallow groundwater levels and flows in the Santa Clara River or the Santa Clara River Estuary.
44	23-Aug-21	Anthony VIA: Mark Andres	Spina Capelli Ticlavilca	mark.capelli@noaa.gov andres.ticlavilca@noaa.gov	805-963-6478	U.S. Dept. of Commerce - NOAA - National Marine Fisheries Service West Coast Region 501 West Ocean Blvd, Suite 4200 Long Beach, CA 90802-4213	3.3.1 Historical Water Budget [§354.18(c)(2)(B)] p. 79 p. 83-84 3.3.2 Current Water Budget [§354.18(c)(1)] p. 84-86 3.3.3 Projected Water Budget p. 86-94 4.3 Pages 104-105 4.4.2.3 Page 108	"The SGMA Regulations require that the historical surface water and groundwater budget be based on a minimum of 10 years of historical data." The GSP does not refer to or account for the effects of the operation of the UWCD Vern Freeman Diversion on the lower Santa Clara River, which diverts, on average, over 62,000 acre-feet per year (AFY) from the main stem of the Santa Clara River (NMFS 2018). This diversion operation affects recharge to all of the lower Santa Clara River groundwater basins, not just the Fox Canyon Basin, including the shallow alluvial aquifer and the other deeper aquifers in within the Mound Basin. These operations have the potential to impact endangered adult and juvenile steelhead in the lower Santa Clara River and Santa Clara River Estuary (NMFS 2008a, 2018). The Draft GSP should therefore include as part of its water-budget analysis the operations of the Vern Freeman Diversion. Specifically, the relationship of groundwater management activities (including both recharge and groundwater extraction activities) and the effects of the related Vern Freeman Diversion on surface flows below the diversion and the maintenance of surface flows supported by groundwater should be explicitly addressed and disclosed in the revised GSP.	The Vern Freeman diversion is located outside of the Mound Basin, so an evaluation of its impacts to the streamflow are not required; however, the diversions are included in the numerical model, so flows are accounted for in the water budget (see Draft GSP section 3.3). Text was added to Section 3.3 to make clear that the water budget accounts for Vern Freeman Diversion operations.
45	23-Aug-21	Anthony VIA: Mark Andres	Spina Capelli Ticlavilca	mark.capelli@noaa.gov andres.ticlavilca@noaa.gov	805-963-6478	U.S. Dept. of Commerce - NOAA - National Marine Fisheries Service West Coast Region 501 West Ocean Blvd, Suite 4200 Long Beach, CA 90802-4213	3.3.4.1 Overdraft Assessment p. 96	"Review of the historical, current and projected groundwater budgets indicate small amounts of declining groundwater storage over time (469 and 147 for the historical and current periods, respectively), as shown in Table 3.3-03. These results suggest a minor amount of overdraft may have occurred during the historical and current period of 6.3% and 2.3%, respectively, of the groundwater pumping during that timeframe." While the Draft GSP does not identify any significant impacts to out-of-stream water supply beneficial uses of the Mound Basin (and in fact projects a slight increase of 68 to 84 AF/yr) between 2022 and 2096, under the assumed future-precipitation rates modeled), the implications from this slight overdraft or increase in storage for any of the GDE associated with the Mount Basin, including the lower Santa Clara River and Santa Clara River Estuary, are unclear	Groundwater pumping does not materially impact shallow groundwater or interconnected surface water flows. There is no shallow groundwater pumping in the Basin. An appendix (Appendix G) has been added to further document the technical data that demonstrate the lack of material influence by pumping in the principal aquifers (Mugu and Hueneme Aquifers) on shallow groundwater levels and flows in the Santa Clara River or the Santa Clara River Estuary.
46	23-Aug-21	Anthony VIA: Mark Andres	Spina Capelli Ticlavilca	mark.capelli@noaa.gov andres.ticlavilca@noaa.gov	805-963-6478	U.S. Dept. of Commerce - NOAA - National Marine Fisheries Service West Coast Region 501 West Ocean Blvd, Suite 4200 Long Beach, CA 90802-4213	4.2 Sustainability Goal [§354.24] p. 100	"The goal of this Groundwater Sustainability Plan (GSP) is to sustainably manage the groundwater resources of the Mound Basin for the benefit of current and anticipated future beneficial users of groundwater and the welfare of the general public who rely directly or indirectly on groundwater. Sustainable groundwater management will ensure the long-term reliability of the Mound Basin groundwater resources by avoiding undesirable results pursuant to the Sustainable Groundwater Management Act (SGMA) no later than 20 years from GSP adoption through implementation of a data-driven and performance-based adaptive management framework." Nothing in the language of the goals specifically refers to the protection of instream beneficial uses associated with GDE of the Mount Basin, such as the lower Santa Clara River or the Santa Clara River Estuary. This appears to be the result, in part, of not recognizing any interconnected surface waters or GDE within the boundaries of the Mound Basin. However, as noted above, the Mound Basin contains interconnected surface water and GDE. See comments above regarding the physical properties of the Mound Basin.	Component 4c of the sustainability goal addresses GDEs, which included those listed in the comment.

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47	23-Aug-21	Anthony VIA: Mark Andres	Spina Capelli Ticlavilca	mark.capelli@noaa.gov andres.ticlavilca@noaa.gov	805-963-6478	U.S. Dept. of Commerce - NOAA - National Marine Fisheries Service West Coast Region 501 West Ocean Blvd, Suite 4200 Long Beach, CA 90802-4213	4.4.3.1 Description of Measurable Objectives Western Half of Basin Page 112	"The chronic lowering of groundwater levels minimum thresholds in the western half of the Basin are superseded by the land subsidence proxy minimum thresholds. Therefore, the land subsidence proxy measurable objectives and interim milestones are adopted for the chronic lowering of groundwater levels measurable objectives in the western half of the Basin." It is not clear how, or if, the land subsidence proxy for minimum thresholds is appropriate for instream beneficial uses associated by GDE supported by interconnected waters. See also, general comment above regarding Minimum Thresholds.	This comment is not applicable due to the lack of material influence by pumping in the principal aquifers (Mugu and Hueneme Aquifers) on shallow groundwater levels and flows in the Santa Clara River or the Santa Clara River Estuary.
48	23-Aug-21	Anthony VIA: Mark Andres	Spina Capelli Ticlavilca	mark.capelli@noaa.gov andres.ticlavilca@noaa.gov	805-963-6478	U.S. Dept. of Commerce - NOAA - National Marine Fisheries Service West Coast Region 501 West Ocean Blvd, Suite 4200 Long Beach, CA 90802-4213	4.5.2.2 Relationships Between Minimum Thresholds and Sustainability Indicators [§354.28(b)(2)] p. 118 4.6 & 4.7	"The minimum thresholds for the reduction of groundwater storage sustainability indicator allow groundwater levels to decline below historical low levels in the eastern half of the Basin. Deeper groundwater levels could potentially increase underflow into the Mound Basin from the Oxnard and/or Santa Paula Basins (or decrease underflow to the Oxnard Basin), which could potentially contribute to undesirable results in those Basins. However, as noted above and in Section 4.4.2.1, the length of time that groundwater levels could remain below historical lows would be limited in order to prevent undesirable results for land subsidence in the western half of the Mound Basin; therefore, the potential effect on the adjacent basins is considered small." This approach and analysis may be appropriate when considering groundwater supplies for out-of-stream beneficial uses for which there may be alternatives. However, it does not take into account the adverse effects of periodic reduction of groundwater on GDE, including the use by migrating, spawning or rearing steelhead. The effects of periodic groundwater reductions on out-of-stream beneficial uses (e.g., domestic or agricultural water supplies) may be addressed with alternative water sources. However, instream uses such as GDE are more vulnerable to periodic groundwater reductions, because there is generally no alternative water source to sustain the GDE, and even a short-term depletion or limitation of stream flow or water surface elevation can be lethal to aquatic species.	This comment is not applicable due to the lack of material influence by pumping in the principal aquifers (Mugu and Hueneme Aquifers) on shallow groundwater levels and flows in the Santa Clara River or the Santa Clara River Estuary.
49	23-Aug-21	James	Maxwell			Ventura County Public Works Water Resources Division	Section 2.2.1	**Section 2.2.1** discusses water usages throughout the Mound Subbasin but does not reference individual, domestic/private well usage. The Draft states that "There are no known de minimus extractors in the Mound Basin." County records show that there is one known, active domestic-designated water well and several potentially abandoned domestic wells. Also reference Section 5.2.	It has been agreed upon that this comment is an error and that there are currently no active domestic wells in the Basin (MBGSA email communication with James Maxwell and Kim Loeb of VCWPD, 8/24/2021). VCWPD updated their records to accurately reflect that.
50	23-Aug-21	James	Maxwell			Ventura County Public Works Water Resources Division	Section 2.2.2.1	**Section 2.2.2.1** references the Ventura County Public Works Agency, Watershed Protection (VCPWA-WP) Groundwater Resources monitoring program. The number of wells monitored by groundwater resources varies but is usually between two and four groundwater wells within the Subbasin.	Text revised: "VCWPD variably monitors ~~three~~ two to four wells. . . "
51	23-Aug-21	James	Maxwell			Ventura County Public Works Water Resources Division	Section 2.2.2.2	**Section 2.2.2.2** references the previous versions of the Urban Water Management Plans (UWMPs) and Water Shortage Contingency Plans (WSCPs) for the City of Ventura (2016) and Casitas Municipal Water District (2016). It should be reflected in the Draft that 2020 UWMP updates have been released and/or adopted. Figures, data, and other relevant information should be updated in the Draft from the most recent UWMPs. There is no discussion of United Water Conservation District's (UWCD's) 2015 and 2020 UWMPs and 2020 WSCP.	The 2020 WSCP and UWMP for City of Ventura (Kennedy/Jenks, 2021a&b) and the 2020 UWMP for CMWD (CMWD, 2021) have been included in the Draft GSP and it has been updated to reflect the differences. There are no figure/table updates necessary.
52	23-Aug-21	James	Maxwell			Ventura County Public Works Water Resources Division	Section 2.2.3.2	**Section 2.2.3.2** discusses water well permitting through the VCPWA-WP. It should be noted that the County oversees compliance with the County Water Well Ordinance No. 4468 which is inclusive of the California Water Well Standards Bulletins 74-9,74-81 and 74-90 with future revisions currently under discussion.	Comment noted. Text updated: "The Ventura County Groundwater Section ~~enforces~~ oversees compliance with County Water Well Ordinance No. 4468 which is inclusive of California's Water Well Standards Bulletins 74-9, 74-81, and 74-90."

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53	23-Aug-21	James	Maxwell			Ventura County Public WorksWater Resources Division	Section 4.7	There is no discussion of potential impacts to groundwater from septic systems or wastewater treatment systems and abandoned wells that potentially serve as conduits for contaminant migration to the underlying aquifers (**Section 4.7**).	Seepage from septic systems are discharged to the Shallow Alluvial Deposits, which is not a principal aquifer. Treated wastewater is discharged to surface water (the Santa Clara River estuary, which is underlain by the Shallow Alluvial Deposits, which is not a principal aquifer. Unused or abandoned domestic wells are addressed in the groundwater quality protection measures under the projects and management actions (see Section 6.5). In addition, water quality is monitored across the basin to detect any elevated contaminant levels.
54	23-Aug-21	James	Maxwell			Ventura County Public Works Water Resources Division	Section 3.0 Basin Setting	There is minimal or no discussion of the Mound Subbasin and the Oxnard Subbasin boundary and any long-term operational interactions between the Fox Canyon Groundwater Management Agency (FCGMA) and MBGSA.	Faults along the basin boundary are characterized in the Regional Geology Section 3.1.2. Additionally, the Groundwater Flow Barriers Section 3.1.4.1.2 and the Water Budget Section 3.3 (historical, current, and projected) provides the estimated groundwater exchange across the boundary.
55	23-Aug-21	James	Maxwell			Ventura County Public Works Water Resources Division	Section 3.1.4.1.2	Faulting is discussed in **Section 3.1.4.1.2** and identifies the absence of monitoring wells on opposing sides of known faults. Known and monitored groundwater wells could provide information regarding potential impedance to groundwater movement across these faults.	Effects of faults were evaluated during model calibration and will be revisited during each GSP update. We agree that additional monitoring is helpful, but is not necessary at this stage.
56	23-Aug-21	James	Maxwell			Ventura County Public Works Water Resources Division	Section 3.1.4.1	The Figures shown in the Executive Summary on pages ES-iv and -v should be placed in and would better illustrate the subsections of **Section 3.1.4.1.**	The appropriate figures are referenced in the text and are only embedded in the Executive Summary for consistency.
57	23-Aug-21	James	Maxwell			Ventura County Public Works Water Resources Division	Section 3.1.4.2	**In Section 3.1.4.2**, it would be beneficial to include estimated and separate quantities of M&I and agricultural return flows within the Subbasin.	Quantities are presented in the Water Budget section (Section 3.3.1, Section 3.3.2, and Table 3.3-02). Section 3.1.4.2 presents the types of recharge and discharge for the Basin.
58	23-Aug-21	James	Maxwell			Ventura County Public Works Water Resources Division	Section 3.1.4.3	**In Section 3.1.4.3**, the Draft mentions using groundwater quality data from VCPWA-WP. The most recently used data was from 2017. The County has more recent water quality data through 2020.	Data updates will be included in the first annual GSP update.
59	23-Aug-21	James	Maxwell			Ventura County Public Works Water Resources Division	Section 3.1.4.4	**Section 3.1.4.4** could include a brief section discussing domestic groundwater wells and the limited use of these types of wells in the Subbasin. Ventura County records indicate that there is one active domestic well.	MBGSA has verified with Ventura County Watershed Protection District (8/24/2021 email communication with James Maxwell and Kim Loeb of VCWPD) that there are no domestic wells currently being used in the Basin. VCWPD updated their records to accurately reflect that.
60	23-Aug-21	James	Maxwell			Ventura County Public Works Water Resources Division	Section 3.2.1.1	**Section 3.2.1.1** includes groundwater level information up to 2019. There is current water level elevation data from Ventura County through 2020.	Data updates will be included in the first annual GSP update.
61	23-Aug-21	James	Maxwell			Ventura County Public WorksWater Resources Division	Section 3.2.4	**Section 3.2.4** discusses groundwater quality impacts to several agricultural water wells screened in the Mugu and Hueneme aquifers. The Draft suggests that elevated concentrations of nitrates in these wells would implicate the migration of contaminants to these aquifers from compromised well seals or casings. The section should include a discussion of the use of wastewater treatment systems in the vicinity of these wells.	There are no wastewater treatment facilities located near the wells in question.
62	23-Aug-21	James	Maxwell			Ventura County Public Works Water Resources Division	Sections 4.4.2.2.5 and 8	**Sections 4.4.2.5 and 4.8** discusses land subsidence in the western and eastern halves of the Subbasin. There is sufficient InSAR data for monitoring subsidence in the eastern half but not the western. Daniel B. Stephens & Associates, Inc. (a Geo-Logic Company) developed the *Fillmore and Piru Basins Land Subsidence Evaluation Technical Memorandum* for the Fillmore and Piru Basins Groundwater Sustainability Agency dated February 4,2021. The memo addresses land subsidence within the Fillmore and Piru Subbasins. Consider development of a similar technical evaluation for the Mound Subbasin to assess conditions in the western half of the Subbasin and any correlations to existing data for the eastern half.	Groundwater levels are used as a proxy for the land subsidence minimum thresholds, which is more protective.

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63	23-Aug-21	James	Maxwell			Ventura County Public Works Water Resources Division	Sections 5.2.3 and 5.3.3	**Sections 5.2.3 and 5.3.3** discuss the design of a monitoring network and collection of data and mentions that monitoring will be affected by implementation of the Oxnard Groundwater Sustainability Plan. Consider noting that future monitoring information from the FCGMA could be used to supplement the MBGSA reporting data.	Comment noted.
64	23-Aug-21	James	Maxwell			Ventura County Public Works Water Resources Division	Section 6.5	**Section 6.5** states the MBGSA will coordinate with the County to identify and address improperly constructed and abandoned wells. It should be noted that this is also to maintain compliance with the Ventura County Well Ordinance No. 4468.	Comment noted.
65	1-Sep-21	Neal	Maguire	nmaguire@fcoplaw.com	805-659-6800	1050 S. Kimball Rd. Ventura, CA 93004	Section 3.3.4.1	First, the draft GSP provides, in section 3.3.4.1, an overdraft assessment required by section 354.18(b)(5) of the GSP Emergency Regulations. The draft GSP utilizes the characterization of overdraft from the Department of Water Resources' Bulleting 118, which provides in part: "Overdraft can be characterized by groundwater levels that decline over a period of years and never fully recover, even in wet years." Section 3.3.4.1 of the draft GSP further notes, "Review of the historical, current and projected groundwater budgets indicate small amounts of declining groundwater storage over time (469 and 147 for the historical and current periods, respectively), as shown in Table 3.3-03." In light of this discussion, we would appreciate clarification regarding the following: 1. Are the values provided in Table 3.3-03 within the error range for the various referenced water budgets? 2. Have the above estimates regarding groundwater storage been accompanied by any reports or accounts of any undesirable results in the Basin?	1. Yes 2. No Text will be updated based on these questions.
66	1-Sep-21	Neal	Maguire	nmaguire@fcoplaw.com	805-659-6800	1050 S. Kimball Rd. Ventura, CA 93004	Section 3.3.4.1	Second and lastly, the draft GSP discusses, in several areas, the lack of a relationship between the Mound Basin's shallow aquifer, which is not utilized for groundwater production, and other aquifers that are being utilized by the Basin's landowners and the City of Ventura. For example, page 68 of the draft GSP notes, with regard to surface water connectivity issues, that the shallow aquifer does not have "any known groundwater extractions within Mound Basin." MBAWG is similarly unaware of any groundwater production from the shallow aquifer. MBAWG also agrees that the shallow aquifer does not seem to interact with the aquifers that are beneficially used, in part because we do not see any associated diminished water quality in the deeper aquifers. With that said, it might be helpful for the GSP to provide further confirmation regarding the connectivity, or lack thereof, between the Basin's aquifers.	An appendix (Appendix G) has been added to further document the technical data that demonstrate the lack of material influence by pumping in the principal aquifers (Mugu and Hueneme Aquifers) on shallow groundwater levels and flows in the Santa Clara River or the Santa Clara River Estuary.
67	21-Oct-21	City of Ventura					Global	Please update references to City's most recent UWMP, CWRR, and WSECP.	References updated.

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68	21-Oct-21	City of Ventura					**ES-1, page ES-iii**	“Other sources of water supply for the Basin include groundwater pumped from City of Ventura wells located in the adjacent Santa Paula and Oxnard Basins and from the Upper Ventura River Basin (not an immediately adjacent basin), and surface water imported from the Ventura River Watershed, which is purchased from Casitas MWD. Although Mound Basin groundwater is an important source of water supply for the communities located within the Basin, the communities are not considered to be “dependent” on Mound Basin groundwater because it is only one component of the City’s water supply portfolio. In contrast, agricultural beneficial users are heavily dependent on groundwater pumped from the Mound Basin as they currently do not have an alternative water supply.” For the first sentence above, the City’s Ventura River water should be characterized as subsurface water extracted from shallow groundwater wells in the Upper Ventura River Basin. For the second sentence above, the City *is* dependent on the Mound Basin groundwater. The sentence should be revised to state that, “The communities located within the Basin rely on Mound Basin groundwater, even though the City does have other sources of water supply in its water supply portfolio.” For the third sentence, the phrase “in contrast,” should be deleted.	Text updated: “Other sources of water supply for the Basin include groundwater pumped from City of Ventura wells located in the adjacent Santa Paula and Oxnard Basins and from the Upper Ventura River Basin (not an immediately adjacent basin), and surface water imported from the Ventura River Watershed, which is purchased from Casitas MWD. Although Mound Basin groundwater is an important source of water supply for the communities located within the Basin, the communities are not considered to be ***exclusively dependent*** on Mound Basin groundwater because it is only one component of the City’s water supply portfolio. In contrast, agricultural beneficial users are heavily dependent on groundwater pumped from the Mound Basin as they currently do not have an alternative water supply.”
69	21-Oct-21	City of Ventura					**Table ES-1, page ES-vii**	The term “Change in Storage” should be clarified to mean change in storage available, as opposed to a change in the amount of groundwater in storage. Upon first use, please add a footnote clarifying the meaning for the non-technical reader, and please note that this applies to the use of that term throughout the GSP.	Footnote added to table to clarify Storage definition.
70	21-Oct-21	City of Ventura					**Acronyms and Abbreviations, page xx**	Please change the definition of “Ventura Water” to “the City of Ventura’s water and wastewater department”	Text updated.
71	11-Nov-21	City of Ventura					**2.1.4 Legal Authority, page 5**	**Comment during MBGSA public hearing:** Please delete the last sentence of the existing paragraph and replace with the following text: “Additionally, the City is currently in the planning and design phases for the proposed VenturaWaterPure Program, which includes diversion of tertiary treated effluent to a new Advanced Water Purification Facility for potable reuse. Construction of these Projects is expected to begin in 2023.”	Paragraph replaced
72	21-Oct-21	City of Ventura					**2.2.1, page 7**	Please change this sentence: “Sources of water for the M&I sector in Mound Basin include local groundwater pumped from City of Ventura wells in the Basin, groundwater pumped by the City of Ventura from the adjacent Santa Paula and Oxnard Basins and from the Upper Ventura River Basin (not an immediately adjacent basin), and surface water imported from the Ventura River Watershed, which is purchased from Casitas MWD.” To the following: “Sources of water for the M&I sector in Mound Basin include local groundwater pumped from City of Ventura wells in the Basin, groundwater pumped by the City of Ventura from the adjacent Santa Paula and Oxnard Basins, subsurface water pumped by the City from the Ventura River / the Upper Ventura River Basin (not an immediately adjacent basin), and surface water purchased from Casitas MWD.”	Text updated.

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73	21-Oct-21	City of Ventura					**2.2.1, page 8**	"Although Mound Basin groundwater is an important source of water supply for the communities located within the Basin, the communities are not considered to be "dependent" on Mound Basin groundwater because it is only one component of the City's water-supply portfolio." The City is dependent on Mound Basin groundwater. Please modify accordingly.	Text updated: "Although Mound Basin groundwater is an important source of water supply for the communities located within the Basin, the communities are not considered to be **exclusively dependent** on Mound Basin groundwater because it is only one component of the City's water-supply portfolio."
74	21-Oct-21	City of Ventura					**2.2.2.2, page 9**	Update reference to City's Urban Water Management Plan and Water Shortage Event Contingency Plan to 2020.	Reference updated.
75	11-Nov-21	City of Ventura					**2.2.3.1, page 9**	**Comment during MBGSA public hearing:** Replace reference to "Oxnard" Subbasin in the last full paragraph on Page 9 with "Mound" Subbasin.	Text updated.
76	11-Nov-21	City of Ventura					**2.2.3.2, page 18**	**Comment during MBGSA public hearing:** Please add the following sentence: "Additionally, groundwater production wells within the City limits of the City of Ventura require a water well agreement with the City of Ventura pursuant to Chapter 8.150 of the San Buenaventura Municipal Code."	Sentence added to Section 2.2.3.2.
77	11-Nov-21	City of Ventura					**2.2.3.2, page 21**	**Comment during MBGSA public hearing:** Typo in City of San Ventura – should be City of San Buenaventura.	Text updated.
78	21-Oct-21	City of Ventura					**Section 3.1.4.4**	We discussed potential issues with the City well depictions. Please review the text and update as you see appropriate.	Footnote added to Table 5.3-01.

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Labeled Comment Letters

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Note: comments which share the major themes from the Appendix F introduction are not included in the comment matrix (Attachement 1) due to their volume and repetition and are addressed in a new appendix to the draft GSP (Appendix G). In order to distinguish the comments from CDFW, NGOs, and NMFS, which do not follow the major themes discussed below, they have been identified and labeled with numbers and boxes below and correspond with the numbers in the comment matrix table (see Attachment 1, comments #6-9).

August 17, 2021

Via Electronic Mail and Online Submission

Mr. Bryan Bondy, P.G.
Executive Director
Mound Basin Groundwater Sustainability Agency
P.O. Box 3544
Ventura, CA 93006-3544
bryan@bondygroundwater.com

Subject: Comments on the Mound Basin Draft Groundwater Sustainability Plan

Dear Mr. Bondy:

The California Department of Fish and Wildlife (CDFW) is providing comments on the Mound Basin Groundwater Sustainability Agency's (MB-GSA) Draft Groundwater Sustainability Plan (Draft GSP). The Draft GSP was prepared pursuant to the Sustainable Groundwater Management Act (SGMA). As trustee agency for the State's fish and wildlife resources, CDFW has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and the habitat necessary for biologically sustainable populations of such species (Fish & Game Code §§ 711.7 and 1802).

Development and implementation of groundwater sustainability plans (GSPs) under SGMA represents a new era of California groundwater management. CDFW has an interest in the sustainable management of groundwater, as many sensitive ecosystems and species depend on groundwater and interconnected surface waters, including ecosystems on CDFW-owned and managed lands within SGMA-regulated basins. SGMA and its implementing regulations afford ecosystems and species-specific statutory and regulatory consideration, including the following as pertinent to GSPs:

- GSPs must **identify and consider impacts to groundwater dependent ecosystems (GDEs)** [23 CCR § 354.16(g) and Water Code § 10727.4(l)];
- Groundwater Sustainability Agencies must **consider all beneficial uses and users of groundwater**, including environmental users of groundwater [Water Code §10723.2 (e)];
- GSPs must **identify and consider potential effects on all beneficial uses and users of groundwater** [23 CCR §§ 354.10(a), 354.26(b)(3), 354.28(b)(4), 354.34(b)(2), and 354.34(f)(3)];
- GSPs must **establish sustainable management criteria that avoid undesirable results** within 20 years of the applicable statutory deadline, including **depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water** [23 CCR § 354.22 *et seq*. and Water Code §§ 10721(x)(6) and 10727.2(b)], and **describe monitoring networks** that can identify adverse impacts to beneficial uses of interconnected surface waters [23 CCR § 354.34(c)(6)(D)]; and,

- GSPs must **account for groundwater extraction for all water use sectors** including managed wetlands, managed recharge, and native vegetation [23 CCR §§ 351(al) and 354.18(b)(3)].

Furthermore, the Public Trust Doctrine imposes a related but distinct obligation to consider how groundwater management affects public trust resources, including navigable surface waters and fisheries. Groundwater hydrologically connected to surface waters are also subject to the Public Trust Doctrine to the extent that groundwater extractions or diversions affect or may affect public trust uses (*Environmental Law Foundation v. State Water Resources Control Board* (2018), 26 Cal. App. 5th 844; *National Audubon Society v. Superior Court* (1983), 33 Cal. 3d 419). Accordingly, groundwater plans should consider potential impacts to and appropriate protections for interconnected surface waters and their tributaries, and interconnected surface waters that support fisheries, including the level of groundwater contribution to those waters.

In the context of SGMA statutes and regulations, and Public Trust Doctrine considerations, groundwater planning should carefully consider and protect environmental beneficial uses and users of groundwater, including fish and wildlife and their habitats, groundwater dependent ecosystems, and interconnected surface waters.

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COMMENT OVERVIEW

CDFW supports ecosystem preservation and enhancement in compliance with SGMA and its implementing regulations based on CDFW expertise and best available information and science. CDFW understands the Mound basin (Basin) and is adjacent to the Santa Paula basin and the Oxnard basin. These three basins sit within the larger Oxnard Plain area. CDFW offers the following comments and recommendations below to assist MB-GSA in identifying and evaluating impacts on biological resources including GDEs within the adjacent groundwater basins. Additional suggestions are included for MB-GSA’s consideration during revisions of the Draft GSP.

COMMENTS AND RECOMMENDATIONS

Comment #1: Data Gaps for Interconnected Surface Water (Section 3.2.6 of Mound Basin Draft GSP, Starting on Page 67)

Issue: Page 67 of the Draft GSP states, *“Data are not available to characterize the interconnection of Santa Clara River surface water and groundwater. Although the frequent perennial baseflow conditions imply that surface and groundwater is interconnected, it is not known specifically which groundwater in which units are connected and where. Of importance for this GSP, it is unknown whether the water table of the shallow alluvial aquifer in Mound Basin extends beneath the stream terrace deposits and intersects surface water in the Santa Clara River channel within the limits of Mound Basin.”*

Concern: There are many unknowns as to the interaction of surface water in the Santa Clara River (SCR), Santa Clara River Estuary (SCRE) and the shallow alluvial aquifer of the Basin, and the adjacent Oxnard and Santa Paula basins. Studies have indicated that although the SCRE is within the Mound Basin, it may potentially be hydrologically connected to the upper aquifers of the Oxnard Plain area. This connection may be through semi-perched or shallow groundwater aquifers. The MB-GSA has not provided enough data to conclude that there isn’t hydrologic connectivity between these various shallow aquifers.

While most of the water flowing into the SCRE comes from the Ventura Wastewater Treatment Plant (VWWTP) and SCR discharge there is still a fair amount of groundwater inflow from the semi-perched aquifer. According to a water balance assessment conducted by Stillwater Sciences in their Santa Clara River Estuary Subwatershed Study for the fall/winter water year 2009- 2010, “The combined measured groundwater flow from the southern floodplain area and the unmeasured groundwater flow, which is presumed to be dominated by groundwater flow from upstream of the Harbor Blvd. bridge, had a combined contribution of approximately 15% of the total inflow volume” (Stillwater Sciences 2011b, p.78).

For the summer/spring 2010 period “The remaining 10% of the inflow volume came from an equal contribution of unmeasured groundwater flow from upstream of the Harbor Blvd. bridge and Santa Clara River flow” (Stillwater Sciences 2011b, p.78).

The Department of Water Resources regulations define interconnected surface water as “surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted [23 CCR § 351(o).].” The regulations do not state that the aquifer needs to be a “principal” aquifer as suggested by the Draft GSP.

GDEs can rely on groundwater for some or all of its requirements, relying on multiple water sources simultaneously and at different temporal or spatial scales (e.g., precipitation, river water, reservoir water, soil moisture in the vadose zone, groundwater, applied water, treated wastewater effluent, urban stormwater, irrigated return flow).

Recommendation: There are data gaps regarding the shallow aquifer and its hydraulic connectivity to the surface waters of the SCR and the SCRE. CDFW recommends the installation of shallow groundwater monitoring wells near potential GDEs and interconnected surface waters, potentially pairing multiple-completion wells with additional streamflow gages. This will facilitate an improved understanding of surface water-groundwater interconnectivity and subsurface recharge channels. A streamflow gage at the SCRE would provide valuable data on the amount of surface water feeding the estuary. CDFW agrees with the recommendation that the MB-GSA collect and analyze the data obtained from the future monitoring well planned for construction at the proposed VWWTP (as stated in the Draft GSP) to address the data gaps. Additional monitoring wells may be needed in other areas of the Basin before making the assertion that there is no interconnectivity between the shallow aquifer and the SCR. There is not enough information provided in the Draft GSP about the interconnectivity between the shallow aquifer and the principal aquifer. Additional clarification is needed in the final GSP.

Comment #2: Groundwater Dependent Ecosystems Do Not Exist in Mound Basin under SGMA (Section 3.2.7 of Mound Basin Draft GSP, Starting on Page 68 and Appendix G)

Issue: Page 69 of the Draft GSP states, *“As presented in Appendix G, iGDE areas 1 through 10 have been screened out and are not considered GDEs...Given the lack of potential for significant impacts to GDEs by principal aquifer pumping, Area 11 will not be considered further in the development of sustainable management criteria for the principal aquifers.”*

Concern: CDFW is concerned with the Draft GSP’s disregard for GDEs in the Basin. Essentially, there are zero GDEs identified for SGMA protection. Eleven areas within the Basin were mapped as containing indicators of potential GDEs. GDEs that were selected by the MB-GSA are as follows:

Area 1 – Harmon Canyon coast live oak trees;
Area 2 – Sexton Canyon coast live oak trees, wetland habitat, and riverine features;
Area 3 – Barlow Canyon (Arroyo Verde Park) riparian mixed hardwood;
Area 4 – Sanjon Barranca coast live oak trees;
Area 5 – Kennebec Linear Park mixed riparian forest and North Bank of Santa Clara River near Saticoy mixed willow forest;
Area 6 – Harmon Barranca and Park mixed riparian hardwood;
Area 7 – Arundell Barranca (northern) riverine features;
Area 8 – Arundell Barranca (central) wetland and riverine features;
Area 9 – Prince Barranca wetland and marsh features;
Area 10 – Alessandro Lagoon willow shrub; and,
Area 11 – Lower Santa Clara River and Estuary estuarine habitat and wetland features.

The MS-GSA determined these 11 areas are not reliant on water from a principal aquifer in the Basin. The MB-GSA is arguing that the primary sources of water for these habitats come from the shallow alluvial aquifer, perched zones, irrigation return flows and tile drain discharges. CDFW believes the shallow aquifer and perched zones rely on surplus water from other external sources to keep them recharged. There is concern that these external sources could diminish or dry up which would adversely affect these GDEs. These are important contributions to sustaining these habitats and should be reinstated in the Draft GSP as GDEs.

The SCR along the Basin is designated critical habitat for the federal Endangered Species Act (FESA) listed southern California steelhead (*Oncorhynchus mykiss* or steelhead). Steelhead and the FESA-listed and California Endangered Species Act (CESA) listed least Bell's vireo (*Vireo bellii pusillus*), the FESA-listed and CESA-listed southwestern willow flycatcher (*Empidonax traillii extimus*) utilize the various habitats identified in the draft GSP as estuarine, wetland, and riverine features, that the MB-GSA has excluded as GDEs.

Water Code § 10721 (x)(6) requires GSPs avoid significant and unreasonable adverse impacts to beneficial uses of surface water including aquatic ecosystems reliant on interconnected surface water. If hydrologic connectivity exists between a terrestrial or aquatic ecosystem and groundwater, then that ecosystem is a potential GDE and must be identified in a GSP. [23 CCR§354.16 (g).] Hydrologic connectivity between surface water and groundwater, as well as groundwater accessibility to terrestrial vegetation, must, therefore, be evaluated carefully, and conclusions should be well-supported. Hydrologic connectivity considerations include connected surface waters, disconnected surface waters and transition surface waters.

Recommendation: CDFW believes the shallow alluvial "aquifer" although rarely used for a water supply is extremely important to the ecological communities or species that depend on groundwater emerging from all aquifers or from groundwater occurring near the surface within the Basin. The 11 areas within the Basin that were mapped as containing potential GDEs should be included in the Draft GSP as they do rely on the shallow alluvial "aquifer" within the Basin, and the MB-GSA has not provided enough data to disregard interconnected surface waters. This shallow alluvial "aquifer" needs to be protected under SGMA. If these GDEs are adversely impacted, groundwater plans should be in place to facilitate appropriate and timely monitoring and management response actions.

Mapping GDEs and other beneficial uses is an essential component in the consideration, development and implementation of GSPs (Water Code §10723.2) and in assessing the potential effects on groundwater beneficial uses. GSAs must also include sustainable management criteria and monitoring to detect adverse impacts on all groundwater beneficial users. CDFW believes it was premature to eliminate a large portion of the GDEs-related data. We recommend that the best scientific data on depth to groundwater be included in the analysis of interconnected surface waters before any data is excluded. Other scientific data to include (but not be limited to): USGS mapped springs/seep and comparing recent groundwater level contours to vegetation root zones. CDFW does not recommend relying solely on soils information. For example, the presence of sandy, dry, and friable soils, does not mean that existing plant species do not rely on groundwater for some portion of their life cycle. Capillary fringe associated with root networks from native plants could be accessing groundwater from deeper depths.

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Comment #3: Impacts of United Water Conservation District's Diversion Operations at the Vern Freeman Diversion on the SCRE (Water Budget Section 3.3 Starting on Page 70)

Issue: The SCRE is located at the western portion of the Basin and is the terminus of the SCR. The protection and preservation of the SCRE for many species is a high priority for CDFW. United Water Conservation District's (UWCD) Vern Freeman Diversion (VFD), which is located in the Santa Paula Subbasin, plays a major role in limiting the amount of surface water that ultimately reaches the SCRE in the Mound Subbasin. As previously mentioned in Comment #2, GDEs do exist in the Basin and the VFD and recharge operations negatively impact these ecosystems. The VFD diverts surface water that would have continued to flow into the Mound Subbasin, but the water is instead diverted to the Oxnard Subbasin for groundwater storage. The water budget does not consider or analyze the VFD amounts in the Draft GSP.

Concern: The SCRE provides open water, sand dune, nearshore, riparian, mudflat, and other habitats that support a number of sensitive species throughout their life cycles, including the tidewater goby (*Eucclogobius newberryi),* steelhead, California least tern (*Sterna antillarum browni*), and western snowy plover (*Charadrius nivosus)* (CDFW 2019). SCRE is a core resource area strategically located along the coast that provides food, shelter, stopover, and safety for wildlife. The Ventura Wastewater Reclamation Facility (VWRF) currently discharges recycled water into the SCRE but will be reducing the amount of effluent discharge (from 4.7 MGD to 1.9 MGD) into the SCRE in the near future. Discharge reduction has the potential to significantly improve water quality conditions in the SCRE at the expense of a reduction in open water habitat. The surface water diverted from the VFD reduces flows needed to sustain the open water habitat for the SCRE. The VFD and spreading basin has altered the natural surface flow and groundwater recharge patterns in the SCR watershed (NMFS 2020, p.3).

Recommendation: CDFW recommends the amounts and timing of streamflow depletions at the Vern Freeman Diversion should be included in the Draft GSP to complete the water budget. Additionally, CDFW recommends the MB-GSA identify the estimated quantity and timing of streamflow depletions in the subbasin. If this information is not available, CDFW recommends the MB-GSA identify a proposed plan to estimate these values. The final GSP should address the UWCD VFD diversion and recharge operations and their effects on surface flows and groundwater elevations along the SCR and SCRE.

ADDITIONAL COMMENTS

Sensitive Species and Habitats: The SCRE contains important steelhead spawning and rearing habitat in Southern California. Threats to steelhead, such as excessively high-water temperatures in the spring, summer, and early fall, reduce available juvenile rearing habitat. Low flows in the fall and winter can delay adult passage to critical spawning areas.

Steelhead trout depend on the SCRE for vital life-history and ecological function and should be at the forefront of MB GSA's protection plan. This species utilizes all areas of the SCRE including the open water habitat. The SCRE has long been recognized as important steelhead rearing habitat for fingerling and smolt until they reach maturity as adults to survive the tough conditions of the Pacific Ocean.

The SCRE receives groundwater inflow upstream in the SCR. Water quality conditions in the SCRE have the potential to affect juvenile steelhead. The SCRE currently has approximately 108 acres of open water which provides a combination of fairly shallow open water and water that is generally deep enough to provide some protection from terrestrial and larger avian predators.

Southwestern pond turtle (*Actinemys pallida*) was designated as a California Species of Special Concern (SSC) in 1994. Southwestern pond turtle's preferred habitat is permanent ponds, lakes, streams, or permanent pools along intermittent streams associated with standing and slow-moving water. A potentially important limiting factor for western pond turtle is the relationship between water level and flow in off-channel water bodies, which can both be affected by groundwater pumping.

8 CDFW recommends that the MB-GSA commit to Arundo *(Arundo donax)* removal in the SCRE and along the SCR within the Basin to improve groundwater supply and enhance habitat quality for nesting birds. Arundo removal is one example of a project and management action to minimize groundwater overdraft. If groundwater depletion results in reduced streamflow due to interconnected surface waters, the nesting and foraging success of the SSC yellow warbler (*Dendroica petechia*), the SSC yellow breasted chat (*Icteria virens*), least Bell's vireo, southwestern willow flycatcher and other bird species may be diminished due to the reduced nesting habitat and food availability.

Proper management of both shallow and deep groundwater pumping combined with reduced surface water pumping and diverting such as that from the would ensure that the SCRE and lower SCR are not negatively impacted. Unsustainable use of groundwater can impact the shallow aquifers and interconnected surface waters on which these species and GDEs reply on for survival. This may lead to adverse impacts on fish and wildlife and the habitat they need to survive. Determining the effects groundwater levels have on surface water flows in the Mound Basin will inform how the groundwater levels may be associated with the health and abundance of riparian vegetation. Poorly managed groundwater pumping, and surface water flows have the potential to reduce the abundance and quality of riparian vegetation, reducing the amount of shade provided by the vegetation, and ultimately leading to increased water temperatures in the SCR and SCRE. CDFW highly recommends the MB-GSA map out locations where there are interconnected surface waters and document aquatic habitats and other GDEs as required under SGMA.

The biological resources within the SCRE were completely eliminated from this Draft GSP and the MB-GSA should provide appropriate consideration to the SCRE. Fish and wildlife resources within the Basin should also be considered in the water budget. Additionally, shallow groundwater levels near interconnected surface waters should be monitored to ensure that groundwater use is not depleting surface water and adversely affecting fish and wildlife resources in the Basin.

9

CONCLUSION

In conclusion, the Draft GSP does not comply with all aspects of SGMA statute and regulations, and CDFW deems the Draft GSP inadequate to protect fish and wildlife beneficial users of groundwater for the following reasons:

1. The assumptions, criteria, findings, and objectives, including the sustainability goal, undesirable results, minimum thresholds, measurable objectives, and interim milestones are not reasonable and/or not supported by the best available information and best available science. [CCR § 355.4(b)(1)] (See Comments # 1, 2, and 3);

2. The Draft GSP does not identify reasonable measures and schedules to eliminate data gaps. [CCR § 355.4(b)(2)] (See Comments # 1, 2, and 3);

3. The sustainable management criteria and projects and management actions are not commensurate with the level of understanding of the basin setting, based on the level of uncertainty, as reflected in the Draft GSP. [CCR § 355.4(b)(3)] (See Comments # 1, 2, and 3); and,

4. The interests of the beneficial uses that are potentially affected by the use of groundwater in the basin, have not been considered. [CCR § 355.4(b)(4)] (See Comments # 1, 2, 3 and see Additional Comments).

CDFW appreciates the opportunity to provide comments. Additionally, we appreciate MB-GSA's continued coordination with CDFW while MB-GSA develops a final GSP. If you have any questions or comments regarding this letter, please contact Steve Slack, Environmental Scientist, at Steven.Slack@wildlife.ca.gov.

Sincerely,

DocuSigned by:
Erinn Wilson-Olgin
B6E58CFE24724F5...

Erinn Wilson-Olgin
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Enclosures (Literature Cited)

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Literature Cited

CDFW. 2019. California Natural Diversity Data Base (CNDDB). (https://www.wildlife.ca.gov/data/cnddb)

National Marine Fisheries Service. 2020. Comment Letter for the Proposed Groundwater Sustainability Plan for the Oxnard Basin dated May 15, 2020. National Marine Fisheries Service, West Coast Region, Long Beach, California

Stillwater Sciences. 2011b. Estuary Sub Watershed Study Assessment of the Physical and Biological Condition of the Santa Clara River Estuary, Ventura County, California. Amended Final Report. September 2011.Prepared for the City of Ventura.

The Nature Conservancy. 2017.Technical Memorandum–Draft Assessment of Groundwater Dependent Ecosystems for the Oxnard Subbasin Groundwater Sustainability Plan.

Note: comments which share the major themes from the Appendix F introduction are not included in the comment matrix (Attachement 1) due to their volume and repetition and are addressed in a new appendix to the draft GSP (Appendix G). In order to distinguish the comments from CDFW, NGOs, and NMFS, which do not follow the major themes discussed below, they have been identified and labeled with numbers and boxes below and correspond with the numbers in the comment matrix table (see Attachment 1, comments #10-16).

August 23, 2021

Mound Basin GSA
P.O. Box 3544
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Submitted via email: jackiel@unitedwater.org.

Re: Public Comment Letter for the Mound Groundwater Basin Draft GSP

Dear Bryan Bondy,

On behalf of the above-listed organizations, we appreciate the opportunity to comment on the Draft Groundwater Sustainability Plan (GSP) for the Mound Groundwater Basin being prepared under the Sustainable Groundwater Management Act (SGMA). Our organizations are deeply engaged in and committed to the successful implementation of SGMA because we understand that groundwater is critical for the resilience of California's water portfolio, particularly in light of changing climate. Under the requirements of SGMA, Groundwater Sustainability Agencies (GSAs) must consider the interests of all beneficial uses and users of groundwater, such as domestic well owners, environmental users, surface water users, federal government, California Native American tribes and disadvantaged communities (Water Code 10723.2).

As stakeholder representatives for beneficial users of groundwater, our GSP review focuses on how well disadvantaged communities, tribes, climate change, and the environment were addressed in the GSP. While we appreciate that some basins have consulted us directly via focus groups, workshops, and working groups, we are providing public comment letters to all GSAs as a means to engage in the development of 2022 GSPs across the state. Recognizing that GSPs are complicated and resource intensive to develop, the intention of this letter is to provide constructive stakeholder feedback that can improve the GSP prior to submission to the State.

10 Based on our review, we have significant concerns regarding the treatment of key beneficial users in the Draft GSP and consider the GSP to be **insufficient** under SGMA. We highlight the following findings:

1. Beneficial uses and users **are not sufficiently** considered in GSP development.
    a. Human Right to Water considerations **are not sufficiently** incorporated.
    b. Public trust resources **are not sufficiently** considered.
    c. Impacts of Minimum Thresholds, Measurable Objectives and Undesirable Results on beneficial uses and users **are not sufficiently** analyzed.
2. Climate change **is not sufficiently** considered.
3. Data gaps **are not sufficiently** identified and the GSP **does not have a plan** to eliminate them.

10

4. Projects and Management Actions **do not sufficiently consider** potential impacts or benefits to beneficial uses and users.

Our specific comments related to the deficiencies of the Mound Groundwater Basin Draft GSP along with recommendations on how to reconcile them, are provided in detail in **Attachment A.**

Please refer to the enclosed list of attachments for additional technical recommendations:

Attachment A	GSP Specific Comments
Attachment B	SGMA Tools to address DAC, drinking water, and environmental beneficial uses and users
Attachment C	Freshwater species located in the basin
Attachment D	The Nature Conservancy's "Identifying GDEs under SGMA: Best Practices for using the NC Dataset"

Thank you for fully considering our comments as you finalize your GSP.

Best Regards,

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Western States Climate and Water Scientist
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Attachment A

Specific Comments on the Mound Groundwater Basin Draft Groundwater Sustainability Plan

1. Consideration of Beneficial Uses and Users in GSP development

Consideration of beneficial uses and users in GSP development is contingent upon adequate identification and engagement of the appropriate stakeholders. The (A) identification, (B) engagement, and (C) consideration of disadvantaged communities, drinking water users, tribes, groundwater dependent ecosystems, streams, wetlands, and freshwater species are essential for ensuring the GSP integrates existing state policies on the Human Right to Water and the Public Trust Doctrine.

A. Identification of Key Beneficial Uses and Users

11

Disadvantaged Communities, Drinking Water Users, and Tribes

The identification of Disadvantaged Communities (DACs), drinking water users, and tribes is **insufficient**. We note the following deficiencies with the identification of these key beneficial users.

- The GSP provides a map of DAC block groups and DAC tracts within the basin (Figure 1 in Appendix D) but does not include any other identifying information for DACs.
- The adopted Stakeholder Engagement Plan (Appendix D) states that there are domestic wells overlying the basin; however, the main body of the GSP states that there are no domestic wells within the basin due to availability of potable water from Ventura Water. The GSP does not provide the location and depth of the domestic wells within the basin, nor does it provide a well density map of domestic wells in the basin. Additionally, the GSP fails to identify the population dependent on groundwater as their source of drinking water in the basin.
- The GSP states that portions of the Barbareno-Ventureno Band of Chumash are located within the Mound Basin, but does not include a map of tribal areas within the basin.

These missing elements are required for the GSA to fully understand the specific interests and water demands of these beneficial users, to support the development of water budgets using the best available information, and to support the development of sustainable management criteria and projects and management actions (PMAs) that are protective of these users.

RECOMMENDATIONS

- Provide clarification on the status of domestic wells within the basin. DWR Well Completion Report Map[1] shows that there are some domestic wells within the basin. Include a map showing the domestic wells in the basin by location and depth. even if they are not currently in use. Wells previously in use may have been impacted by poor water quality or declining groundwater elevations.
- Provide an estimate of the population dependent on groundwater within the Mound Basin. The GSP states that "The City of Ventura (Ventura Water) serves the areas indicated by DWR as Disadvantaged Communities (DACs) and Severely Disadvantaged

[1] DWR Well Completion Report Map https://dwr.maps.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37

11 Communities (SDACs).” The GSP does not, however, currently provide clear information on how and to what extent DAC members rely on groundwater.

- Include a map of tribal lands within the basin.

Interconnected Surface Waters

The identification of Interconnected Surface Waters (ISWs) is **insufficient**. ISWs were inadequately dismissed based on the incorrect assertion that the shallow aquifer is not a principal aquifer, despite the recognition in the Basin Setting section of the GSP that there is a likely connection between shallow groundwater and surface water. Groundwater in the shallow aquifer is likely providing baseflow to the Santa Clara River in this basin. The GSP states on p. 51: “In addition to groundwater production from the principal aquifers, discharge of small quantities of groundwater from the shallow alluvial aquifer to the lower reach of the Santa Clara River and possibly one other area in Mound Basin may contribute to groundwater-dependent ecosystems (GDEs).” SGMA defines principal aquifers as “aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems” [23 CCR § 351 (aa)].

The GSP states that it is unknown whether there is a connection between the shallow and underlying principle aquifers in the basin. Even if pumping is concentrated in deeper aquifers, SGMA still requires GSAs to sustainably manage groundwater resources in shallow aquifers that can support springs, surface water, and groundwater dependent ecosystems. This is because the goal of SGMA is to sustainably manage groundwater resources for current and future social, economic, and environmental benefits, and while groundwater pumping may not be currently occurring in a shallow aquifer, it could be in the future.

The GSP states on p. 67: “Data are not available to characterize the interconnection of Santa Clara River surface water and groundwater. Although the frequent perennial baseflow conditions imply that surface and groundwater is interconnected, it is not known specifically which groundwater in which units are connected and where.” However, the GSP should not ignore ISWs just because there is a lack of data to support their characterization. The absence of evidence is not the evidence of absence. Therefore, potential ISWs are not being identified, described, nor managed in the GSP. Until a disconnection can be proven, include all potential ISWs in the GSP. This is necessary to assess whether surface water depletions caused by groundwater use are having an adverse impact on environmental beneficial users of surface water.

RECOMMENDATIONS

- Include the shallow groundwater system as a principal aquifer in this GSP to ensure adequate monitoring and management of this critical groundwater resource for current and future beneficial users.

- Provide depth-to-groundwater contour maps using the best practices presented in Attachment D, to aid in the determination of ISWs. Specifically, ensure that the first step is contouring groundwater elevations, and then subtracting this layer from land surface elevations from a DEM to estimate depth-to-groundwater contours across the landscape. This will provide accurate contours of depth to groundwater along streams and other land surface depressions where GDEs are commonly found.

- Use seasonal data over multiple water year types to capture the variability in environmental conditions inherent in California's climate, when mapping ISWs.

- Reconcile ISW data gaps with specific measures (shallow monitoring wells (especially in the shallow aquifer), stream gauges, and nested/clustered wells) along surface water features in the Monitoring Network section of the GSP.

Groundwater Dependent Ecosystems

The identification of Groundwater Dependent Ecosystems (GDEs) is **insufficient**. The GSP took initial steps to identify and map GDEs using the Natural Communities Commonly Associated with Groundwater dataset (NC dataset) and other sources. However, we found that mapped features in the NC dataset were improperly disregarded, as described below.

- The GSP uses the same incorrect rationale used in the ISW section to state that GDEs are not present in the Basin because they do not rely on groundwater from a principal aquifer. As noted above, GSP Regulations define principal aquifers as "aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems" [23 CCR §351(aa)] regardless of pumping rates. Shallow aquifers that have the potential to support well development, support ecosystems, or provide baseflow to streams are principal aquifers, even if the majority of the basin's pumping is occurring in deeper principal aquifers. If there are no data to characterize groundwater conditions in the shallow principal aquifer, then the GDE should be retained as a potential GDE and data gaps reconciled in the Monitoring Network section of the GSP.
- GDEs were incorrectly removed in areas adjacent to irrigated fields due to the presence of surface water. However, GDEs can rely on multiple water sources – including shallow groundwater receiving inputs from irrigation return flow from nearby irrigated fields - simultaneously and at different temporal/spatial scales. NC dataset polygons adjacent to irrigated land can still potentially be reliant on shallow groundwater aquifers, and therefore should not be removed solely based on their proximity to irrigated fields.

RECOMMENDATIONS

- Provide depth-to-groundwater contour maps, noting the best practices presented in Attachment D. Specifically, ensure that the first step is contouring groundwater elevations, and then subtracting this layer from land surface elevations from a DEM to estimate depth-to-groundwater contours across the landscape.

- If insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons as "Potential GDEs" in the GSP until data gaps are reconciled in the monitoring network.

- In addition to providing maps of the vegetation and wetland communities from the NC dataset in the GSP area (as provided in Appendix G of the GSP), please also provide an inventory, map, or description of fauna (e.g., birds, fish, amphibian) species in the basin and note any threatened or endangered species. See Attachment C of this letter for a list of freshwater species located in the Mound Basin.

12 **Native Vegetation**

Native vegetation is a water use sector that is required[2,3] to be included into the water budget. The integration of this ecosystem into the water budget is **insufficient**. The water budget did not include the current, historical, and projected demands of native vegetation. The omission of explicit water demands for native vegetation is problematic because key environmental uses of groundwater are not being accounted for as water supply decisions are made using this budget, nor will they likely be considered in project and management actions.

RECOMMENDATION
• Quantify and present all water use sector demands in the historical, current, and projected water budgets with individual line items for each water use sector, including native vegetation.

B. Engaging Stakeholders

13 **Stakeholder Engagement during GSP development**

Stakeholder engagement during GSP development is **insufficient**. SGMA's requirement for public notice and engagement of stakeholders[4] is not fully met by the description in the Stakeholder Engagement Plan included in the GSP (Appendix D).

We acknowledge and commend the clear description of the inclusion of an environmental stakeholder on the governing board of the GSA. The Environmental Stakeholder Director is responsible for engaging environmental stakeholders within the Basin and representing environmental interests before the GSA, including during GSP implementation. However, the engagement plan describes only a minimum amount of outreach to DACs. Stakeholder engagement has primarily occurred via Ventura Water bill stuffers and newsletters, including materials provided in Spanish. Noted deficiencies in the stakeholder engagement process include:

- As the water supplier for DACs in the Basin, the City represented DAC interests through its participation on the MBGSA Board of Directors. However, it does not give more information about how their interests were represented.
- The opportunities for public involvement and engagement are limited to MBGSA regular board meetings, review of the MBGSA's website, and providing comments via the website.
- The GSP states that the GSA "has held several public workshops to provide in-depth discussion of the GSP and obtain stakeholder feedback. The workshops include polls to help facilitate public input on key issues and identify which outreach methods are most

[2] "'Water use sector' refers to categories of water demand based on the general land uses to which the water is applied, including urban, industrial, agricultural, managed wetlands, managed recharge, and native vegetation." [23 CCR §351(al)]

[3] "The water budget shall quantify the following, either through direct measurements or estimates based on data: (3) Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow." [23 CCR §354.18]

[4] "A communication section of the Plan shall include a requirement that the GSP identify how it encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin." [23 CCR §354.10(d)(3)]

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effective." The GSP gives no further information about how the workshops were advertised or if DACs were engaged to attend.

- The GSP states that portions of the Barbareno-Ventureno Band of Chumash are located within the Mound Basin and the MBGSA will inform the Tribal Elder, Julie Tumamait, throughout the GSP development process and GSP implementation.However, there are no further details on the engagement with the tribe.
- Domestic well owners are specifically mentioned in the Stakeholder Engagement Plan as holders of overlying groundwater rights, however no information is provided other than stating that their participation is invited in the Agency's public meetings.
- The Stakeholder Engagement Plan does not include a plan for continual opportunities for engagement through the implementation phase of the GSP for DACs.

RECOMMENDATIONS

- Include a more detailed and robust Stakeholder Engagement Plan that details how the GSA will actively target and engage DAC community members during the remainder of the GSP development process and throughout the GSP implementation phase. Include plans to directly engage the DAC population for inclusion on the Board of Directors instead of having DACs represented by the City of Ventura. Refer to Attachment B for specific recommendations on Stakeholder Communication and Engagement.

- Conduct outreach at frequented locations such as farmers markets and schools across the plan area, providing translation services and technical assistance where needed. Refer to Attachment B for specific recommendations on how to actively engage community stakeholders.

- Consult and engage with the Barbareno-Ventureno Band of Chumash Tribe. Refer to "DWR guidance for engagement with tribal governments" for specific guidance.[5]

14

C. Considering Beneficial Uses and Users When Establishing Sustainable Management Criteria and Analyzing Impacts on Beneficial Uses and Users

The consideration of beneficial uses and users when establishing sustainable management criteria (SMC) is **insufficient**. The consideration of potential impacts on all beneficial users of groundwater in the basin are required when defining undesirable results[6] and establishing minimum thresholds[7,8]

[5] DWR guidance on Engagement with Tribal Governments https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/Guidance-Doc-for-SGM-Engagement-with-Tribal-Govt_ay_19.pdf

[6] "The description of undesirable results shall include [...] potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results." [23 CCR §354.26(b)(3)]

[7] "The description of minimum thresholds shall include [...] how minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests." [23 CCR §354.28(b)(4)]

[8] "The description of minimum thresholds shall include [...] how state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the agency shall explain the nature of and the basis for the difference." [23 CCR §354.28(b)(5)]

14

Disadvantaged Communities and Drinking Water Users

The GSP states that the City of Ventura (Ventura Water) serves DAC communities in the basin. It also states that there are domestic wells in the basin, but that the majority of these domestic well owners are *de minimus* users. It does not provide the location of the domestic wells, the screened interval, or the most recent reported date of well usage. Because the location of domestic wells is not provided in the GSP, the impacts to the domestic well user population are unknown. Because the GSP has not established SMC for the shallow principal aquifer, the GSP neither describes nor analyzes direct or indirect impacts on DACs or domestic drinking wells when defining undesirable results for chronic lowering of groundwater levels or water quality. Therefore, the SMC provided in the GSP are not protective of domestic drinking water well users.

RECOMMENDATIONS

Chronic Lowering of Groundwater Levels

- Establish chronic lowering of groundwater level SMC for the shallow principal aquifer that are protective of DACs and domestic well users. Even though the shallow principal aquifer is not currently pumped or treated for domestic drinking water, it could be in the future.
- Consider and evaluate the impacts of selected minimum thresholds and measurable objectives on drinking water users within the basin.

Degraded Water Quality

- Establish water quality SMC for the shallow principal aquifer that are protective of drinking water users. Even though the shallow principal aquifer is not currently pumped or treated for domestic drinking water, it could be in the future.
- Establish minimum thresholds at the representative monitoring wells that avoid the specific undesirable result of impacting water quality for potable use. For each of the two deep principal aquifers, the GSP states that undesirable results occur when all representative monitoring wells in a principal aquifer exceed the minimum threshold concentration for a constituent for two consecutive years. Because the minimum thresholds are set to the MCL, or in some cases higher than the Secondary MCL (see Table 4.1-02), this does not appear to satisfy the stated minimum threshold goal of protecting water quality for potable uses.
- Evaluate the cumulative or indirect impacts of proposed minimum thresholds on drinking water users, including domestic wells and municipal water suppliers. The GSP states that potential effects on municipal beneficial uses would be increased costs for treatment or blending to meet drinking water standards, however this is the only impact discussed.

Groundwater Dependent Ecosystems and Interconnected Surface Waters

Because the shallow aquifer is disregarded as a principal aquifer in the GSP, sustainable management criteria provided in the GSP do not consider potential impacts to environmental beneficial users. The GSP neither describes nor analyzes direct or indirect impacts on environmental users of groundwater or surface water when defining undesirable results. This is problematic because without identifying potential impacts to GDEs and beneficial users of interconnected surface waters, minimum thresholds may compromise, or even irreparably destroy, environmental beneficial users. Since potential GDEs are present in the basin, they must be considered when developing SMC for the basin. The comments above provide recommendations for re-evaluating the extent of GDEs and ISW in the basin by first considering the shallow aquifer as a principal aquifer.

RECOMMENDATIONS

- Establish SMC for the shallow principal aquifer that are protective of environmental uses and users. When defining undesirable results for chronic lowering of groundwater levels, water quality, and depletions of interconnected surface waters, please provide specifics on what biological responses (e.g., extent of habitat, growth, recruitment rates) would best characterize a significant and unreasonable impact to GDEs. Undesirable results to environmental users occur when 'significant and unreasonable' effects on beneficial users are caused by one of the sustainability indicators (i.e., chronic lowering of groundwater levels, degraded water quality, or depletion of interconnected surface water). Thus, potential impacts on environmental beneficial uses and users need to be considered when defining undesirable results[9] in the basin. Defining undesirable results is the crucial first step before the minimum thresholds[10] can be determined.

- For the interconnected surface water SMC, the undesirable results should include a description of potential impacts on instream habitats within ISWs when defining minimum thresholds in the basin[11]. The GSP should confirm that minimum thresholds for ISWs avoid adverse impacts to environmental beneficial users of interconnected surface waters as these environmental users could be left unprotected by the GSP (See Attachment C for a list of freshwater species in your basin). These recommendations apply especially to environmental beneficial users that are already protected under pre-existing state or federal law[6,12].

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2. Climate Change

The SGMA statute identifies climate change as a significant threat to groundwater resources and one that must be examined and incorporated in the GSPs. The GSP Regulations[13] require integration of climate change into the projected water budget to ensure that projects and management actions sufficiently account for the range of potential climate futures.

The integration of climate change into the projected water budget is **insufficient**. The GSP does incorporate climate change into the projected water budget using DWR change factors for 2030 and 2070. However, the GSP did not consider the 2070 extremely wet and extremely dry climate scenarios in the projected water budget. The GSP should clearly and transparently incorporate the extremely wet and

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[9] "The description of undesirable results shall include [...] potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results". [23 CCR §354.26(b)(3)]
[10] The description of minimum thresholds shall include [...] how minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests." [23 CCR §354.28(b)(4)]
[11] "The minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results." [23 CCR §354.28(c)(6)]
[12] Rohde MM, Seapy B, Rogers R, Castañeda X, editors. 2019. Critical Species LookBook: A compendium of California's threatened and endangered species for sustainable groundwater management. The Nature Conservancy, San Francisco, California. Available at: https://groundwaterresourcehub.org/public/uploads/pdfs/Critical_Species_LookBook_91819.pdf
[13] "Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater flow." [23 CCR §354.18(e)]

15 dry scenarios provided by DWR into projected water budgets or select more appropriate extreme scenarios for their basins. While these extreme scenarios may have a lower likelihood of occurring, their consequences could be significant, therefore they should be included in groundwater planning.

We acknowledge and commend the inclusion of climate change into key inputs (precipitation, evaporation, surface water flow, and sea level inputs) of the projected water budget. Additionally, the sustainable yield is calculated based on the projected pumping for all three future projections (baseline, 2030, and 2070). However, if the water budgets are incomplete, including the omission of extremely wet and dry scenarios, then there is increased uncertainty in virtually every subsequent calculation used to plan for projects, derive measurable objectives, and set minimum thresholds. Plans that do not adequately include climate change projections may underestimate future impacts on vulnerable beneficial users of groundwater such as ecosystems and domestic well owners.

RECOMMENDATIONS

- Integrate extreme wet and dry scenarios into the projected water budget to form the basis for development of sustainable management criteria and projects and management actions.

- Climate change was addressed when describing the minimum threshold for seawater intrusion. We recommend incorporating climate change considerations into other projects and management actions.

3. Data Gaps

The consideration of beneficial users when establishing monitoring networks is **insufficient**. Our comments above note that the principal shallow aquifer was disregarded in the GSP. The lack of monitoring wells in the shallow aquifer and/or the lack of plans for future monitoring threatens GDEs, aquatic habitats, surface water users and shallow domestic well water. Potential GDEs are located in areas of the subbasin where no shallow groundwater monitoring currently exists or is proposed, leaving data gaps unfilled. Potential ISWs have been dismissed in the GSP, without proposed recommendations to improve ISW identification, mapping, and estimates of depletions. Appropriate monitoring is necessary so that groundwater conditions within GDEs and ISWs are characterized and surface-shallow groundwater interactions are fully integrated into the GSP.

Without adequate monitoring and identification of data gaps in the shallow aquifer, GDEs, ISWs, DACs, and domestic well users will remain unprotected by the GSP. The Plan therefore fails to meet SGMA's requirements for the monitoring network[14].

[14] "The monitoring network objectives shall be implemented to accomplish the following: [...] (2) Monitor impacts to the beneficial uses or users of groundwater." [23 CCR §354.34(b)(2)]

RECOMMENDATIONS

- Include representative monitoring sites (RMSs) in the shallow principal aquifer across the basin for all groundwater condition indicators. The GSP states that water quality in the shallow principal aquifer is poor, but provides no monitoring data. Prioritize proximity to GDEs and domestic wells when identifying new RMPs.
- Provide maps that overlay monitoring well locations with the locations of DACs, domestic wells, and GDEs to clearly identify potentially impacted areas.
- Evaluate how the gathered data will be used to identify and map GDEs and ISWs, and to identify DACs and shallow domestic well users that are vulnerable to undesirable results.
- Determine what ecological monitoring can be used to assess the potential for significant and unreasonable impacts to GDEs or ISWs due to groundwater conditions in the subbasin.

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4. Addressing Beneficial Users in Projects and Management Actions

The consideration of beneficial users when developing projects and management actions is **insufficient**. The GSP states there is no need for project and management actions to address gaps between current and projected sustainable yield. However, groundwater sustainability under SGMA is defined not just by sustainable yield, but by the avoidance of undesirable results for all beneficial users. These beneficial users such as GDEs, aquatic habitats, surface water users, DACs, and drinking water users were not sufficiently identified in the GSP. Therefore, potential project and management actions have not been designed or proposed to protect these vulnerable users of the shallow principal aquifer.

RECOMMENDATIONS

Because GDEs, aquatic habitats, surface water users, DACs, and shallow domestic well water users were not sufficiently identified in the GSP, please consider including the following related to potential project and management actions in the GSP:

- For GDEs and ISWs, recharge ponds, reservoirs and facilities for managed stormwater recharge can be designed as multiple-benefit projects to include elements that act functionally as wetlands and provide a benefit for wildlife and aquatic species. For guidance on how to integrate multi-benefit recharge projects into your GSP refer to the “Multi-Benefit Recharge Project Methodology Guidance Document”[15].

[15] The Nature Conservancy. 2021. Multi-Benefit Recharge Project Methodology for Inclusion in Groundwater Sustainability Plans. Sacramento. Available at: https://groundwaterresourcehub.org/sgma-tools/multi-benefit-recharge-project-methodology-guidance/

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- For DACs, monitor the impacts of projects and management actions on communities and drinking water users. For example, provide locations of the improperly constructed or abandoned wells, as discussed in Section 6.5, that create conduits for migration of poor-quality water from shallow water-bearing units into the principal aquifers. Discuss how sealing these wells will benefit DACs and domestic wells users.

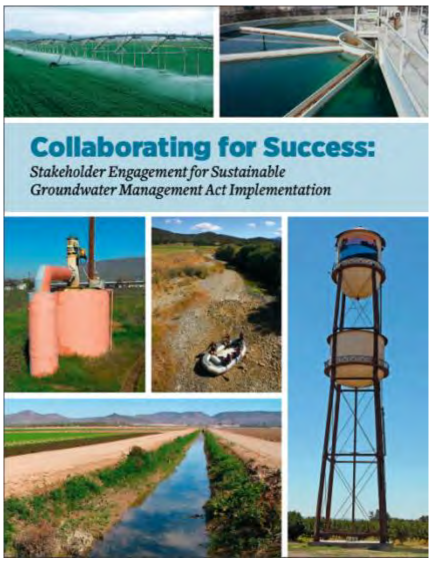
- For DACs and domestic well owners, take a full accounting of the locations and screened intervals of domestic wells in the basin, even those with de minimus use. Implement a drinking water well mitigation program to protect drinking water users.

- Develop management actions that incorporate climate and water delivery uncertainties to address future water demand and prevent future undesirable results.

Attachment B

SGMA Tools to address DAC, drinking water, and environmental beneficial uses and users

Stakeholder Engagement and Outreach



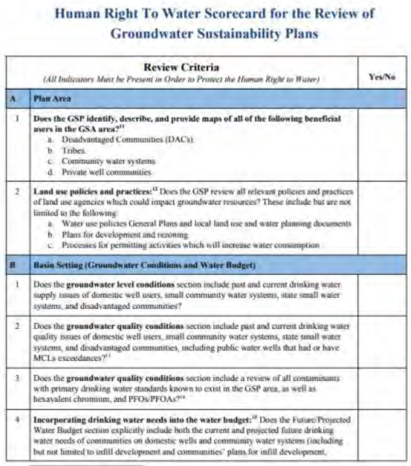
Clean Water Action, Community Water Center and Union of Concerned Scientists developed a guidance document called Collaborating for success: Stakeholder engagement for Sustainable Groundwater Management Act Implementation. It provides details on how to conduct targeted and broad outreach and engagement during Groundwater Sustainability Plan (GSP) development and implementation. Conducting a targeted outreach involves:

- Developing a robust Stakeholder Communication and Engagement plan that includes outreach at frequented locations (schools, farmers markets, religious settings, events) across the plan area to increase the involvement and participation of disadvantaged communities, drinking water users and the environmental stakeholders.

- Providing translation services during meetings and technical assistance to enable easy participation for non-English speaking stakeholders.

- GSP should adequately describe the process for requesting input from beneficial users and provide details on how input is incorporated into the GSP.

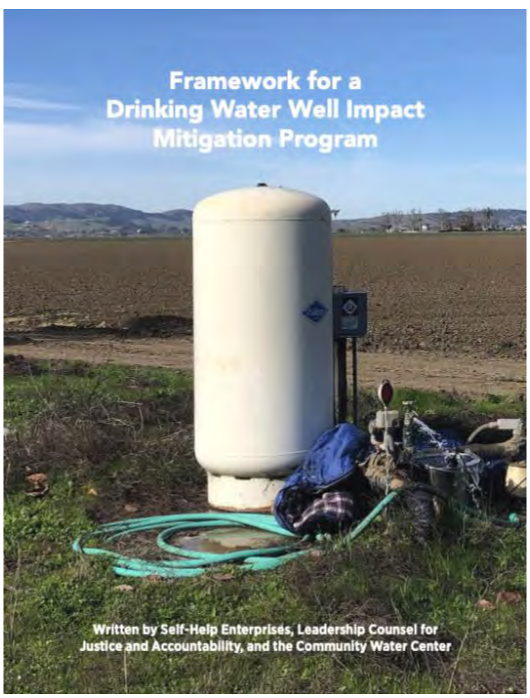
The Human Right to Water


Human Right To Water Scorecard for the Review of Groundwater Sustainability Plans

	Review Criteria *(All Indicators Must be Present in Order to Protect the Human Right to Water)*	**Yes/No**
A	**Plan Area**	
1	**Does the GSP identify, describe, and provide maps of all of the following beneficial users in the GSA area?**[11] a. Disadvantaged Communities (DACs). b. Tribes. c. Community water systems d. Private well communities	
2	**Land use policies and practices:**[12] Does the GSP review all relevant policies and practices of land use agencies which could impact groundwater resources? These include but are not limited to the following: a. Water use policies General Plans and local land use and water planning documents b. Plans for development and rezoning c. Processes for permitting activities which will increase water consumption	
B	**Basin Setting (Groundwater Conditions and Water Budget)**	
1	Does the **groundwater level conditions** section include past and current drinking water supply issues of domestic well users, small community water systems, state small water systems, and disadvantaged communities?	
2	Does the **groundwater quality conditions** section include past and current drinking water quality issues of domestic well users, small community water systems, state small water systems, and disadvantaged communities, including public water wells that had or have MCLs exceedances?[13]	
3	Does the **groundwater quality conditions** section include a review of all contaminants with primary drinking water standards known to exist in the GSP area, as well as hexavalent chromium, and PFOs/PFOAs?[14]	
4	**Incorporating drinking water needs into the water budget:**[15] Does the Future/Projected Water Budget section explicitly include both the current and projected future drinking water needs of communities on domestic wells and community water systems (including but not limited to infill development and communities' plans for infill development.	

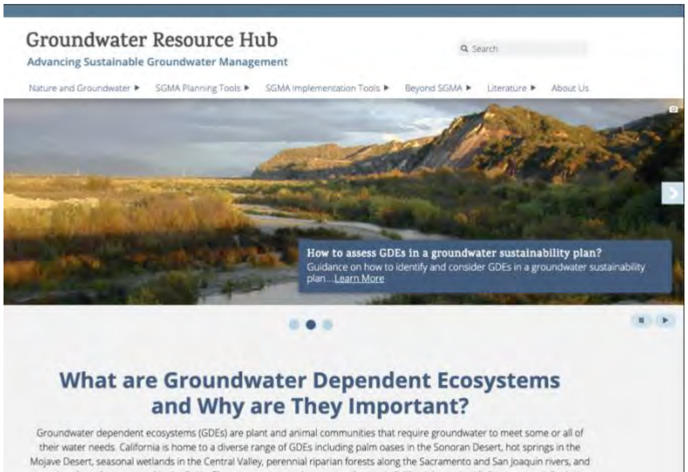
The Human Right to Water Scorecard was developed by Community Water Center, Leadership Counsel for Justice and Accountability and Self Help Enterprises to aid Groundwater Sustainability Agencies (GSAs) in prioritizing drinking water needs in SGMA. The scorecard identifies elements that must exist in GSPs to adequately protect the Human Right to Drinking water.

Drinking Water Well Impact Mitigation Framework



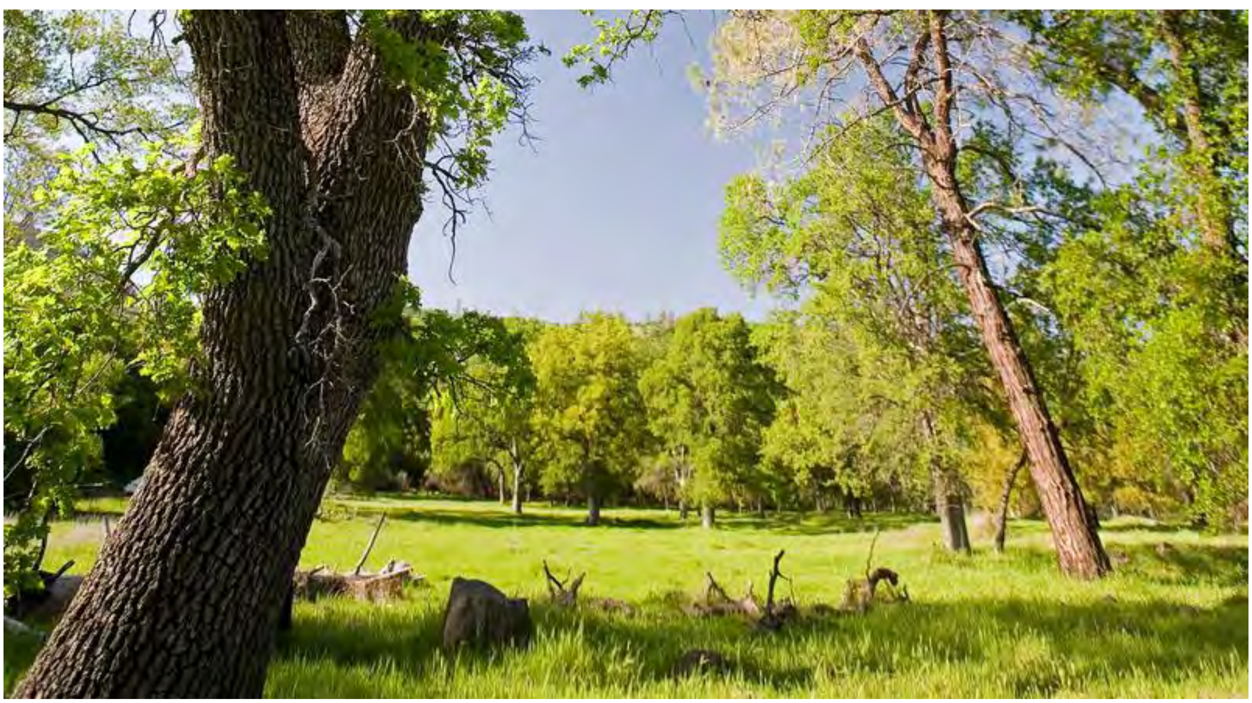
The Drinking Water Well Impact Mitigation Framework was developed by Community Water Center, Leadership Counsel for Justice and Accountability and Self Help Enterprises to aid GSAs in the development and implementation of their GSPs. The framework provides a clear roadmap for how a GSA can best structure its data gathering, monitoring network and management actions to proactively monitor and protect drinking water wells and mitigate impacts should they occur.

Groundwater Resource Hub



The Nature Conservancy has developed a suite of tools based on best available science to help GSAs, consultants, and stakeholders efficiently incorporate nature into GSPs. These tools and resources are available online at [GroundwaterResourceHub.org](). The Nature Conservancy's tools and resources are intended to reduce costs, shorten timelines, and increase benefits for both people and nature.

Rooting Depth Database



The Plant Rooting Depth Database provides information that can help assess whether groundwater-dependent vegetation are accessing groundwater. Actual rooting depths will depend on the plant species and site-specific conditions, such as soil type and availability of other water sources. Site-specific knowledge of depth to groundwater combined with rooting depths will help provide an understanding of the potential groundwater levels are needed to sustain GDEs.

How to use the database

The maximum rooting depth information in the Plant Rooting Depth Database is useful when verifying whether vegetation in the Natural Communities Commonly Associated with Groundwater (NC Dataset) are connected to groundwater. A 30 ft depth-to-groundwater threshold, which is based on averaged global rooting depth data for phreatophytes[1], is relevant for most plants identified in the NC Dataset since most plants have a max rooting depth of less than 30 feet. However, it is important to note that deeper thresholds are necessary for other plants that have reported maximum root depths that exceed the averaged 30 feet threshold, such as valley oak (*Quercus lobata*), Euphrates poplar (*Populus euphratica*), salt cedar (*Tamarix spp.*), and shadescale (*Atriplex confertifolia*). The Nature Conservancy advises that the reported max rooting depth for these deeper-rooted plants be used. For example, a depth-to groundwater threshold of 80 feet should be used instead of the 30 ft threshold, when verifying whether valley oak polygons from the NC Dataset are connected to groundwater. It is important to re-emphasize that actual rooting depth data are limited and will depend on the plant species and site-specific conditions such as soil and aquifer types, and availability to other water sources.

The Plant Rooting Depth Database is an Excel workbook composed of four worksheets:

1. California phreatophyte rooting depth data (included in the NC Dataset)
2. Global phreatophyte rooting depth data
3. Metadata
4. References

How the database was compiled

The Plant Rooting Depth Database is a compilation of rooting depth information for the groundwater-dependent plant species identified in the NC Dataset. Rooting depth data were compiled from published scientific literature and expert opinion through a crowdsourcing campaign. As more information becomes available, the database of rooting depths will be updated. Please Contact Us if you have additional rooting depth data for California phreatophytes.

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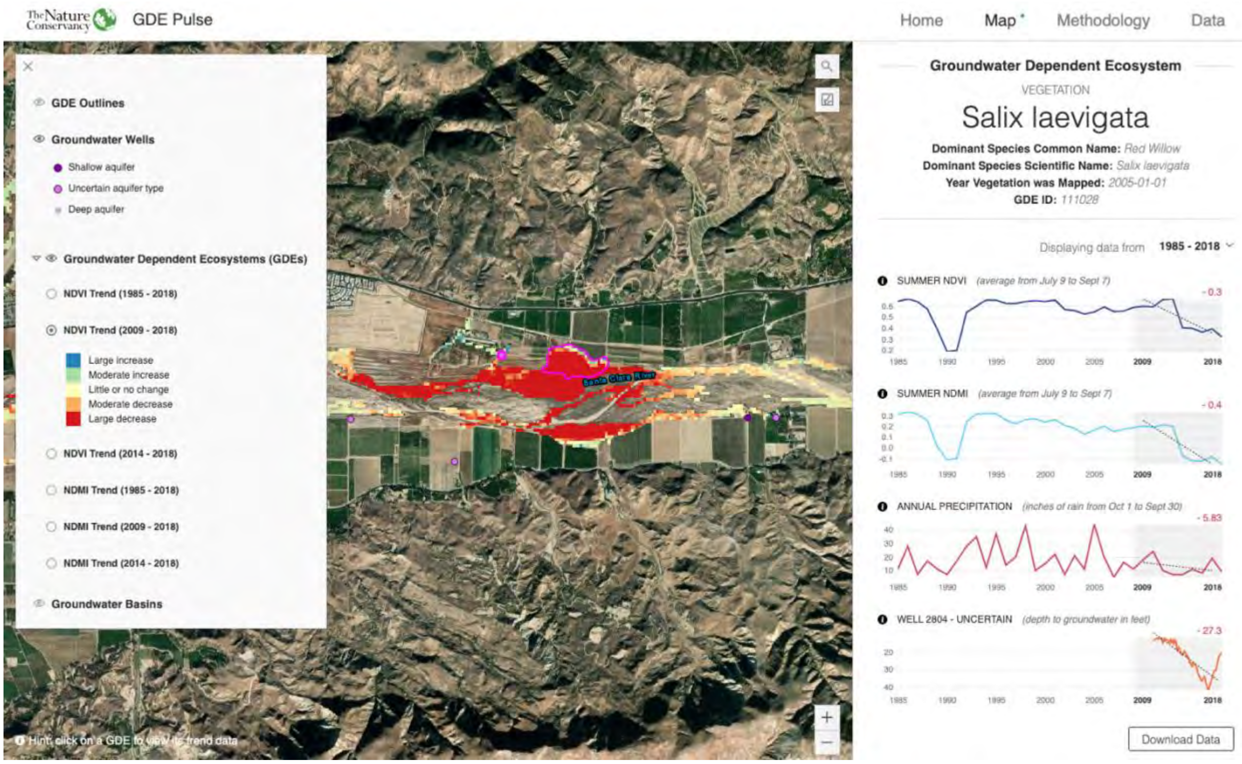
[1] Canadell, J., Jackson, R.B., Ehleringer, J.B. et al. 1996. Maximum rooting depth of vegetation types at the global scale. Oecologia 108, 583–595. https://doi.org/10.1007/BF00329030

GDE Pulse



GDE Pulse is a free online tool that allows Groundwater Sustainability Agencies to assess changes in groundwater dependent ecosystem (GDE) health using satellite, rainfall, and groundwater data. Remote sensing data from satellites has been used to monitor the health of vegetation all over the planet. GDE pulse has compiled 35 years of satellite imagery from NASA's Landsat mission for every polygon in the Natural Communities Commonly Associated with Groundwater Dataset. The following datasets are available for downloading:

Normalized Difference Vegetation Index (NDVI) is a satellite-derived index that represents the greenness of vegetation. Healthy green vegetation tends to have a higher NDVI, while dead leaves have a lower NDVI. We calculated the average NDVI during the driest part of the year (July - Sept) to estimate vegetation health when the plants are most likely dependent on groundwater.

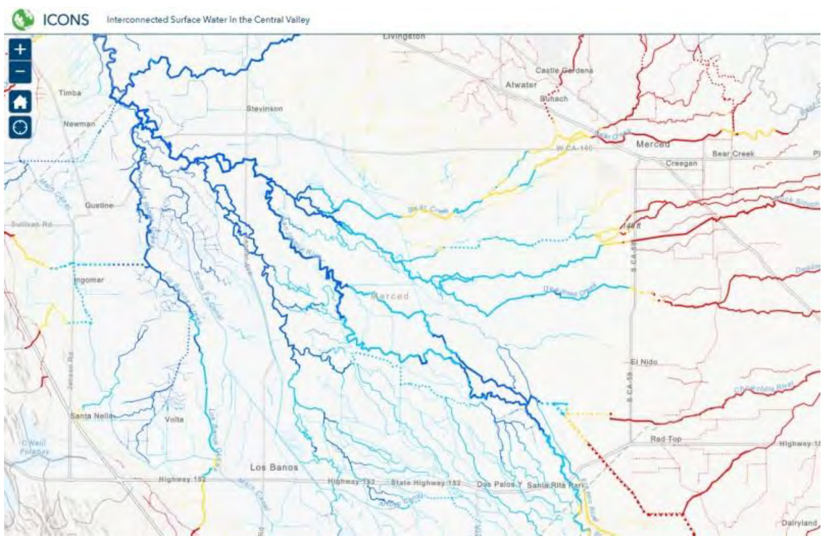
Normalized Difference Moisture Index (NDMI) is a satellite-derived index that represents water content in vegetation. NDMI is derived from the Near-Infrared (NIR) and Short-Wave Infrared (SWIR) channels. Vegetation with adequate access to water tends to have higher NDMI, while vegetation that is water stressed tends to have lower NDMI. We calculated the average NDVI during the driest part of the year (July–September) to estimate vegetation health when the plants are most likely dependent on groundwater.

Annual Precipitation is the total precipitation for the water year (October 1st – September 30th) from the PRISM dataset. The amount of local precipitation can affect vegetation with more precipitation generally leading to higher NDVI and NDMI.

Depth to Groundwater measurements provide an indication of the groundwater levels and changes over time for the surrounding area. We used groundwater well measurements from nearby (<1km) wells to estimate the depth to groundwater below the GDE based on the average elevation of the GDE (using a digital elevation model) minus the measured groundwater surface elevation.

ICONOS Mapper

Interconnected Surface Water in the Central Valley



ICONS maps the likely presence of interconnected surface water (ISW) in the Central Valley using depth to groundwater data. Using data from 2011-2018, the ISW dataset represents the likely connection between surface water and groundwater for rivers and streams in California's Central Valley. It includes information on the mean, maximum, and minimum depth to groundwater for each stream segment over the years with available data, as well as the likely presence of ISW based on the minimum depth to groundwater. The Nature Conservancy developed this database, with guidance and input from expert academics, consultants, and state agencies.

We developed this dataset using groundwater elevation data available online from the California Department of Water Resources (DWR). DWR only provides this data for the Central Valley. For GSAs outside of the valley, who have groundwater well measurements, we recommend following our methods to determine likely ISW in your region. The Nature Conservancy's ISW dataset should be used as a first step in reviewing ISW and should be supplemented with local or more recent groundwater depth data.

Attachment C

Freshwater Species Located in the Mound Basin

To assist in identifying the beneficial users of surface water necessary to assess the undesirable result "depletion of interconnected surface waters", this attachment provides a list of freshwater species located in the Mound Basin. To produce the freshwater species list, we used ArcGIS to select features within the California Freshwater Species Database version 2.0.9 within the basin boundary. This database contains information on ~4,000 vertebrates, macroinvertebrates and vascular plants that depend on fresh water for at least one stage of their life cycle. The methods used to compile the California Freshwater Species Database can be found in Howard et al. 2015[1]. The spatial database contains locality observations and/or distribution information from ~400 data sources. The database is housed in the California Department of Fish and Wildlife's BIOS[2] as well as on The Nature Conservancy's science website[3].

Scientific Name	Common Name	Legal Protected Status		
		Federal	State	Other
BIRDS				
Actitis macularius	Spotted Sandpiper			
Aechmophorus clarkii	Clark's Grebe			
Aechmophorus occidentalis	Western Grebe			
Agelaius tricolor	Tricolored Blackbird	Bird of Conservation Concern	Special Concern	BSSC - First priority
Aix sponsa	Wood Duck			
Anas acuta	Northern Pintail			
Anas americana	American Wigeon			
Anas clypeata	Northern Shoveler			
Anas crecca	Green-winged Teal			
Anas cyanoptera	Cinnamon Teal			
Anas discors	Blue-winged Teal			
Anas platyrhynchos	Mallard			
Anas strepera	Gadwall			
Anser albifrons	Greater White-fronted Goose			
Ardea alba	Great Egret			
Ardea herodias	Great Blue Heron			
Aythya affinis	Lesser Scaup			
Aythya americana	Redhead		Special Concern	BSSC - Third priority

[1] Howard, J.K. et al. 2015. Patterns of Freshwater Species Richness, Endemism, and Vulnerability in California. PLoSONE, 11(7). Available at: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0130710

[2] California Department of Fish and Wildlife BIOS: https://www.wildlife.ca.gov/data/BIOS

[3] Science for Conservation: https://www.scienceforconservation.org/products/california-freshwater-species-database

Aythya collaris	Ring-necked Duck			
Aythya marila	Greater Scaup			
Aythya valisineria	Canvasback		Special	
Botaurus lentiginosus	American Bittern			
Bucephala albeola	Bufflehead			
Bucephala clangula	Common Goldeneye			
Butorides virescens	Green Heron			
Calidris alpina	Dunlin			
Calidris mauri	Western Sandpiper			
Calidris minutilla	Least Sandpiper			
Chen caerulescens	Snow Goose			
Chen rossii	Ross's Goose			
Chlidonias niger	Black Tern		Special Concern	BSSC - Second priority
Chroicocephalus philadelphia	Bonaparte's Gull			
Cistothorus palustris palustris	Marsh Wren			
Cygnus columbianus	Tundra Swan			
Egretta thula	Snowy Egret			
Empidonax traillii	Willow Flycatcher	Bird of Conservation Concern	Endangered	
Fulica americana	American Coot			
Gallinago delicata	Wilson's Snipe			
Himantopus mexicanus	Black-necked Stilt			
Icteria virens	Yellow-breasted Chat		Special Concern	BSSC - Third priority
Ixobrychus exilis hesperis	Western Least Bittern		Special Concern	BSSC - Second priority
Limnodromus scolopaceus	Long-billed Dowitcher			
Lophodytes cucullatus	Hooded Merganser			
Megaceryle alcyon	Belted Kingfisher			
Mergus serrator	Red-breasted Merganser			
Numenius americanus	Long-billed Curlew			
Numenius phaeopus	Whimbrel			
Nycticorax nycticorax	Black-crowned Night-Heron			
Oxyura jamaicensis	Ruddy Duck			

Pelecanus erythrorhynchos	American White Pelican		Special Concern	BSSC - First priority
Phalacrocorax auritus	Double-crested Cormorant			
Phalaropus tricolor	Wilson's Phalarope			
Piranga rubra	Summer Tanager		Special Concern	BSSC - First priority
Plegadis chihi	White-faced Ibis		Watch list	
Pluvialis squatarola	Black-bellied Plover			
Podiceps nigricollis	Eared Grebe			
Podilymbus podiceps	Pied-billed Grebe			
Porzana carolina	Sora			
Rallus limicola	Virginia Rail			
Recurvirostra americana	American Avocet			
Riparia riparia	Bank Swallow		Threatened	
Rynchops niger	Black Skimmer			
Setophaga petechia	Yellow Warbler			BSSC - Second priority
Tachycineta bicolor	Tree Swallow			
Tringa melanoleuca	Greater Yellowlegs			
Tringa semipalmata	Willet			
Vireo bellii	Bell's Vireo			
Xanthocephalus xanthocephalus	Yellow-headed Blackbird		Special Concern	BSSC - Third priority
CRUSTACEANS				
Hyalella spp.	Hyalella spp.			
FISH				
Eucyclogobius newberryi	Tidewater goby	Endangered	Special Concern	Vulnerable - Moyle 2013
Oncorhynchus mykiss - Southern CA	Southern California steelhead	Endangered	Special Concern	Endangered - Moyle 2013
HERPS				
Actinemys marmorata marmorata	Western Pond Turtle		Special Concern	ARSSC
Anaxyrus boreas boreas	Boreal Toad			
Pseudacris cadaverina	California Treefrog			ARSSC
Rana boylii	Foothill Yellow-legged Frog	Under Review in the Candidate or Petition Process	Special Concern	ARSSC
Rana draytonii	California Red-legged Frog	Threatened	Special Concern	ARSSC

Spea hammondii	Western Spadefoot	Under Review in the Candidate or Petition Process	Special Concern	ARSSC
Thamnophis hammondii hammondii	Two-striped Gartersnake		Special Concern	ARSSC
Thamnophis sirtalis sirtalis	Common Gartersnake			
INSECTS & OTHER INVERTS				
Apedilum spp.	Apedilum spp.			
Chironomidae fam.	Chironomidae fam.			
Chironomus spp.	Chironomus spp.			
Cricotopus spp.	Cricotopus spp.			
Dicrotendipes spp.	Dicrotendipes spp.			
Enochrus carinatus				Not on any status lists
Ephydridae fam.	Ephydridae fam.			
Eukiefferiella spp.	Eukiefferiella spp.			
Micropsectra spp.	Micropsectra spp.			
Paracladopelma spp.	Paracladopelma spp.			
Parametriocnemus spp.	Parametriocnemus spp.			
Pentaneura spp.	Pentaneura spp.			
Polypedilum spp.	Polypedilum spp.			
Pseudochironomus spp.	Pseudochironomus spp.			
Rheotanytarsus spp.	Rheotanytarsus spp.			
Simulium donovani				Not on any status lists
Simulium spp.	Simulium spp.			
Simulium tescorum				Not on any status lists
MOLLUSKS				
Physa spp.	Physa spp.			
Physella cooperi	Olive Physa			V
PLANTS				
Arundo donax	NA			
Bolboschoenus maritimus paludosus	NA			Not on any status lists
Datisca glomerata	Durango Root			
Ludwigia peploides peploides	NA			Not on any status lists
Lythrum californicum	California Loosestrife			
Phyla nodiflora	Common Frog-fruit			

Platanus racemosa	California Sycamore			
Potentilla anserina pacifica				Not on any status lists
Salix lasiandra lasiandra				Not on any status lists

Attachment D

July 2019

IDENTIFYING GDEs UNDER SGMA
Best Practices for using the NC Dataset

The Sustainable Groundwater Management Act (SGMA) requires that groundwater dependent ecosystems (GDEs) be identified in Groundwater Sustainability Plans (GSPs). As a starting point, the Department of Water Resources (DWR) is providing the Natural Communities Commonly Associated with Groundwater Dataset (NC Dataset) online[1] to help Groundwater Sustainability Agencies (GSAs), consultants, and stakeholders identify GDEs within individual groundwater basins. To apply information from the NC Dataset to local areas, GSAs should combine it with the best available science on local hydrology, geology, and groundwater levels to verify whether polygons in the NC dataset are likely supported by groundwater in an aquifer (Figure 1)[2]. This document highlights six best practices for using local groundwater data to confirm whether mapped features in the NC dataset are supported by groundwater.

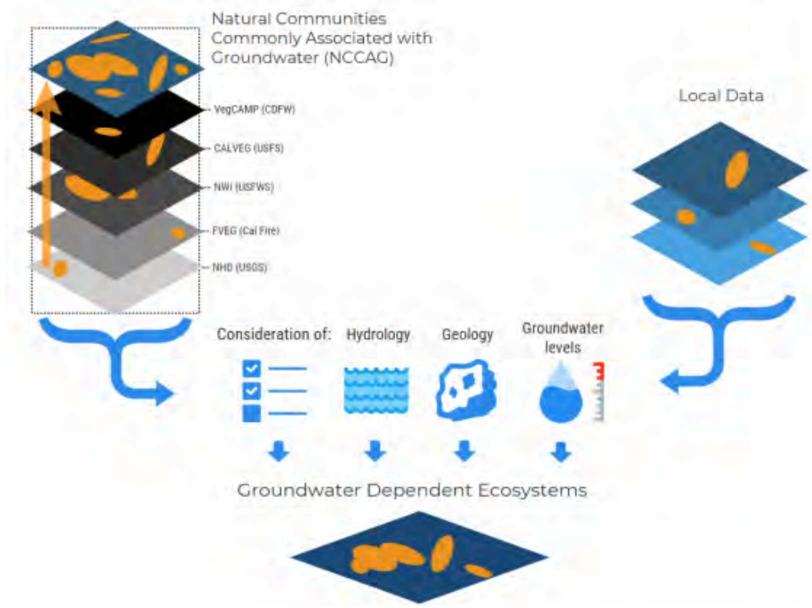


Figure 1. Considerations for GDE identification.
Source: DWR[2]

[1] NC Dataset Online Viewer: https://gis.water.ca.gov/app/NCDatasetViewer/
[2] California Department of Water Resources (DWR). 2018. Summary of the "Natural Communities Commonly Associated with Groundwater" Dataset and Online Web Viewer. Available at: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Data-and-Tools/Files/Statewide-Reports/Natural-Communities-Dataset-Summary-Document.pdf

The NC Dataset identifies vegetation and wetland features that are good indicators of a GDE. The dataset is comprised of 48 publicly available state and federal datasets that map vegetation, wetlands, springs, and seeps commonly associated with groundwater in California[3]. It was developed through a collaboration between DWR, the Department of Fish and Wildlife, and The Nature Conservancy (TNC). TNC has also provided detailed guidance on identifying GDEs from the NC dataset[4] on the Groundwater Resource Hub[5], a website dedicated to GDEs.

BEST PRACTICE #1. Establishing a Connection to Groundwater

Groundwater basins can be comprised of one continuous aquifer (Figure 2a) or multiple aquifers stacked on top of each other (Figure 2b). In unconfined aquifers (Figure 2a), using the depth-to-groundwater and the rooting depth of the vegetation is a reasonable method to infer groundwater dependence for GDEs. If groundwater is well below the rooting (and capillary) zone of the plants and any wetland features, the ecosystem is considered disconnected and groundwater management is not likely to affect the ecosystem (Figure 2d). However, it is important to consider local conditions (e.g., soil type, groundwater flow gradients, and aquifer parameters) and to review groundwater depth data from multiple seasons and water year types (wet and dry) because intermittent periods of high groundwater levels can replenish perched clay lenses that serve as the water source for GDEs (Figure 2c). Maintaining these natural groundwater fluctuations are important to sustaining GDE health.

Basins with a stacked series of aquifers (Figure 2b) may have varying levels of pumping across aquifers in the basin, depending on the production capacity or water quality associated with each aquifer. If pumping is concentrated in deeper aquifers, SGMA still requires GSAs to sustainably manage groundwater resources in shallow aquifers, such as perched aquifers, that support springs, surface water, domestic wells, and GDEs (Figure 2). This is because vertical groundwater gradients across aquifers may result in pumping from deeper aquifers to cause adverse impacts onto beneficial users reliant on shallow aquifers or interconnected surface water. The goal of SGMA is to sustainably manage groundwater resources for current and future social, economic, and environmental benefits. While groundwater pumping may not be currently occurring in a shallower aquifer, use of this water may become more appealing and economically viable in future years as pumping restrictions are placed on the deeper production aquifers in the basin to meet the sustainable yield and criteria. Thus, identifying GDEs in the basin should done irrespective to the amount of current pumping occurring in a particular aquifer, so that future impacts on GDEs due to new production can be avoided. A good rule of thumb to follow is: *if groundwater can be pumped from a well - it's an aquifer*.

[3] For more details on the mapping methods, refer to: Klausmeyer, K., J. Howard, T. Keeler-Wolf, K. Davis-Fadtke, R. Hull, A. Lyons. 2018. Mapping Indicators of Groundwater Dependent Ecosystems in California: Methods Report. San Francisco, California. Available at: https://groundwaterresourcehub.org/public/uploads/pdfs/iGDE_data_paper_20180423.pdf
[4] "Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act: Guidance for Preparing Groundwater Sustainability Plans" is available at: https://groundwaterresourcehub.org/gde-tools/gsp-guidance-document/
[5] The Groundwater Resource Hub: www.GroundwaterResourceHub.org

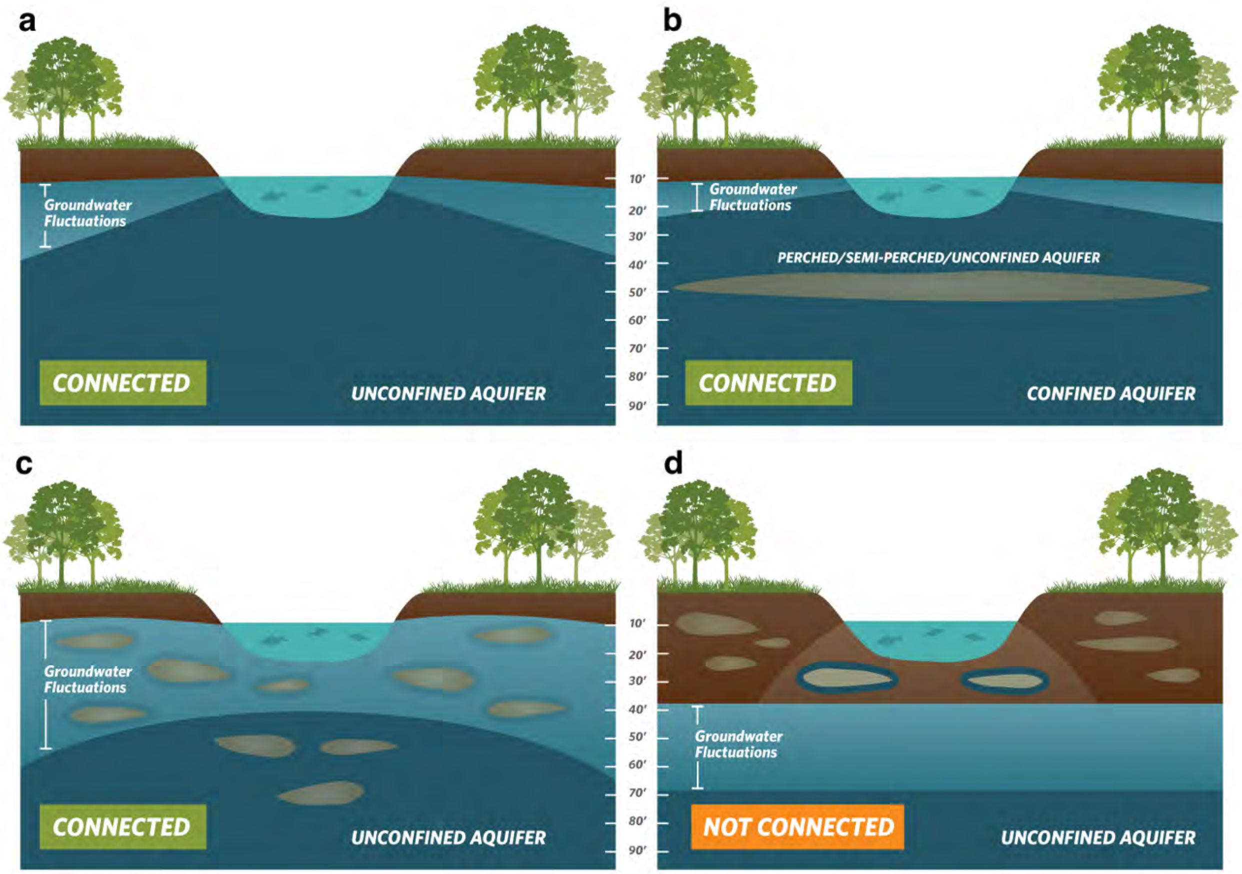


Figure 2. Confirming whether an ecosystem is connected to groundwater. Top: (a) Under the ecosystem is an unconfined aquifer with depth-to-groundwater fluctuating seasonally and interannually within 30 feet from land surface. (b) Depth-to-groundwater in the shallow aquifer is connected to overlying ecosystem. Pumping predominately occurs in the confined aquifer, but pumping is possible in the shallow aquifer. Bottom: (c) Depth-to-groundwater fluctuations are seasonally and interannually large, however, clay layers in the near surface prolong the ecosystem's connection to groundwater. (d) Groundwater is disconnected from surface water, and any water in the vadose (unsaturated) zone is due to direct recharge from precipitation and indirect recharge under the surface water feature. These areas are not connected to groundwater and typically support species that do not require access to groundwater to survive.

BEST PRACTICE #2. Characterize Seasonal and Interannual Groundwater Conditions

SGMA requires GSAs to describe current and historical groundwater conditions when identifying GDEs [23 CCR §354.16(g)]. Relying solely on the SGMA benchmark date (January 1, 2015) or any other single point in time to characterize groundwater conditions (e.g., depth-to-groundwater) is inadequate because managing groundwater conditions with data from one time point fails to capture the seasonal and interannual variability typical of California's climate. DWR's Best Management Practices document on water budgets[6] recommends using 10 years of water supply and water budget information to describe how historical conditions have impacted the operation of the basin within sustainable yield, implying that a baseline[7] could be determined based on data between 2005 and 2015. Using this or a similar time period, depending on data availability, is recommended for determining the depth-to-groundwater.

GDEs depend on groundwater levels being close enough to the land surface to interconnect with surface water systems or plant rooting networks. The most practical approach[8] for a GSA to assess whether polygons in the NC dataset are connected to groundwater is to rely on groundwater elevation data. As detailed in TNC's GDE guidance document[4], one of the key factors to consider when mapping GDEs is to contour depth-to-groundwater in the aquifer that is supporting the ecosystem (see Best Practice #5).

Groundwater levels fluctuate over time and space due to California's Mediterranean climate (dry summers and wet winters), climate change (flood and drought years), and subsurface heterogeneity in the subsurface (Figure 3). Many of California's GDEs have adapted to dealing with intermittent periods of water stress, however if these groundwater conditions are prolonged, adverse impacts to GDEs can result. While depth-to-groundwater levels within 30 feet[4] of the land surface are generally accepted as being a proxy for confirming that polygons in the NC dataset are supported by groundwater, it is highly advised that fluctuations in the groundwater regime be characterized to understand the seasonal and interannual groundwater variability in GDEs. Utilizing groundwater data from one point in time can misrepresent groundwater levels required by GDEs, and inadvertently result in adverse impacts to the GDEs. Time series data on groundwater elevations and depths are available on the SGMA Data Viewer[9]. However, if insufficient data are available to describe groundwater conditions within or near polygons from the NC dataset, include those polygons in the GSP until data gaps are reconciled in the monitoring network (see Best Practice #6).

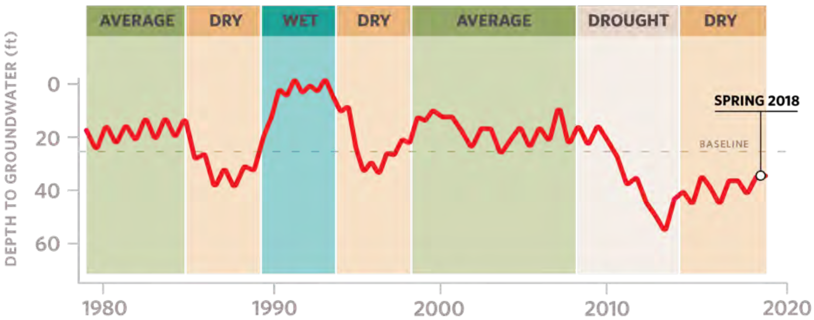


Figure 3. Example seasonality and interannual variability in depth-to-groundwater over time. Selecting one point in time, such as Spring 2018, to characterize groundwater conditions in GDEs fails to capture what groundwater conditions are necessary to maintain the ecosystem status into the future so adverse impacts are avoided.

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[6] DWR. 2016. Water Budget Best Management Practice. Available at: https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/BMP_Water_Budget_Final_2016-12-23.pdf

[7] Baseline is defined under the GSP regulations as "historic information used to project future conditions for hydrology, water demand, and availability of surface water and to evaluate potential sustainable management practices of a basin." [23 CCR §351(e)]

[8] Groundwater reliance can also be confirmed via stable isotope analysis and geophysical surveys. For more information see The GDE Assessment Toolbox (Appendix IV, GDE Guidance Document for GSPs[4]).

[9] SGMA Data Viewer: https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer

BEST PRACTICE #3. Ecosystems Often Rely on Both Groundwater and Surface Water

GDEs are plants and animals that rely on groundwater for all or some of its water needs, and thus can be supported by multiple water sources. The presence of non-groundwater sources (e.g., surface water, soil moisture in the vadose zone, applied water, treated wastewater effluent, urban stormwater, irrigated return flow) within and around a GDE does not preclude the possibility that it is supported by groundwater, too. SGMA defines GDEs as "ecological communities and species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface" [23 CCR §351(m)]. Hence, depth-to-groundwater data should be used to identify whether NC polygons are supported by groundwater and should be considered GDEs. In addition, SGMA requires that significant and undesirable adverse impacts to beneficial users of surface water be avoided. Beneficial users of surface water include environmental users such as plants or animals[10], which therefore must be considered when developing minimum thresholds for depletions of interconnected surface water.

GSAs are only responsible for impacts to GDEs resulting from groundwater conditions in the basin, so if adverse impacts to GDEs result from the diversion of applied water, treated wastewater, or irrigation return flow away from the GDE, then those impacts will be evaluated by other permitting requirements (e.g., CEQA) and may not be the responsibility of the GSA. However, if adverse impacts occur to the GDE due to changing groundwater conditions resulting from pumping or groundwater management activities, then the GSA would be responsible (Figure 4).

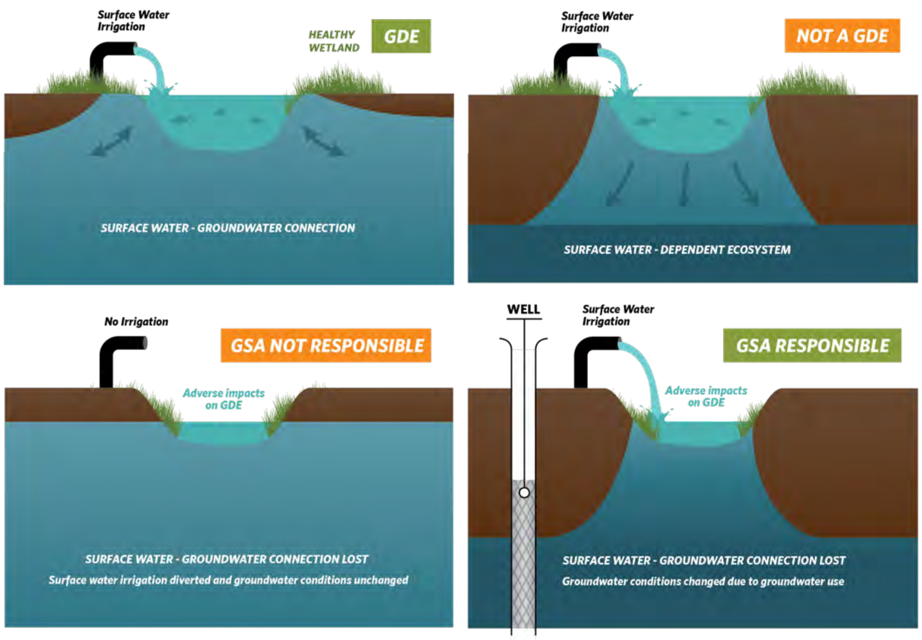

Figure 4. Ecosystems often depend on multiple sources of water. Top: (Left) Surface water and groundwater are interconnected, meaning that the GDE is supported by both groundwater and surface water. (Right) Ecosystems that are only reliant on non-groundwater sources are not groundwater-dependent. Bottom: (Left) An ecosystem that was once dependent on an interconnected surface water, but loses access to groundwater solely due to surface water diversions may not be the GSA's responsibility. (Right) Groundwater dependent ecosystems once dependent on an interconnected surface water system, but loses that access due to groundwater pumping is the GSA's responsibility.

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[10] For a list of environmental beneficial users of surface water by basin, visit: https://groundwaterresourcehub.org/gde-tools/environmental-surface-water-beneficiaries/

BEST PRACTICE #4. Select Representative Groundwater Wells

Identifying GDEs in a basin requires that groundwater conditions are characterized to confirm whether polygons in the NC dataset are supported by the underlying aquifer. To do this, proximate groundwater wells should be identified to characterize groundwater conditions (Figure 5). When selecting representative wells, it is particularly important to consider the subsurface heterogeneity around NC polygons, especially near surface water features where groundwater and surface water interactions occur around heterogeneous stratigraphic units or aquitards formed by fluvial deposits. The following selection criteria can help ensure groundwater levels are representative of conditions within the GDE area:

- Choose wells that are within 5 kilometers (3.1 miles) of each NC Dataset polygons because they are more likely to reflect the local conditions relevant to the ecosystem. If there are no wells within 5km of the center of a NC dataset polygon, then there is insufficient information to remove the polygon based on groundwater depth. Instead, it should be retained as a potential GDE until there are sufficient data to determine whether or not the NC Dataset polygon is supported by groundwater.

- Choose wells that are screened within the surficial unconfined aquifer and capable of measuring the true water table.

- Avoid relying on wells that have insufficient information on the screened well depth interval for excluding GDEs because they could be providing data on the wrong aquifer. This type of well data should not be used to remove any NC polygons.

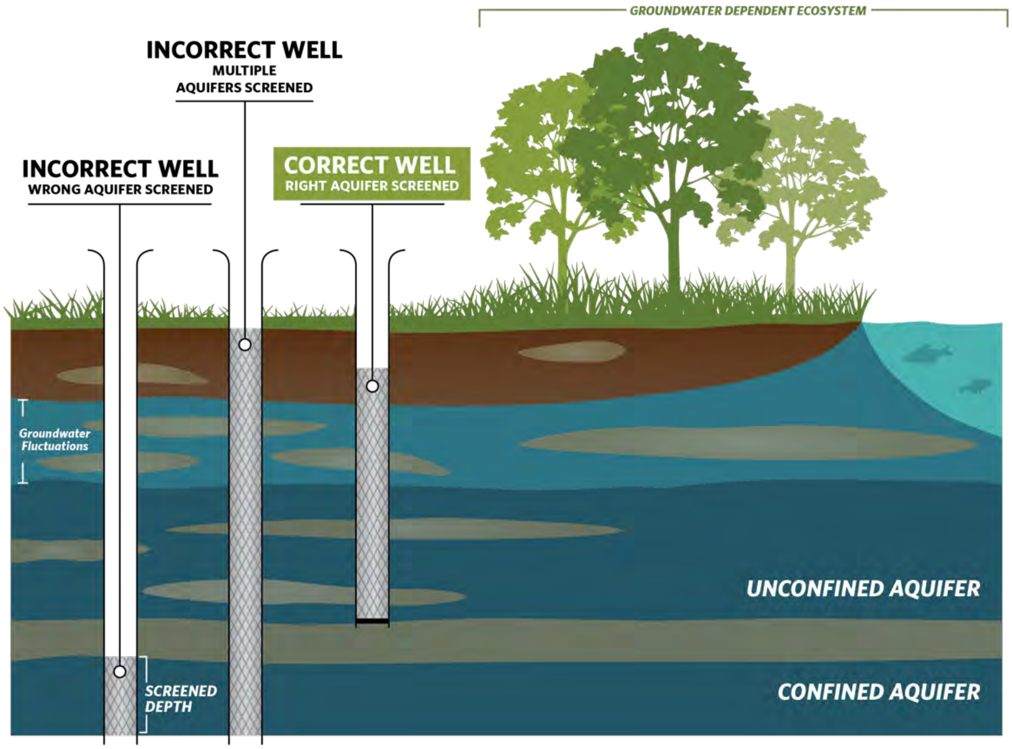

Figure 5. Selecting representative wells to characterize groundwater conditions near GDEs.

BEST PRACTICE #5. Contouring Groundwater Elevations

The common practice to contour depth-to-groundwater over a large area by interpolating measurements at monitoring wells is unsuitable for assessing whether an ecosystem is supported by groundwater. This practice causes errors when the land surface contains features like stream and wetland depressions because it assumes the land surface is constant across the landscape and depth-to-groundwater is constant below these low-lying areas (Figure 6a). A more accurate approach is to interpolate groundwater elevations at monitoring wells to get groundwater elevation contours across the landscape. This layer can then be subtracted from land surface elevations from a Digital Elevation Model (DEM)[11] to estimate depth-to-groundwater contours across the landscape (Figure b; Figure 7). This will provide a much more accurate contours of depth-to-groundwater along streams and other land surface depressions where GDEs are commonly found.

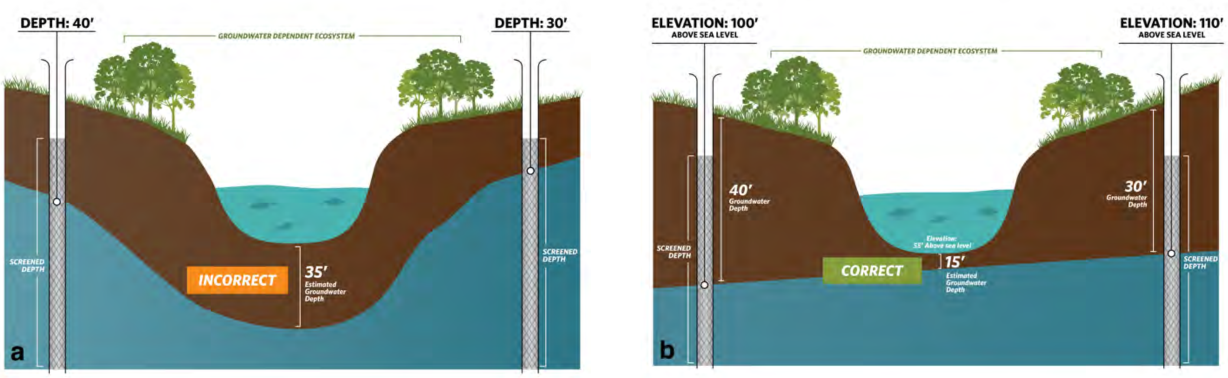

Figure 6. Contouring depth-to-groundwater around surface water features and GDEs. (a) Groundwater level interpolation using depth-to-groundwater data from monitoring wells. (b) Groundwater level interpolation using groundwater elevation data from monitoring wells and DEM data.

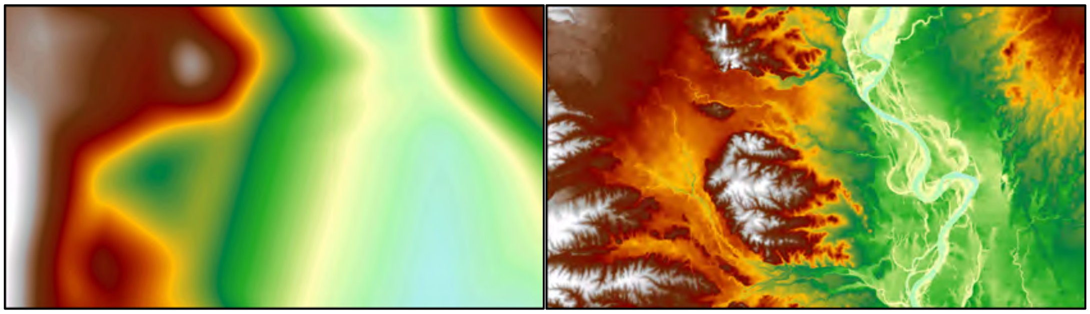

Figure 7. Depth-to-groundwater contours in Northern California. (Left) Contours were interpolated using depth-to-groundwater measurements determined at each well. (Right) Contours were determined by interpolating groundwater elevation measurements at each well and superimposing ground surface elevation from DEM spatial data to generate depth-to-groundwater contours. The image on the right shows a more accurate depth-to-groundwater estimate because it takes the local topography and elevation changes into account.

[11] USGS Digital Elevation Model data products are described at: https://www.usgs.gov/core-science-systems/ngp/3dep/about-3dep-products-services and can be downloaded at: https://iewer.nationalmap.gov/basic/

BEST PRACTICE #6. Best Available Science

Adaptive management is embedded within SGMA and provides a process to work toward sustainability over time by beginning with the best available information to make initial decisions, monitoring the results of those decisions, and using the data collected through monitoring programs to revise decisions in the future. In many situations, the hydrologic connection of NC dataset polygons will not initially be clearly understood if site-specific groundwater monitoring data are not available. If sufficient data are not available in time for the 2020/2022 plan, The Nature Conservancy strongly advises that questionable polygons from the NC dataset be included in the GSP until data gaps are reconciled in the monitoring network. Erring on the side of caution will help minimize inadvertent impacts to GDEs as a result of groundwater use and management actions during SGMA implementation.

KEY DEFINITIONS

Groundwater basin is an aquifer or stacked series of aquifers with reasonably well-defined boundaries in a lateral direction, based on features that significantly impede groundwater flow, and a definable bottom. *23 CCR §341(g)(1)*

Groundwater dependent ecosystem (GDE) are ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. *23 CCR §351(m)*

Interconnected surface water (ISW) surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted. *23 CCR §351(o)*

Principal aquifers are aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems. *23 CCR §351(aa)*

ABOUT US

The Nature Conservancy is a science-based nonprofit organization whose mission is *to conserve the lands and waters on which all life depends*. To support successful SGMA implementation that meets the future needs of people, the economy, and the environment, TNC has developed tools and resources (www.groundwaterresourcehub.org) intended to reduce costs, shorten timelines, and increase benefits for both people and nature.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

August 23, 2021

Bryan Bondy
Executive Director
Mound Basin Groundwater Sustainability Agency
P.O. Box 3544
Ventura, CA 93006-3544

Re: Preliminary Draft Mound Basin Groundwater Sustainability Plan (July 2021)

Dear Mr. Bondy:

Enclosed with this letter are NOAA National Marine Fisheries Service's (NMFS) comments on the Preliminary Draft Mound Basin Groundwater Sustainability Plan (Draft GSP) prepared by the Mound Basin Groundwater Sustainability Agency (MBGSA).

The Draft GSP was developed pursuant to, and intended to meet the requirements of the California Sustainable Groundwater Management Act (SGMA). The SMGA includes specific requirements to identify and consider adverse impacts on all recognized beneficial uses of groundwater and related interconnected surface waters, including Groundwater Dependent Ecosystems (GDE). (*See* Cal. Water Code §§ 10720.1, 10721, 10727.2.)

As explained more fully in the enclosure, the Draft GSP does not, but should, adequately address the recognized instream beneficial uses of the lower Santa Clara River and Santa Clara River Estuary (as well as other GDE), potentially affected by the management of groundwater within the Mound Groundwater Basin. Additionally, the Draft GSP should also recognize the important relationship between the extensive groundwater extractions and recharge program in the Fox Canyon Groundwater Basin (including the conjunctively operated Fillmore and Piru Groundwater Basins) and its potential adverse effects on the amount and extent of surface flows and other water dependent habitat features utilized by the federally listed endangered southern California steelhead (*Oncorhynchus mykiss*).

The revised Draft GSP should be re-circulated to give NMFS, and other interested parties, an opportunity to review the revisions before the Draft GSP is finalized.

NMFS appreciates the opportunity to comment on the Draft GSP. If you have a question regarding this letter or enclosure, please contact Mr. Mark H. Capelli in our Santa Barbara Office (805) 963-6478 or mark.capelli@noaa.gov, or Mr. Andres Ticlavilca in our Santa Rosa Office (707) 575-6-54 or andres.ticlavilca@noaa.gov.

Sincerely,

Anthony P. Spina
Chief, Southern California Branch
California Coastal Office

cc:
Darren Brumback, NMFS, California Coastal Office
Rick Rogers, NMFS, California Coastal Office
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Robert Holmes, CDFW, Sacramento
Steve Gibson, CDGFW, Region 5
Steve Slack, CDFW, Region 5
Mary Ngo, CDFW, Region 5
Greg Martin, CDDR, Channel Coast District
Nate Cox, CDPR, Channel Coast District
Christopher Diel, USFWS, Ventura Field Office
Chris Dellith, USFWS, Ventura Field Office

Note: comments which share the major themes from the Appendix F introduction are not included in the comment matrix (Attachement 1) due to their volume and repetition and are addressed in a new appendix to the draft GSP (Appendix G). In order to distinguish the comments from CDFW, NGOs, and NMFS, which do not follow the major themes discussed below, they have been identified and labeled with numbers and boxes below and correspond with the numbers in the comment matrix table (see Attachment 1, comments #31-48).

NOAA's National Marine Fisheries Service's Comments on Preliminary Draft Mound Basin Groundwater Sustainability Plan (2021)

August 23, 2021

Overview

NOAA's National Marine Fisheries Service (NMFS) provides the following comments on the Draft Mound Basin Groundwater Sustainability Plan (Draft GSP), with a focus on Area 11 (*i.e.*, the lower Santa Clara River and Santa Clara River Estuary). Prior to presenting the comments, NMFS first provides background information on the endangered steelhead (*Oncorhynchus mykiss*), which reside in the Santa Clara River watershed, including the reach of the mainstem of the Santa Clara River and Santa Clara River Estuary underlain by the Mound Groundwater Basin. That background information includes the status of the species, life history and habitat requirements, and actions that are essential for recovery of the species. That information is essential for understanding the potential implications of operating the Mound Basin in the Santa Clara River for the endangered Southern California Distinct Population Segment (DPS) of steelhead. Our general and specific comments on the Draft GSP are presented in subsequent sections.

Status of Steelhead, Life History and Habitat Requirements, and Recovery Needs

Status of steelhead and habitat for the species in the Santa River Watershed

NMFS listed southern California steelhead, including the populations in the Santa Clara River watershed (which includes the Mound Groundwater Basin), as endangered in 1997 (62 FR 43937), and reaffirmed the endangered listing in 2006 (71 FR 5248).

NMFS designated critical habitat for southern California steelhead in 2005 (70 FR 52488). Within the Mound Basin, this designation includes the mainstem of the Santa Clara River and the Santa Clara River Estuary (*See* Figures 1 and 2).

Critical habitat for endangered steelhead includes: 1) freshwater spawning habitat with water quality and quantity conditions and substrate that support spawning, incubation, and larval development; 2) freshwater rearing sites with water quality and floodplain connectivity to form and maintain physical habitat conditions that support juvenile growth and mobility, and natural cover such as shade, submerged and overhanging vegetation that provide forage and refugia opportunities; and 3) freshwater migration corridors free of anthropogenic passage impediments that promote adult and juvenile mobility and survival.

Of particular relevance to the Draft GSP for the Mound Basin are the functions of the Santa Clara River Estuary. NMFS Southern California Steelhead Recovery Plan (2012) noted:

> "Each stream system terminates at the coast with some type of estuary-lagoon system. In southern California, seasonal lagoons currently tend to form each summer when decreased streamflows allow marine processes to build a sand berm at the mouth of each system. Juvenile steelhead over-summer in these lagoons, where they often grow so rapidly that they can undergo smoltification at age 1 and enter the ocean large enough to experience enhanced survival to adulthood (Hayes *et al*. 2008, Bond 2006)." P. 2-19.

NMFS Southern California Steelhead Recovery Plan further noted:

> "The timing of emigration is influenced by a variety of factors such as photoperiod, streamflow, temperature, and breaching of the sandbar at the river's mouth. These out-migrating juveniles, termed smolts [reference to Figure omitted]), live and grow to maturity in the ocean for two to four years before returning to freshwater to reproduce (citations omitted)." p. 2--2,

Steelhead populations in the SCS Recovery Planning area have not been extensively investigated; however, steelhead smolts have been documented in southern California estuaries, including the Santa Clara River Estuary *(e.g.,* Kelley 2008).

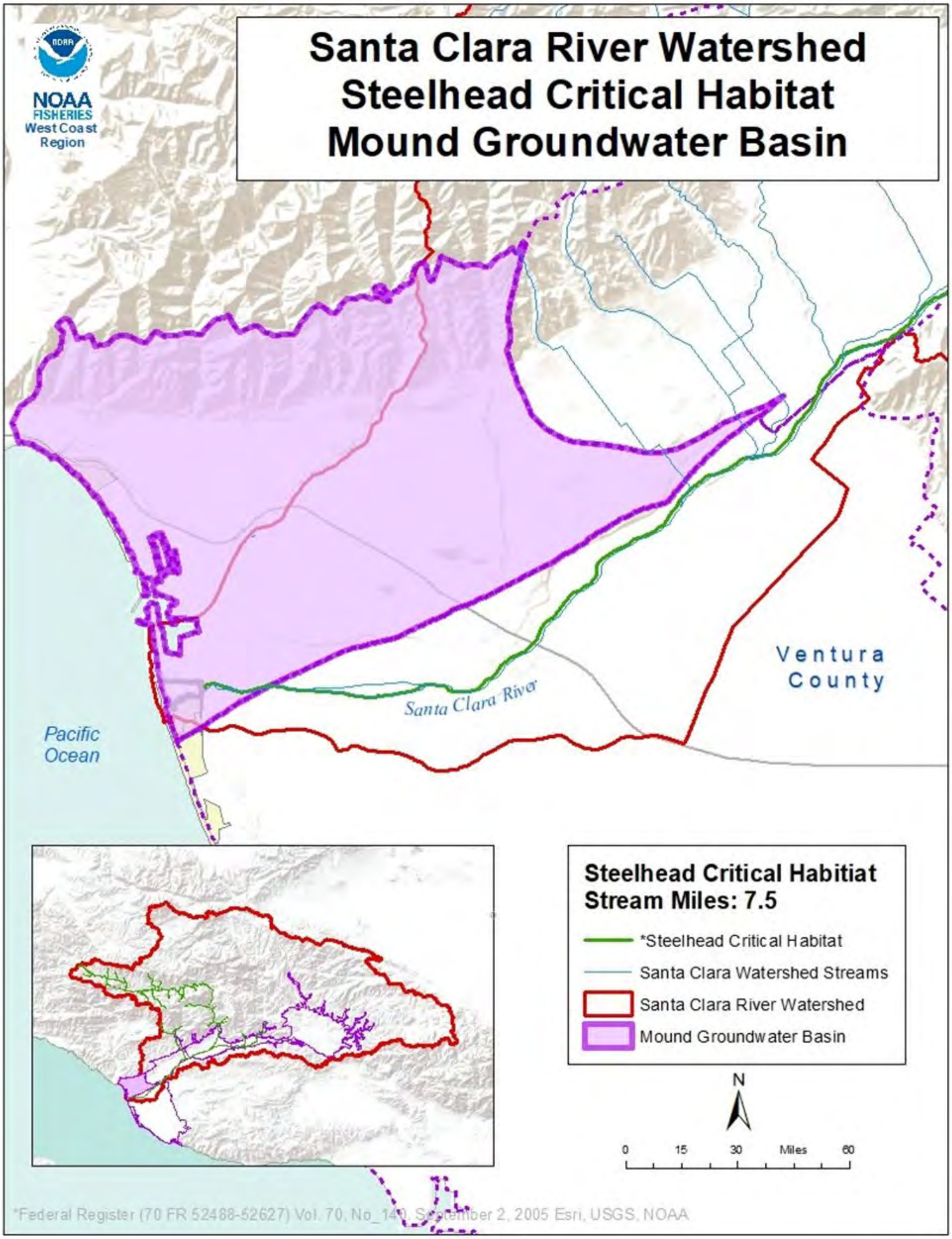

Figure 1. Lower Santa Clara River and Santa Clara River Estuary Steelhead Critical Habitat within the Mound Groundwater Basin.

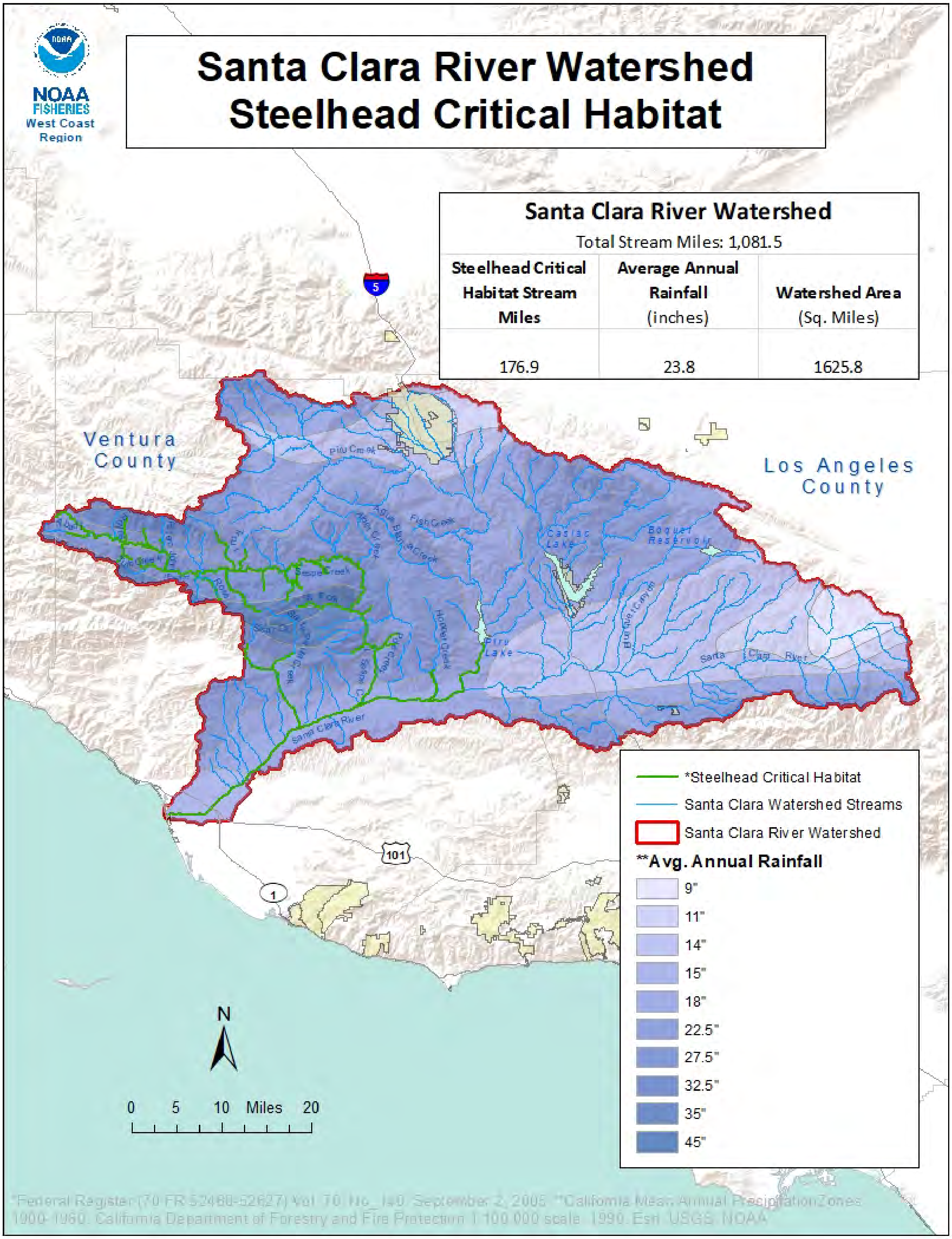

Figure 2. Santa Clara River Watershed Steelhead Critical Habitat.

Habitat for this species has been adversely affected by loss and modification of physical or biological features (substrate, water quality and quantity, water temperature channel morphology and complexity, passage conditions, riparian vegetation, introduction of non-native invasive species, etc.) through activities such as surface-water diversions and groundwater extractions (S*ee* "Current DPS-Level Threats Assessment", pp. 4-1 – 4-11, and "Threats and Threat Sources", pp. 9-14 – 9-17, in NMFS 2012). Additionally, estuaries in southern California have been reduced in size through filling and there habitat functions have been degraded through a variety of anthropogenic activities, such as water diversions and extractions and point and non-point waste discharges. The size of the pre-historic Santa Clara River Estuary is estimated to have been reduced by over half (U.S. Coast Survey 1855a, 1855b, Capelli 2007, Beller *et al*. 2011, Stein *et al.* 2014). Thus many of the physical and biological features of designated critical habitats have been significantly degraded (and in some cases lost) in ways detrimental to the biological needs of steelhead. These habitat modifications have hindered the ability of designated critical habitat to provide for the survival and ultimately recovery of this species.

NMFS has also modeled and mapped potential intrinsic potential spawning and rearing habitat in the Santa Clara watershed, using the "envelop method", as part of its recovery planning process for the endangered Southern California DPS of Steelhead (*See* Figure 3). This method uses observed associations between fish distribution and the quantitative values of environmental parameters such as stream gradient, summer mean discharge and air temperature, valley width to mean discharge, and the presence of alluvial deposits – habitat features that are critical to steelhead spawning and rearing (Boughton and Goslin 2006, Map 5, Santa Barbara to Point Dume, pp. 20-21).

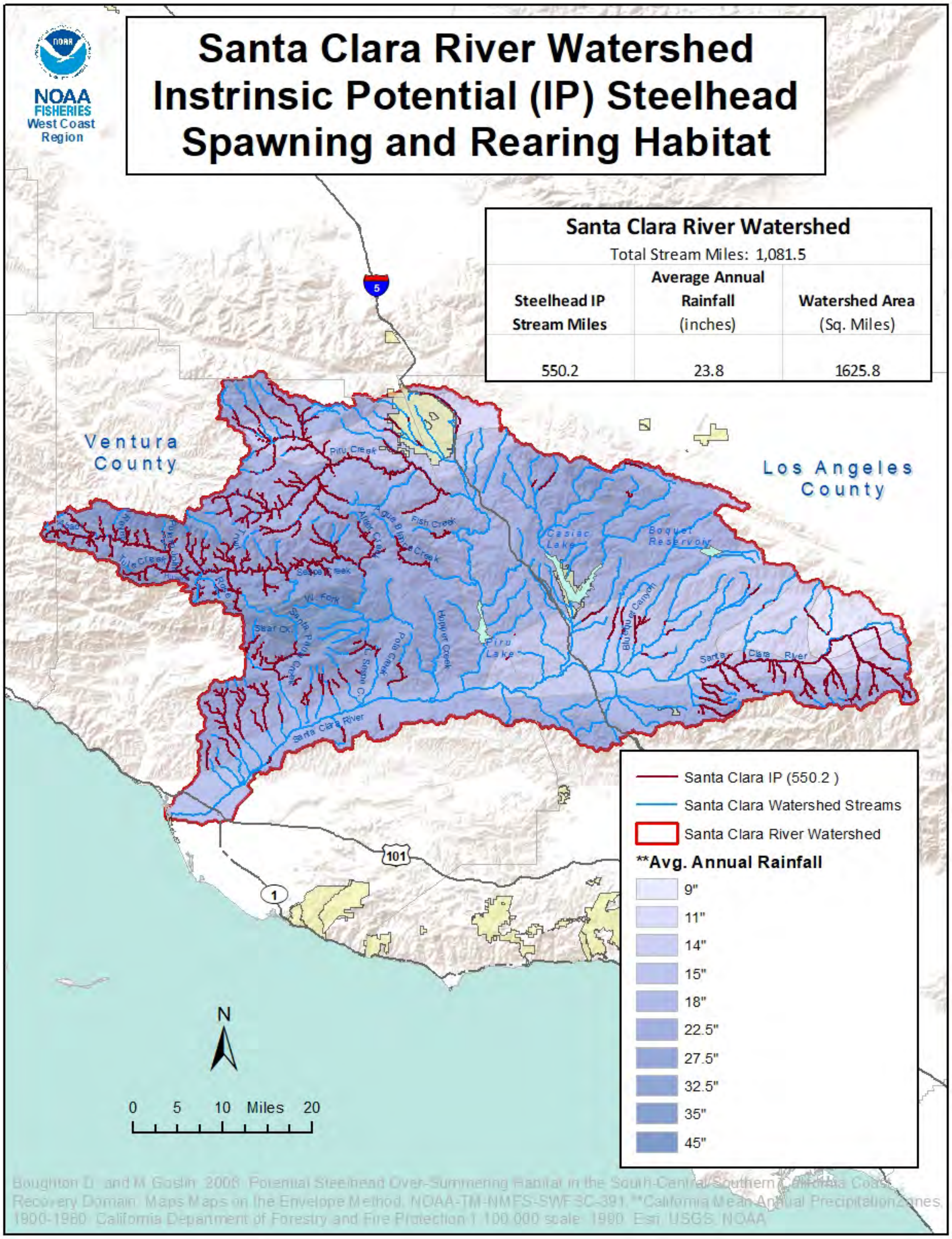

Figure 3. Santa Clara River Watershed Intrinsic Potential Steelhead Spawning and Rearing Habitat.

Steelhead life history and habitat requirements

Adult steelhead spend a majority of their adult life in the marine environment. However, the reproductive and early development stages of this species' life history occurs in the freshwater environment (migration to and from spawning areas, spawning, incubation of eggs and the rearing of juveniles), including in the main stem and tributaries such as those in the Santa Clara River watershed. Many of the natural variables (such as seasonal surface flow patterns, water quality, including water temperature) are significantly impacted by the artificial modification of these freshwater habitats. This includes both surface and sub-surface extractions that lower the water table and can, in turn, affect the timing, duration, and magnitude of surface flows essential for steelhead migration, spawning and rearing. In southern California, warm, dry summers require that juvenile steelhead have access to perennial stream reaches (including coastal estuaries) with tolerable water temperature (*See*, for example, Boughton *et al*. 2009). The over-summering period can be challenging to juvenile steelhead survival and growth. Surface diversions in combination with lowered groundwater tables during the dry season can *indirectly* affect rearing individuals by reducing vegetative cover, and *directly* by reducing or eliminating the summertime surface flows (or pool depths) in parts of the watershed. These conditions have been and are being exacerbated by global climate change (Beighley *et al*. 2008, Feng *et al*. 2019, Gudmundsson *et al*. 2021).

Recovery needs of endangered steelhead

Among other federally mandated responsibilities, NMFS is responsible for administering the U.S. Endangered Species Act for the protection and conservation of endangered steelhead utilizing the Santa Clara River Watershed. As part of this responsibility, NMFS developed the Southern California Steelhead Recovery Plan (NMFS 2012)[1]. Through a comprehensive analysis of systemic threats to this species, diversion of surface-flow and groundwater extractions were identified as "very high" threats to the long-term survival of endangered steelhead in the Santa Clara River (NMFS 2012, pp. 9-1 through 9-17).

To address the identified threats to endangered steelhead in the Santa Clara River Watershed, NMFS' Southern California Steelhead Recovery Plan identifies a number of recovery actions targeting surface diversions and groundwater extraction (NMFS 2012, p. 8-6, Table 9-7, p. 9-61). These include:

SCR-SCS-4.2 Develop and implement a water management plan to identify the appropriate diversion rates for all surface water diversions that will maintain surface flow necessary to support all *O. mykiss* life history stages, including adult and juvenile *O. mykiss* migration, and suitable spawning, incubation, and rearing habitat.

[1] National Marine Fisheries Service. 2012. Southern California Coast Steelhead Recovery Plan. West Coast Region, California Coastal Area Office, Long Beach, California; *see* also, Keir Associates and National Marine Fisheries Service. 2008, Hunt & Associates Biological Consulting Services 2000.

SCR-SCS-6.1 Conduct groundwater extraction analysis and assessment. Conduct hydrological analysis to identify groundwater extraction rates, effects on the natural stream pattern (timing, duration and magnitude) of surface flows in the mainstem and tributaries, *and the estuary*, and effects on all *O. mykiss* life history stages, including adult and juvenile *O. mykiss* migration, spawning, incubation, and rearing habitats. (emphasis added)

SAC-SCR-6.2 Develop and implement groundwater monitoring and management program. Develop and implement groundwater monitoring program to guide management of groundwater extractions to ensure surface flows provide essential support for all *O. mykiss* life history stages, including adult and juvenile *O. mykiss* spawning, incubation and rearing habitats.

SAC-SCR-12.1 Develop and implement an estuary restoration and management plan.

GSPs developed under SGMA provide an important mechanism for implementing these recovery actions for the Santa Clara River watershed. The GSP for the Mound Basin is an essential mechanism for the implementation specific recovery actions for the lower Santa Clara River and the Santa Clara River Estuary.

General Comments on the Draft GSP

Impacting the natural process of groundwater inputs to surface flows and water surface elevations is of concern because the inputs can buffer daily water temperature fluctuations (Heath 1983, Brunke *et al.* 1996, Barlow and Leake 2012, Hebert 2016). Artificially reducing the groundwater inputs can expand or shrink the amount of fish habitat and feeding opportunities for rearing juvenile steelhead (Fetter 1997, Sophocleous 2002, Glasser *et al.* 2007, Croyle 2009,), and reduce opportunities for juveniles to successfully emigrate to the estuary and the ocean (Bond 2006, Hayes *et al.* 2008). Low summer baseflow, likely caused by both surface water diversions and pumping hydraulically connected groundwater, is noted as a significant stress to steelhead survival in the Santa Clara River and tributaries (*See*, for example, Table 9-2, p. 9-15 in NMFS 2012).

Management of the groundwater resources within the Santa Clara River watershed has affected the water resources and other related natural resources throughout the Santa Clara River watershed. For example, extraction of groundwater from these basins has lowered groundwater levels causing the elimination of artesian springs that formerly supported a wide variety of plant and animal species, and affected surface flows that support the migrations of endangered steelhead, as well as other aquatic species in the Santa Clara River watershed (Stillwater Sciences 2005. 2007a, 2007b, 2011a, 2011b, 2017).

The development and operation of surface water supply facilities throughout the Santa Clara River are integral in the management of the groundwater resources associated with the Santa Clara River. Facilities such as Pyramid Reservoir, Santa Felicia Dam, Piru Creek Diversion and spreading basins, and the Vern Freeman Diversion Dam and spreading basin have profoundly altered the natural surface flow and groundwater recharge patterns in the Santa Clara River watershed, from the headwaters to the Pacific Ocean (*e.g*., NMFS 2008a, 2008b, 2016, 2020, 2021). Unless the Draft GSP is revised to reflect the operation of these integral components of the groundwater management program for the Santa Clara River, the future adopted GSP will be unable to meet the requirement of SGMA to effectively provide for the protection of habitats, including those recognized instream beneficial uses that are dependent on groundwater such as fish migration, spawning and rearing, as well as other GDE within the Mound Basin.

When analyzing impacts on steelhead or other aquatic organisms resulting from groundwater and related streamflow diversions, identifying flow levels that effectively support essential life functions of this organism is critical (Barlow and Leake 2012). Specifically, it is essential to determine what flows adequately supports steelhead migration during the winter and spring, and juvenile rearing year round. Without an understanding of these hydrologic/biotic relationships, a GSP cannot ensure that significant and unreasonable adverse impacts from groundwater depletion (and in the case of the Santa Clara River, the integrally related surface water diversion/groundwater recharge program) are avoided (Heath 1983, California Department of Water Resources 2016).

Specific Comments on the Draft GSP

The following comments on the Executive Summary of the Draft GSP are arranged by page and paragraph number; additional comments on individual Draft GSP elements are presented subsequently.

31 **Executive Summary**

ES-1 Plan Area, Land Use, and Water Sources

Pages ES-ii-iii

The Draft Plan states:

> "The beneficial uses of groundwater extracted from the principal aquifers of Mound Basin include municipal, industrial, and agricultural water supply corresponding to the land use categories above." p. ES-ii

The listed beneficial uses within the boundaries of the Mound Groundwater Basin include only out-of-stream beneficial uses, and largely ignores the instream beneficial uses, including those linked to with GDE, including, but not limited to Area 11 (*i.e*., the lower Santa Clara River and Santa Clara River Estuary). The Draft GSP should be revised to explicitly acknowledge the instream beneficial uses supported by the groundwater basin, including the GDE associated with the lower Santa Clara River and Santa Clara River Estuary. The recognized instream beneficial uses for the portion of the lower Santa Clara

31 River within the Mound Basin include: warm freshwater habitat, cold freshwater habitat, wildlife habitat, habitat for rare, threatened and endangered species, fish migration, and wetland habitat. Santa Clara River Estuary instream beneficial uses include: estuarine habitat, marine habitat, wildlife habitat, habitat for rare, threatened and endangered species, fish migration, spawning habitat, and wetland habitat.[2]

32 **ES-2 Basin Setting and Groundwater Conditions**

Pages ES-iii-vi

The Draft GSP asserts that:

> "Despite the interconnection with shallow groundwater, there is no depletion of interconnected surface water in the Basin because there are no groundwater extractions from the shallow groundwater units and groundwater in the principal aquifers is physically separated from the surface water bodies by several hundred feet of fine-grained materials. No groundwater dependent ecosystems (GDEs) have been identified in the Basin that appear to be relying on groundwater from a principal aquifer."
> P. ES-vi

The regulations governing SGMA do not stipulate that the provisions of SGMA cover only "principal aquifers" as the Draft GSP appears to presume. The regulations define interconnected surface water as "surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water . . ." (23 CCR Section 351(0). Significantly, "continuous" refers specifically to hydrologic connection, not a continuous temporal connection.

The Draft GSP does not adequately recognize the potential role of groundwater in the lower reaches of the Santa Clara River or the Santa Clara River Estuary, or the role of groundwater elevations in ensuring surface flows water surface elevations and supporting the life-cycle of steelhead, including their migratory, spawning and rearing phases (*See* additional comments on Appendix A to the Draft Mound Basin GSP below.). Both the Santa Clara River estuary and the portion of the Santa Clara River upstream of Harbor Boulevard within the boundaries of the Oxnard Subbasin should be fully addressed in the revised Draft GSP. Further, because groundwater-management activities within the Santa Clara River watershed involve the United Water Conservation District's (UWCD) diversion operations at the Vern Freeman Diversion, the relationship between these diversion activities and groundwater elevations along the affected portion of the Santa Clara River (and estuary) should be addressed in the revised Draft GSP.

See additional comments below on interconnected groundwater and surface flows water surface elevations in Area 11 (*i.e.*, the lower Santa Clara River and Santa Clara River Estuary) of the Mound Basin.

[2] Table 2. Beneficial Use of Inland Surface Waters, Los Angeles Regional Water Quality Control Board (2011). p. 2-7

33 **ES-3 Water Budget**

Pages ES-vi-vii

The Draft GSP notes that:

> "The primary sources of recharge to the Mound Basin groundwater system are underflow from the Santa Paula Basin, areal recharge (the sum of infiltration of precipitation, M&I return flows, and agricultural irrigation return flows), and mountain-front recharge. Stream channel recharge is a minor component." p. ES-vi

The revised Draft GSP should acknowledge that both the direct surface flow and the underflow from the Santa Paula Basin are influenced by the upstream diversion of surface flows in the Santa Clara River watershed and the artificial recharge of ground water as a result of the Vern Freeman Diversion located approximately 10 miles upstream of the Mound Basin.

34 **ES-4 Sustainable Management Criteria**

Pages ES-vii-x

The sustainable criteria are expressed explicitly and exclusively in terms of groundwater levels, water chemistry, and land subsidence, and do not explicitly recognize the important relationship between groundwater levels and the surface flows (particularly base flows) or water quality parameters (such as temperature, dissolved oxygen, *etc*.) that contribute to the maintenance of GDE within the Mound Basin (including, but not limited to, the lower Santa Clara River and the Santa Clara River Estuary).

There is no specific criterion in the Draft Criteria that deals with the GDE associated with the federally listed species (or the designated critical habitat) which utilize the Mount Basin[3]. In fact, the word "steelhead", "trout", or even "fish" do not appear in the Draft GSP. This is an important omission that should be corrected in the revised Draft GSP because GDE for the Mound Basin includes the use of surface flow by the federally listed endangered southern California steelhead for migration, spawning and rearing.

Specifically, the revised Draft GSP should include a description of the extent of designated critical habitat for endangered steelhead (as well as other listed or recognized sensitive species) that occur within the boundaries of the Mound Basin (*See* Figures 1 and 3).

ES-5 **Monitoring Networks**

Pages x-xii

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[3] For a discussion of the terrestrial and as well as aquatic listed species, see, Stillwater (2007a) and California Department of Fish and Wildlife (2021).

The monitoring is primarily aimed at addressing the limited Sustainable Management Criteria. There is little in the monitoring program that specifically addresses the potential effects of groundwater extractions on GDE, including, but not limited to, the lower Santa Clara River channel and the Santa Clara River Estuary. *See* additional comments below regarding the inadequacies of the proposed monitoring program for the Mound Basin GSP.

Draft Mound Basin GSP

1.0 Introduction to Plan Contents [Article 5 §354]

The following comments are addressed to the specific sections and provisions of the draft GSP, arranged by the GSP section headings.

35 **2.2.2.2 Existing Water Resource Management Programs [§354.8(c) and (d)]**

Pages 9-11.

One of the largest and most significant water-resource-management program within the Santa Clara River watershed, the UWCD's groundwater recharge program, consisting of the combined facilities of the Santa Felicia Dam, Piru Diversion, Vern Freeman Diversion and a series of groundwater settling basins. This program and its related facilities should be included in this section because it affects not only the artificial recharge to the Fox Canyon aquifer, but the natural recharge to the other groundwater basins on the Oxnard Plain, including the Mound and Santa Paula Basins; *see* NMFS comments on the Fox Canyon GSP (2020)

36 **2.2.2.3 Conjunctive Use Programs [§354.8(e)]**

Page 11

The City of Ventura's water supply includes groundwater extractions (as well as surface diversions) that are subject to a separate GSP, and this fact should be noted in the revised Draft Mound GSP.

37 **2.3 Notice and Communication [§354.10]**

Page 22-24

The Draft GSP is focused out-of-stream users of the Mound Basin and does not adequately recognize the public trust natural resources that may be affected by the extractions of groundwater from the Mound Basin, and therefore be of interest to state and federal natural resource regulatory agencies such as NMFS, U.,S. Fish and Wildlife Service, and the California Department of Fish and Wildlife, and the California Department of Parks and Recreation (which owns a portion of the Santa Clara River Estuary wetlands).

2.3.1 Beneficial Uses and Users [§354.10(a)]

38 Pages 23-24

We would note that the listed beneficial uses within the boundaries of the Mound Basin identify only out-of-stream beneficial uses, and largely ignore instream beneficial uses. The revised Draft GSP should be revised to explicitly acknowledge the instream beneficial uses supported by the groundwater basin, including, but not limited to, the GDE associated with the lower Santa Clara River and Santa Clara River Estuary. *See* comment above.

3.0 Basin Setting [Article 5, SubArticle 2]

3.1.2 Regional Geology [§354.14(b)(1) and (d)(2)]

Pages 32-43

> "Some clay-rich soils within the Holocene and Pleistocene alluvial deposits present in Mound Basin may be of sufficiently low vertical permeability to allow the formation of thin, discontinuous lenses or layers of shallow, "perched" groundwater above the primary saturated zone of the shallow alluvial aquifer (described in the next subsection of this GSP)." p. 34

The variable permeability also characterizes the shallow upper alluvial aquifer that lays above the Mound Basin and allows connectivity between the upper alluvial aquifer and portion of the Mound Basin. See additional comments below regarding the physical properties of the Mound Basin and its multiple-layered aquifers.

3.1.4 Principal Aquifers and Aquitards [§354.14(b)(4)(A)]

> "The SGMA defines "principal aquifers" as "aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems." p. 35

While the shallow alluvial aquifer laying above the Mound Basin may be "rarely used for water supply", it does not follow that the provisions of the Draft GSP should only be limited to the Mound Basin. Because water in the overlying shallow alluvial aquifer can percolate to the aquifer below, reducing the groundwater level in the Mound Basin can result in lower groundwater levels in the shallow alluvial aquifer, thus affecting GDE associated with the shallow alluvial aquifer, including, but not limited to, surface water in the lower Santa Clara River, and the Santa Clara River Estuary. *See* additional comments below regarding the physical properties of the Mound Basin and the groundwater contribution the Santa Clara River Estuary.

39 **3.1.4.1 Physical Properties of Aquifers and Aquitards**

Pages 36-45

The Draft GSP notes:

39

> "At the time of writing of this GSP, no aquifer test results for hydraulic conductivity or storativity were found in available references. However, well information collected over the past several decades by United . . . is considered the best available information concerning aquifer and aquitard properties. . . However, it is recognized that on a local scale, hydraulic conductivity can vary by orders of magnitude over short distances, and there may be areas in Mound Basin where hydraulic conductivity is higher or lower than the values shown on Table 3.1-01." p. 39

The lack of specific information regarding hydraulic conductivity or storativity in the Mound Basin and the overlying shallow alluvial aquifer does not allow the categorical conclusions relied upon in the Draft GSP to eliminate consideration of GDE within the Mound Basin. The information and model used by United was focused on water conductivity and storativity that is more relevant to out-of-stream water supply and beneficial uses than the smaller values that may be relevant to support GDE.

We would also note that there are groundwater technologies that permits aquifer testing in individual layers of a multi-layered aquifers such as found in the Mound Basin. Pumping tests are essential for determining the hydrological conductivity and storativity of aquifer layers. Such tests must be at a fine enough scale to assess the significance for instream beneficial uses associated with GDE, including, but not limit to, those of the lower Santa Clara River and Santa Clara River Estuary, and not be limited to traditional out-of-stream beneficial uses such as domestic, municipal or agricultural water supply. Without these field-based measurements it is impossible to conduct credible aquifer simulations such as the one found in the Draft GSP dealing with groundwater levels driven by climate-change scenarios through 2070 (*See, e.g.*, Figure 4.6-03 of the Draft GSP.)

The Draft GSP further notes:

> "Since 1979, when reporting of groundwater extraction from wells was mandated within United's service area, no pumping has been reported from the shallow alluvial aquifer for water supply in Mound Basin (pumping data for water-supply wells are included in the Mound Basin Data Management System [DMS]), likely due to insufficient saturated thickness and/or poor water quality. Because it is not used for water supply, the shallow alluvial aquifer is not considered a "principal aquifer" at this time for the purpose of groundwater sustainability planning." p. 40

However, the Draft GSP also acknowledges that:

> "Based on calibration of its regional groundwater flow model, United (2021a) estimated the horizontal hydraulic conductivity of the shallow alluvial aquifer to be 200 ft/d in Mound Basin, and the vertical hydraulic conductivity to be 20 ft/d. The specific yield of the shallow alluvial aquifer in the groundwater flow model is 15% (United, 2021a). p. 40

The Mound Basin is a series of layered aquifers with variable hydraulic properties within and across layers. This is clearly depicted in the longitudinal cross-section A-A' in Figure 3.1-05 of the Draft GSP) (Figures, Section 2) depicting the formations constituting the various aquifer layers of the Mound Basin. The "aquitards" have fault discontinuities, and there is hydraulic connection between aquifers and aquitards". The hydraulic head that prevails in the layered aquifer system, including those in the "aquitards", are all interconnected. The lowering of the hydraulic head in deep aquifers will induce a vertical downward movement of groundwater from the shallow aquifer, which in turn is hydraulically connected to the Santa Clara River and the Santa Clara River Estuary.

As noted above, because water in the shallow alluvial aquifer can percolate to the lower Mount Basin aquifers, reducing the groundwater level in the Mound Basin can result in lower groundwater levels in the shallow alluvial aquifer, thus affecting GDE associated with the overlying shallow alluvial aquifer, including surface water in the lower Santa Clara River, and the Santa Clara River Estuary. Consequently, while the shallow alluvial aquifer may not be considered a "principal aquifer", pumping from the Mound Basin can affect the GDE associated with the shallow aquifer, including the lower reaches of the Santa Clara River and the Santa Clara River Estuary, and therefore cannot be omitted from the analysis of the Draft GSP for the Mound Basin. *See* additional comments below regarding groundwater contribution the Santa Clara River Estuary.

40

3.1.4.2 Groundwater Recharge and Discharge Areas [§354.14(d)(4)]

Pages 44-45

The Draft GSP notes that:

> "The Santa Clara River is the only major stream in Mound Basin, and the reach of the Santa Clara River in [the] Mound Basin is considered to usually be the site of groundwater discharge, rather than recharge (Stillwater Sciences, 2011[b]; United, 2018). However, the lower Santa Clara River in the area of its estuary is reported to fluctuate from gaining to losing cycles as water levels rise and fall in response to breaching of the barrier sand at the mouth of the river (Stillwater Sciences, 2011[b[). When the elevation of surface water in the estuary rises (following closure of the barrier bar), some of the rising water infiltrates (recharges) the shallow deposits adjacent to the river. Then, typically in the following winter or spring, a large storm will produce sufficient flows in the river that it will breach the barrier bar and cause rapid decline of surface water levels in the estuary, causing groundwater in the adjacent shallow deposits to discharge back into the river over a sustained period." p. 45

This statement warrants several comments:

First, the distinction between discharge and recharge is misleading; the surface flows in the lower reaches of the Santa Clara River are in direct contact with the alluvial aquifer (which is described elsewhere in the draft GSP as being up to a 100 feet thick).

40 Second, river discharge (particularly base flows influence by underlying groundwater levels in the Mound Basin) support the GDE in this portion of the Mound Basin.

Third, recharge is not limited to periods when the water surface elevations in the estuary rises following the closure of the sand bar at the mouth of the Santa Clara River Estuary.

Lastly, the draft GSP does not accurately characterize the groundwater contribution to the Santa Clara River Estuary or the lower reaches of the Santa Clara River. According to a water balance assessment conducted by Stillwater Sciences (2011a, 2011b) for the fall/winter period of 2010, "groundwater was estimated to contribute approximately 15% of the inflow volume . . .". For the summer/spring 2010 period, "the groundwater contribution was estimated at 10 percent . . ." The Stillwater study also indicates that in the "Santa Clara River reach upstream of the estuary, groundwater provides the dry summer baseflow, if it exists, and is a quarter of the winter flow, based on the 2010 water year assessment." (TNC 2017, pp. 3-4).

3.1.4.3 Groundwater Quality [§354.14(b)(4)(D)]

Pages 45-50

The Draft GSP notes that:

> "SSP&A (2020) further concluded that there is no significant evidence for interactions between groundwater in the principal aquifers and shallow groundwater (CWP-510 is included here) or deeper, mineralized water. SSP&A (2020) also concluded that groundwater at the sample locations in the Basin is at least 1,000 years old. These conclusions together suggest that vertical movement of water percolating from land surface is not a major source of recharge to the principal aquifers, except where they are exposed at land surface in the northern portion of the basin." p. 46

The analysis and conclusion articulated here reflects a water supply for out-of-stream beneficial uses perspective that is pervasive throughout the Draft GSP. However, groundwater-surface interactions on smaller scale than would normally be considered in a traditional groundwater management program are relevant in considering the effects of groundwater management actions (including the timing, rate, and amount of groundwater extractions) on GDE such as the exist in the lower reaches of the Santa Clara River and the Santa Clara River Estuary.

3.1.4.4 Primary Beneficial Uses [§354.14(b)(4)(E)]

Pages 50-54

The Draft GSP recognizes that:

> "In addition to groundwater production from the principal aquifers, discharge of small quantities of groundwater from the shallow alluvial aquifer to the lower reach of the Santa Clara River and possibly one other

area in Mound Basin may contribute to groundwater-dependent ecosystems (GDEs). This potential beneficial groundwater use is further described in Section 3.2.6." p. 51

Despite the acknowledgement of groundwater-surface water interconnections, the Draft GSP concludes that because the shallow alluvial aquifer overlaying the Mound Basin is "rarely used for water supply", and the "likely limited, connection between Mound Basin shallow groundwater" there are not impacts to the GDEs by principal aquifer pumping, and therefore potential adverse Impacts will not be considered in the development of sustainable management criteria for the principal aquifers within the Mound Basin. For the reasons indicated above, this conclusion is not supported by the data presented in the Draft GSP. *See* additional Comments below regarding Appendix A, "Area 11- Lower Santa Clara River and Estuary."

The Draft GSP asserts:

"No data gaps or significant uncertainties were identified." p. 54

This claim is contradicted by the acknowledgement that "no aquifer test results for hydraulic conductivity or storativity were found in available references." p.39 *See* additional comments bellow on Monitoring Networks.

41

3.2 Groundwater Conditions [§354.16]

Pages 54-69

The Draft GSP notes that:

> "Groundwater elevation data are available for nearly 60 wells located within Mound Basin. However, not all of these wells are being monitored at present. The distribution of wells is heavily skewed towards the southern half of the Basin, with relatively few wells existing in the northern half of the Basin (north of Highway 126)." p. 54

The Draft GSP does not provide details regarding the well construction showing the intervals of the well through which groundwater enters the wells. Also, it is unclear if there are "sanitary plugs" installed in the wells that retard or prevent flow through shallow and deep aquifers. *See* comment above regarding the assertion that "No data gaps or significant uncertainties were identified."

42

3.2.1 Groundwater Elevations [§354.16(a)]

Page 54

The Draft GSP acknowledges that:

> "The contouring of groundwater levels in Mound Basin is complicated by the sparse data, particularly in the northern portion of the Basin." p. 54

42 *See* comment above regarding the assertion that "No data gaps or significant uncertainties were identified."

43 **3.2.2 Change in Storage [§354.16(b)]**

> "Similar to contouring of groundwater levels in Mound Basin (as described above), estimation of historical changes in groundwater stored in the Basin is complicated by sparse groundwater elevation data, particularly in the northern portion of the Basin and in HSUs with few monitoring points. Due to these limitations, annual and cumulative changes in groundwater in storage were estimated using United's (2018 and 2021a, 2021b) groundwater flow model, which is generally well calibrated on a regional scale to groundwater elevation measurements." p. 60

Groundwater models that are aimed at a "regional scale" are not likely to adequately describe changes in groundwater and surface water elevations (particularly base flows) that support localized GDE such as those associated with the lower Santa Clara River and the Santa Clara River Estuary, as well as other GDE within the Mound Basin identified by the California Department of Fish and Wildlife (2021). *See* comment above regarding the assertion that "No data gaps or significant uncertainties were identified."

3.2.3 Seawater Intrusion [§354.16(c)]

Pages 61-62

The Draft GSP notes that:

> "Due to the lack of evidence of seawater intrusion in onshore portions of the Basin and lack of data concerning the location of any offshore seawater intrusion front in the principal aquifers, the maps and cross-sections of the seawater intrusion front required pursuant to §354.16(c) cannot be prepared." p. 62

See comment above regarding the assertion that "No data gaps or significant uncertainties were identified."

3.2.6 Interconnected Surface Water Systems [§354.16(f)]

Pages 67-68

The Draft GSP notes that:

> "Data are not available to characterize the interconnection of Santa Clara River surface water and groundwater. Although the frequent perennial baseflow conditions imply that surface and groundwater is interconnected, it is not known specifically which groundwater in which units are

> connected and where. Of importance for this GSP, it is unknown whether the water table of the shallow alluvial aquifer in Mound Basin extends beneath the stream terrace deposits and intersects surface water in the Santa Clara River channel within the limits of Mound Basin." p. 67

However, the Draft GSP concludes that:

> "Regardless of the questions and uncertainty surrounding interconnection of shallow aquifer and/or stream terrace groundwater with the Santa Clara River baseflow, it can be concluded that there is no depletion of interconnected surface water in this area because neither unit has any known groundwater extractions within Mound Basin." p. 68.

As noted above, while the shallow alluvial aquifer laying about the Mound Basin may be "rarely used for water supply", it does not follow that there is "no depletion of interconnected surface water within the boundaries of the Mound Basin." Because water in the shallow alluvial aquifer can percolate to the aquifer below, reducing the groundwater level in the Mound Basin can result in lower groundwater levels in the shallow alluvial aquifer, thus affecting GDE associated with the shallow alluvial aquifer, including surface water in the lower Santa Clara River, and the Santa Clara River Estuary. *See* additional comments above regarding the physical properties of the Mound Basin, as well as those below regarding groundwater contribution the Santa Clara River Estuary.

3.2.7 Groundwater-Dependent Ecosystems [§354.16(g)]

Pages 68-69

The Draft GSP states that:

> " . . .it is noted that there is no known shallow groundwater extraction within Mound Basin. . . . Given the lack of potential for significant impacts to the GDEs by principal aquifer pumping, Area 11 [*i.e.*, lower Santa Clara River and Santa Clara River Estuary] will not be considered further in the development of sustainable management criteria for the principal aquifers." p. 69

As noted above the data presented in the Draft GSP does not support this assessment and conclusion. *See* additional comment above regarding the physical properties of the Mound Basin and those below regarding Appendix A, "Area 11- Lower Santa Clara River and Estuary."

3.3 Water Budget [§354.18]

Pages 70-97

See comments below regarding individual sub-sections of the Water Budget.

44 **3.3.1 Historical Water Budget [§354.18(c)(2)(B)]**

Pages 79-82

The Draft GSP notes that:

"The SGMA Regulations require that the historical surface water and groundwater budget be based on a minimum of 10 years of historical data." p. 79

The GSP does not refer to or account for the effects of the operation of the UWCD Vern Freeman Diversion on the lower Santa Clara River, which diverts, on average, over 62,000 acre-feet per year (AFY) from the main stem of the Santa Clara River (NMFS 2018). This diversion operation affects recharge to all of the lower Santa Clara River groundwater basins, not just the Fox Canyon Basin, including the shallow alluvial aquifer and the other deeper aquifers in within the Mound Basin. These operations have the potential to impact endangered adult and juvenile steelhead in the lower Santa Clara River and Santa Clara River Estuary (NMFS 2008a, 2018). The Draft GSP should therefore include as part of its water-budget analysis the operations of the Vern Freeman Diversion. Specifically, the relationship of groundwater management activities (including both recharge and groundwater extraction activities) and the effects of the related Vern Freeman Diversion on surface flows below the diversion and the maintenance of surface flows supported by groundwater should be explicitly addressed and disclosed in the revised GSP.

3.3.1.3 Impact of Historical Conditions on Basin Operations [§354.18(c)(2)(C)]

Pages 83-84

See comments above regarding Historical Water Budget.

3.3.2 Current Water Budget [§354.18(c)(1)]

Pages 84-86

As noted above, the GSP does not refer to or account for the effects of the operation of the UWCD Vern Freeman Diversion on the Lower Santa Clara River, but should as part of its current water budget. See comments above regarding the UWCD Vern Freeman Diversion.

3.3.3 Projected Water Budget

Pages 86-94

As noted above, the GSP does not refer to or account for the effects of the operation of the Vern Freeman Diversion on the Lower Santa Clara River, but should as part of its projected water budget. See comments above regarding the UWCD Vern Freeman Diversion.

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3.3.4.1 Overdraft Assessment

Pages 95-96

The Draft GSP notes that:

> "Review of the historical, current and projected groundwater budgets indicate small amounts of declining groundwater storage over time (469 and 147 for the historical and current periods, respectively), as shown in Table 3.3-03. These results suggest a minor amount of overdraft may have occurred during the historical and current period of 6.3% and 2.3%, respectively, of the groundwater pumping during that timeframe." p. 96

While the Draft GSP does not identify any significant impacts to out-of-stream water supply beneficial uses of the Mound Basin (and in fact projects a slight increase of 68 to 84 AF/yr) between 2022 and 2096, under the assumed future-precipitation rates modeled), the implications from this slight overdraft or increase in storage for any of the GDE associated with the Mount Basin, including the lower Santa Clara River and Santa Clara River Estuary, are unclear

3.4 Management Areas [§354.20]

Page 97

The Draft GSP indicates that:

"No management areas were established for this GSP". p. 97.

This decision appears to be the result, in part, of not recognizing any significant interconnected surface water or GDE within the boundaries of the Mound Basin. However, as noted above, the Mound Basin contains interconnected water and GDE. Additionally, the analysis in the Draft GSP is largely from a water supply perspective, with an emphasis on out-of-stream beneficial uses, and does not recognized water conductivity and storativity that is more relevant to instream beneficial uses associated with GDE, including but not limited to those in Area 11 (*i.e*., the lower Santa Clara River and Santa Clara River Estuary) .*See* comments above regarding the physical properties of the Mound Basin.

4.0 Sustainable Management Criteria [Article 5, SubArticle 3]

Pages 98-148 *See* comments below on individual sub-sections.

4.2 Sustainability Goal [§354.24]

Pages 90-100

The Draft GSP states, in part, that:

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> "The goal of this Groundwater Sustainability Plan (GSP) is to sustainably manage the groundwater resources of the Mound Basin for the benefit of current and anticipated future beneficial users of groundwater and the welfare of the general public who rely directly or indirectly on groundwater. Sustainable groundwater management will ensure the long-term reliability of the Mound Basin groundwater resources by avoiding undesirable results pursuant to the Sustainable Groundwater Management Act (SGMA) no later than 20 years from GSP adoption through implementation of a data-driven and performance-based adaptive management framework." P. 100

Nothing in the language of the goals specifically refers to the protection of instream beneficial uses associated with GDE of the Mount Basin, such as the lower Santa Clara River or the Santa Clara River Estuary. This appears to be the result, in part, of not recognizing any interconnected surface waters or GDE within the boundaries of the Mound Basin. However, as noted above, the Mound Basin contains interconnected surface water and GDE. *See* comments above regarding the physical properties of the Mound Basin.

4.3 Process for Establishing Sustainable Management Criteria [§354.26(a), §354.34(g)(3)]

Pages 101-102

See comments above regarding the interest of state and federal natural resource regulatory agencies such as NMFS, U.S. Fish and Wildlife Service, and the California Department of Fish and Wildlife, and the California Department of Parks and Recreation (which owns a portion of the Santa Clara River Estuary wetlands).

Evaluation of Potential Effects on Beneficial Uses and Users, Land Uses, and Property Interests [§354.26(b)(3)]

Pages 103-104

The discussion in this section is focused on out-of-stream beneficial uses of the groundwater resources of the Mount Basin, and does not directly address the instream beneficial uses of interest to state and federal natural resource regulatory agencies such as NMFS, U.S. Fish and Wildlife Service, and the California Department of Fish and Wildlife, and the California Department of Parks and Recreation. These would include, but are not limited to, the GDE associated with the lower Santa Clara River and the Santa Clara River Estuary.

Cause of Groundwater Conditions That Could Lead to Undesirable Results [§354.26(b)(1)]

Pages 104-105

The causes that could lead to undesirable results should include the operations of UWCD Vern Freeman Diversion on the lower Santa Clara River. *See* comments above, particularly regarding GDE.

4.4.2 Minimum Thresholds [§354.28]

Pages 105-107

None of the minimum thresholds in the Draft GSP deal specifically with the GDE associated with the Mound Basin, which include the lower Santa Clara River and the Santa Clara River Estuary. This is a significant omission from the Draft GSP that should be addressed in the revised Draft GSP for the Mound Basin.

4.4.2.2 Relationships Between Minimum Thresholds and Sustainability Indicators [§354.28(b)(2)]

Page 108

See general comment above regarding "Minimum Thresholds" and those below regarding "Criteria Used to Define Undesirable Results".

4.4.2.3 Minimum Thresholds in Relation to Adjacent Basins [§354.28(b)(3)]

Page 108

See general comment above regarding Minimum Thresholds and the operation of the UWCD Vern Freeman Diversion.

4.4.2.4 Impact of Minimum Thresholds on Beneficial Uses and Users [§354.28(b)(4)]

Page 108

See general comment above regarding "Minimum Thresholds" and those below regarding Criteria Used to Define Undesirable Results" below.

Groundwater Beneficial Users (All Types)

Page 109

Land Uses and Property Interests (All Types)

Page 109

See comments above regarding the interest of state and federal natural resource regulatory agencies such as NMFS, U.S. Fish and Wildlife Service, and the California Department of Fish and Wildlife, and the California Department of Parks and Recreation (which owns a portion of the Santa Clara River Estuary wetlands).

4.4.2.5 Potential Effects on other Sustainability Indicators [§354.28(c)(1)(B)]

Pages 109-110

See general comment above regarding "Minimum Thresholds" and those below regarding Criteria Used to Define Undesirable Results".

Depletion of Interconnected Surface Water

Page 110

The Draft GSP states that:

> "This sustainability indicator is not applicable to the Mound Basin." (p. 110)

As noted above, while the shallow alluvial aquifer laying about the Mound Basin may be "rarely used for water supply", it does not follow that there is "no depletion of interconnected surface water within the boundaries of the Mound Basin." Because water in the shallow alluvial aquifer can percolate to the aquifer below, reducing the groundwater level in the Mound Basin can result in lower groundwater levels in the shallow alluvial aquifer, thus affecting GDE associated with the shallow alluvial aquifer, including surface water in the lower Santa Clara River, and the Santa Clara River Estuary. *See* additional comments above the physical properties of the Mound Basin and the groundwater contribution the Santa Clara River Estuary.

4.4.2.6 Current Standards Relevant to Sustainability Indicator [§354.28(b)(5)]

Page 111

> "MBGSA [Mound Basin Groundwater Sustainability Agency] is unaware of any federal, state, or local standards for chronic lowering of groundwater levels." p. 110

While there is no general numeric standards for chronic lowering of groundwater levels, this statement fails to recognize the over-arching standards established by SGMA, particularly those intended to protect GDE.

4.4.2.7 Measurement of Minimum Thresholds [§354.28(b)(6)]

Page 111

> "Groundwater elevations will be directly measured to determine their relation to minimum thresholds. Groundwater level monitoring will be conducted in accordance with the monitoring plan outlined in Section 5." p. 111

The groundwater-monitoring plan only provides for annual monitoring. A more appropriate approach would be to monitor seasonally to account for the strong effect of seasonal changes in hydrologic and hydraulic conditions that are of significant to GDE, including, but not limited to, those associated with the lower Santa Clara River and the Santa Clara River Estuary. For example, monitoring towards the end of summer or beginning of fall, as well as the beginning of Spring each year could help inform groundwater and other natural resource managers of the effects of both recharge (natural and artificial) as well as groundwater pumping patterns on GDE within the Mound Basin such as the lower Santa Clara River and Santa Clara River Estuary.

Without shallow groundwater wells that would provide specific data on the relationship between groundwater levels and surface flows, a reliable assessment of the effects of extracting groundwater from these areas on GDE is not possible. This is a significant data gap that could be addressed by the installation of shallow groundwater wells (or piezometers) to better describe these relationships.

Additionally, data gathered from groundwater well monitoring should be correlated with stream flow in the lower Santa Clara River and surface water elevations in the Santa Clara River Estuary. This can and should be accomplished by added a stream flow gauges capable of monitoring base flows in the lower Santa Clara River between U.S. Highway 101 and the Harbor Boulevard Bridge, as well as one or more water surface elevation gauges within the Santa Clara River Estuary.

See general comment above regarding "Minimum Thresholds" and those below regarding "Criteria Used to Define Undesirable Results".

4.4.3 Measurable Objectives and Interim Milestones [§354.30(a),(b),(c),(d),(e),(g)]

Page 111

See general comment above regarding "Minimum Thresholds" and those below regarding "Criteria Used to Define Undesirable Results".

47 **4.4.3.1 Description of Measurable Objectives**
Western Half of Basin

Page 112

The Draft GSP notes that:

> "The chronic lowering of groundwater levels minimum thresholds in the western half of the Basin are superseded by the land subsidence proxy minimum thresholds. Therefore, the land subsidence proxy measurable objectives and interim milestones are adopted for the chronic lowering of groundwater levels measurable objectives in the western half of the Basin." p. 112

It is not clear how, or if, the land subsidence proxy for minimum thresholds is appropriate for instream beneficial uses associated by GDE supported by interconnected waters. *See* also, general comment above regarding Minimum Thresholds.

Eastern Half of the Basin

4.4.3.2 Interim Milestones [§354.30(e)]

Page 113

See general comment above regarding "Minimum Thresholds" and those below regarding "Criteria Used to Define Undesirable Results".

Western Half of Basin

Page 113

See general comment above regarding "Minimum Thresholds" and those below regarding "Criteria Used to Define Undesirable Results".

Eastern Half of Basin

Page 113

See general comment above regarding "Minimum Thresholds" and those below regarding "Criteria Used to Define Undesirable Results".

4.5 Reduction of Groundwater Storage

4.5.1 Undesirable Results [§354.26]

Pages 114-116

See general comment above regarding Minimum Thresholds.

Evaluation of Potential Effects on Beneficial Uses and Users, Land Uses, and Property Interests [§354.26(b)(3)]

The Draft GSP states that:

> "The evaluation of potential effects on beneficial uses and users, land uses, and property interests for the reduction of groundwater storage sustainability indicator is the same as for the other sustainability indicators and is incorporated herein by reference to Sections 4.4.2.4, 4.6.2.4, and 4.7.2.4.

And,

> "Reduction of groundwater storage has the potential to impact the beneficial uses and users of groundwater in the Mound Basin by limiting the volume of groundwater available that can be economically extracted for agricultural, municipal, industrial, and domestic use. These impacts

> can affect all users of groundwater in the Mound Basin. Groundwater elevations are used to determine whether significant and unreasonable reduction of groundwater in storage is occurring." p. 115

As noted previously, the Draft GSP should be revised to explicitly acknowledge the instream beneficial uses supported by the Mound Basin and its individual aquifers, including, but not limited to, the GDE associated with the lower Santa Clara River and Santa Clara River Estuary. The recognized instream beneficial uses for the portion of the lower Santa Clara River within the Mound Basin include: warm freshwater habitat, cold freshwater habitat, wildlife habitat, habitat for rare, threatened and endangered species, fish migration, and wetland habitat. Santa Clara River Estuary instream beneficial uses include: estuarine habitat, marine habitat, wildlife habitat, habitat for rare, threatened and endangered species, fish migration, spawning habitat, and wetland habitat.

Criteria Used to Define Undesirable Results [§354.26(b)(2)]

The Draft GSP states that:

> "The criteria used to define undesirable results for the reduction of groundwater storage sustainability indicator are based on the qualitative description of undesirable results, which is causing other sustainability indicators to have undesirable results. As explained in Section 4.5.2, groundwater levels will be used as a proxy for the reduction of groundwater storage sustainability indicator minimum thresholds. Based on the foregoing, the combination of minimum threshold exceedances that is deemed to cause significant and unreasonable effects in the basin for the reduction of groundwater storage sustainability indicator is the same as the combinations deemed to cause undesirable results for the land subsidence sustainability indicator (western half of the Basin) and chronic lowering of groundwater levels sustainability indicator (eastern half of the Basin) (Table 4.1-01)." p. 116

While groundwater levels are important indicator of the general condition of the groundwater basin, such metrics are not a substitute for metrics that are specifically aimed at informing management of the Mound Basin for the purpose of protecting instream beneficial associated with GDE within Mound Basin, including the lower Santa Clara River and the Santa Clara River Estuary. Specifically, these criteria do not address whether there may be significant stream flow depletion or lowered water surface elevation (from a biological perspective) caused by groundwater pumping within the Mound Basin. *See* general comment above regarding "Minimum Thresholds" regarding GDE.

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4.5.2.2 Relationships Between Minimum Thresholds and Sustainability Indicators [§354.28(b)(2)]

> "The minimum thresholds for the reduction of groundwater storage sustainability indicator allow groundwater levels to decline below

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> historical low levels in the eastern half of the Basin. Deeper groundwater levels could potentially increase underflow into the Mound Basin from the Oxnard and/or Santa Paula Basins (or decrease underflow to the Oxnard Basin), which could potentially contribute to undesirable results in those Basins. However, as noted above and in Section 4.4.2.1, the length of time that groundwater levels could remain below historical lows would be limited in order to prevent undesirable results for land subsidence in the western half of the Mound Basin; therefore, the potential effect on the adjacent basins is considered small." p. 118

This approach and analysis may be appropriate when considering groundwater supplies for out-of-stream beneficial uses for which there may be alternatives. However, it does not take into account the adverse effects of periodic reduction of groundwater on GDE, including the use by migrating, spawning or rearing steelhead. The effects of periodic groundwater reductions on out-of-stream beneficial uses (*e.g.*, domestic or agricultural water supplies) may be addressed with alternative water sources. However, instream uses such as GDE are more vulnerable to periodic groundwater reductions, because there is generally no alternative water source to sustain the GDE, and even a short-term depletion or limitation of stream flow or water surface elevation can be lethal to aquatic species.

4.5.2.4 Impact of Minimum Thresholds on Beneficial Uses and Users [§354.28(b)(4)]

Page 119

> "The effects on beneficial users and land uses in the Basin are the same as analyzed for the land subsidence sustainability indicator (western half of Basin) and chronic lowering of groundwater levels sustainability indicator (eastern half of Basin) and are incorporated herein by reference to Sections 4.4.2.4 and 4.8.2.4." p. 119

See the comments above regarding "Criteria Used to Define Undesirable Results" and Relationship Between Minimum Thresholds and Sustainability Indicators".

4.5.2.5 Current Standards Relevant to Sustainability Indicator [§354.28(b)(5)]

Page 119

"MBGSA is unaware of any federal, state, or local standards for reduction of groundwater storage." p. 119

As noted above, while there are no numeric standards, this statement does not appear to recognize the standards that that are established by SGMA, particularly regarding GDE.

4.5.2.6 Measurement of Minimum Thresholds [§354.28(b)(6)]

Page 119

See the comments above regarding "Minimum Thresholds", "Criteria Used to Define Undesirable Results" and "Relationship Between Minimum Thresholds and Sustainability Indicators."

4.5.3 Measurable Objectives and Interim Milestones [§354.30(a),(b),(c),(d),(e),(g)]

Page 120

See the comments above regarding "Minimum Thresholds", "Criteria Used to Define Undesirable Results" and "Relationship Between Minimum Thresholds and Sustainability Indicators."

4.5.3.1 Description of Measurable Objectives

Page 120

See the comments above regarding "Minimum Thresholds", "Criteria Used to Define Undesirable Results" and "Relationship Between Minimum Thresholds and Sustainability Indicators."

Western Half of Basin

See general comment above regarding "Minimum Thresholds" regarding GDE.

Eastern Half of Basin

See general comment above regarding "Minimum Thresholds" regarding GDE.

4.6 Seawater Intrusion

Pages 120-121

See comment above regarding the assertion that "No data gaps or significant uncertainties were identified."

4.6.1 Undesirable Results [§354.26]

Pages 122-124

See comment above regarding the assertion that "No data gaps or significant uncertainties were identified."

Process and Criteria for Defining Undesirable Results [§354.26(a)]

Page 122

See comments above regarding the interest of state and federal natural resource regulatory agencies such as NMFS, U.S. Fish and Wildlife Service, and the California

Department of Fish and Wildlife, and the California Department of Parks and Recreation (which owns a portion of the Santa Clara River Estuary wetlands).

Evaluation of Potential Effects on Beneficial Uses and Users, Land Uses, and Property Interests [§354.26(b)(3)]

Page 122

As noted previously, the Draft GSP should be revised to explicitly acknowledge the instream beneficial uses supported by the groundwater basin, including the GDE associated with the lower Santa Clara River and Santa Clara River Estuary. *See* comment above regarding "Process and Criteria for Defining Undesirable Results".

Criteria Used to Define Undesirable Results [§354.26(b)(2)]

Pages 123-124

See the comments above regarding "Minimum Thresholds", "Criteria Used to Define Undesirable Results" and "Relationship Between Minimum Thresholds and Sustainability Indicators."

4.6.2 Minimum Thresholds [§354.28]

4.6.2.1 Information and Criteria to Define Minimum Thresholds [§354.28(a), (b)(1),(c)(3)(A),(c)(3)(B), and (e)]

Page 124-125

See the comments above regarding "Minimum Thresholds", "Criteria Used to Define Undesirable Results" and "Relationship Between Minimum Thresholds and Sustainability Indicators."

4.6.2.2 Relationships Between Minimum Thresholds and Sustainability Indicators [§354.28(b)(2)]

Pages 125-126

See the comments above regarding "Minimum Thresholds", "Criteria Used to Define Undesirable Results" and "Relationship Between Minimum Thresholds and Sustainability Indicators."

4.6.2.3 Minimum Thresholds in Relation to Adjacent Basins [§354.28(b)(3)]

Page 126

See the comments above regarding "Minimum Thresholds", "Criteria Used to Define Undesirable Results", "Relationship Between Minimum Thresholds and Sustainability Indicators", the UWCD Vern Freeman Diversion.

4.6.2.4 Impact of Minimum Thresholds on Beneficial Uses and Users [§354.28(b)(4)]

Pages 126-127

See the comments above regarding “Minimum Thresholds”, “Criteria Used to Define Undesirable Results” and “Relationship Between Minimum Thresholds and Sustainability Indicators.”

4.6.2.5 Current Standards Relevant to Sustainability Indicator [§354.28(b)(5)]

Page 127

> “MBGSA is unaware of any federal, state, or local standards for seawater intrusion other than the WQOs included in the RWQCB-LA Basin Plan (RWQCB-LA, 2019). The minimum threshold for seawater intrusion is equal to the RWQCB Basin Plan WQO for chloride.” p. 127

This statement does not appear to recognize the broad standards that that are established by SGMA.

4.6.2.6 Measurement of Minimum Thresholds [§354.28(b)(6)]

Page 127

See the comments above regarding “Minimum Thresholds”, “Criteria Used to Define Undesirable Results” and “Relationship Between Minimum Thresholds and Sustainability Indicators.”

4.6.3 Measurable Objectives and Interim Milestones [§354.30(a),(b),(c),(d),(e),(g)]

Page 128

See the comments above regarding “Minimum Thresholds”, “Criteria Used to Define Undesirable Results” and “Relationship Between Minimum Thresholds and Sustainability Indicators.”

4.7 Degraded Water Quality

Pages 128-136

See the comments above regarding “Minimum Thresholds”, “Criteria Used to Define Undesirable Results” and “Relationship Between Minimum Thresholds and Sustainability Indicators.”

4.7.1 Undesirable Results [§354.26]

Page 130

See the comments above regarding "Minimum Thresholds", "Criteria Used to Define Undesirable Results" and "Relationship Between Minimum Thresholds and Sustainability Indicators."

Process and Criteria for Defining Undesirable Results [§354.26(a)]

Page 130

See comments above regarding the interest of state and federal natural resource regulatory agencies such as NMFS, U.S. Fish and Wildlife Service, and the California Department of Fish and Wildlife, and the California Department of Parks and Recreation (which owns a portion of the Santa Clara River Estuary wetlands).

Evaluation of Potential Effects on Beneficial Uses and Users, Land Uses, and Property Interests [§354.26(b)(3)]

Page 130

As noted previously, the Draft GSP should be revised to explicitly acknowledge the instream beneficial uses supported by the groundwater basin, including the GDE associated with the lower Santa Clara River and Santa Clara River Estuary. *See* comment above regarding "Process and Criteria for Defining Undesirable Results."

Cause of Groundwater Conditions That Could Lead to Undesirable Results [§354.26(b)(

Page 131

See the comments above regarding "Minimum Thresholds", "Criteria Used to Define Undesirable Results" and "Relationship Between Minimum Thresholds and Sustainability Indicators."

Criteria Used to Define Undesirable Results [§354.26(b)(2)]

Page 131

See the comments above regarding "Minimum Thresholds", "Criteria Used to Define Undesirable Results" and "Relationship Between Minimum Thresholds and Sustainability Indicators."

4.7.2 Minimum Thresholds [§354.28]

Page 131

See the comments above regarding "Minimum Thresholds", "Criteria Used to Define Undesirable Results" and "Relationship Between Minimum Thresholds and Sustainability Indicators."

4.7.2.2 Relationships Between Minimum Thresholds and Sustainability Indicators [§354.28(b)(2)]

Page 133

See the comments above regarding "Minimum Thresholds", "Criteria Used to Define Undesirable Results" and "Relationship Between Minimum Thresholds and Sustainability Indicators."

4.7.2.3 Minimum Thresholds in Relation to Adjacent Basins [§354.28(b)(3)]

Page 134

See the comments above regarding "Minimum Thresholds", "Criteria Used to Define Undesirable Results" and "Relationship Between Minimum Thresholds and Sustainability Indicators."

4.7.2.5 Current Standards Relevant to Sustainability Indicator [§354.28(b)(5)]

Page 135

As noted above, while there is are no numeric standard, this statement does not appear to recognize the standards that that are established by SGMA, particularly regarding GDE.

4.7.3 Measurable Objectives and Interim Milestones [§354.30(a),(b),(c),(d),(e),(g)]

Page 136

See the comments above regarding "Minimum Thresholds", "Criteria Used to Define Undesirable Results" and "Relationship Between Minimum Thresholds and Sustainability Indicators."

4.7.3.1 Interim Milestones [§354.30(e)]

Page 136

See the comments above regarding "Minimum Thresholds", "Criteria Used to Define Undesirable Results" and "Relationship Between Minimum Thresholds and Sustainability Indicators."

4.8 Land Subsidence

Page 137-148

As noted above, it is not clear how, or if, the land subsidence proxy for minimum thresholds is appropriate for within-stream beneficial uses associated by GDE supported by interconnected waters. *See* also, general comment above regarding Minimum Thresholds.

4.9 Depletions of Interconnected Surface Water

Page 148

The Draft GSP asserts that:

> "Depletions of interconnected surface water is not an applicable indicator of groundwater sustainability in the Mound Basin and, therefore, no SMC [Sustainable Management Criteria] are set. Section 3.2.6 Interconnected Surface Water Systems provides the evidence for the inapplicability of this sustainability indicator.| p. 148

As noted in the comments above, this statement and the conclusion associated with it are not supported by either the evidence or the analysis presented in the Draft GSP. Rather, the Draft GSP either ignores or mis-interprets the physical properties of the Mound Basin, and applies an inappropriate standard for the evaluation of potential effects of groundwater extraction from the Mound Basin on GDE within the Mound Basin, including, but not limited to the Area 11 (i.e., the lower Santa Clara River and Santa Clara River Estuary). Further, the Draft GSP fails to acknowledge or take into account the effects of the operation of the UWCD Vern Freeman Diversion on the lower Santa Clara River, which diverts, on average, over 62,000 acre-feet per year (AFY) from the main stem of the Santa Clara River (NMFS 2018). This diversion operation affects recharge to all of the lower Santa Clara River groundwater basins, not just the Fox Canyon Basin, including the shallow alluvial aquifer and the other deeper aquifers in within the Mound Basin.

4.10 Measurable Objectives and Interim Milestones for Additional Plan Elements [§354.30(f)]

Page 148

> "No measurable objectives were developed for the additional plan elements included in the GSP." p. 148

See the comments above regarding "Minimum Thresholds", "Criteria Used to Define Undesirable Results" and "Relationship Between Minimum Thresholds and Sustainability Indicators"

5.0 Monitoring Networks [Article 5, SubArticle 4]

Pages 149-177

The Draft GSP notes:

> "Surface flows in the Santa Clara River are measured daily by the VCWPD [Ventura County Watershed Protection District] at flow-gaging station '723 - Santa Clara River at Victoria Ave' located outside of the Basin. Data from this station are available online and can be downloaded

> annually to update this surface water component of the Mound Basin water budget (VCWPD, 2021). MBGSA intends to continue using data from these existing sources as input to United's model, which will in turn be used periodically to quantify changes in water-budget components. At present, this GSP does not contemplate development of a new monitoring network or modification of existing monitoring networks to obtain data regarding groundwater pumping, imported water, or recharge quantities because it is MBGSA's opinion that these water budget components are currently adequate for sustainable management of the Basin." p. 53

However, the Draft GSP earlier (p. 67) acknowledges that gauge 723 is poorly calibrated to measure low flows in the Santa Clara River. These lower flows, while of less importance from traditional water supply perspective, do provide important support for GDE such as those associated with the lower Santa Clara River and the Santa Clara River Estuary within the Mound Basin.

As noted above, the monitoring proposed is aimed at addressing the limited Sustainable Management Criteria. There is nothing identified in the monitoring program that addresses the potential effects of groundwater extractions on GDE, including the lower Santa Clara River channel and the Santa Clara River Estuary. Shallow groundwater wells within the alluvial overlaying the Mound Basin would provide specific data on relationship between groundwater levels and surface flows. This appears to be a significant data gap that should be addressed by the installation of shallow groundwater wells (or piezometers) to better described these relationships.

6.0 Projects and Management Actions [Article 5, SubArticle 5]

Pages 178-191

The Draft GSP indicates that"

> "No management areas were established for this GSP".

This decision appears to be the result, in part, on not recognizing any interconnected surface water or GDE within the boundaries of the Mound Basin. However, as noted above, the Mound Basin does contain interconnected water and GDE.

In addition to monitoring the effects of groundwater (and related surface water diversions) within the Mound Basin, the Draft GSP should recognized other management activities that affect both water supply for out-of-stream beneficial uses and GDE, including, but not limited to, the lower Santa Clara River and the Santa Clara River Estuary.

The introduction and spread of the non-native, invasive giant reed *Arundo donax* has degraded both terrestrial and aquatic habitats within the Mound Basin, including GDE associated with lower Santa Clara River and Santa Clara River Estuary. In addition to displacing native riparian habitat important to a number of terrestrial and aquatic species, including steelhead, *Arundo donax* draws heavily on groundwater, and can reduce stream flow (particularly bae flows) due to the interconnected nature of surface flows within the Mound Basin (The Nature Conservancy 2019, Stover *et al.* 2018, Dudley and Cole 2018). As part of its over-all groundwater management project, therefore, the MGBSA should include an aggressive Arundo donax removal program, coordinated with adjacent landowners, including the California Department of Parks and Recreation and the Ventura County Watershed Protection District.

See the comments above regarding "Minimum Thresholds", "Criteria Used to Define Undesirable Results" and "Relationship Between Minimum Thresholds and Sustainability Indicators."

7.0 GSP Implementation

Pages 192-198

See comment above regarding "Projects and Management Actions".

Appendix A to Draft Mound Basin GSP

Area 11 – Lower Santa Clara River and Estuary

Pages 7-8

The description of the lower reaches of the Santa Clara River and Santa Clara River Estuary is based almost entirely on Grossinger, *et al* (2011), which was largely limited to a description of the vegetative characteristics of the wetlands of the Southern California Coast. That study, while providing valuable information on the type and distribution of various vegetative communities, does not provide comparable information on aquatic species associated with the Santa Clara River or its Estuary. The habitats covered here are principally riparian and terrestrial, omitting coverage of various types of aquatic habitats. Also, the characterization did not reference the more focused historical investigation prepared by Beller *et al*. (2011), which provided additional information on the wetland resources of the lower Santa Clara River and Santa Clara River Estuary, though it also did not provide significant information on fish, wildlife, and other species associated with the GDEs within the Mount Basin.

As a result, the characterization of the habitats and species associated with the lower Santa Clara River and Santa Clara River Estuary is incomplete and misleading. For example, while the pre-historic size and complexity of the Santa Clara River Estuary has been substantially reduced significant habitats and habitat functions remain. These have been described in various publications that were not cited, and apparently not consulted, in preparing the draft GSP for the Mound Basin. For an overview of the species that currently utilize the lower Santa Clara River and Santa Clara River Estuary, *see* Stillwater Sciences (2011a) Focal Species Analysis and Habitat Characterization for the Lower Santa Clara River and Major Tributaries. Additional habitat and species information on the Santa Clara River Estuary can be can be found in Stillwater Sciences (2011b) Geomorphic Assessment of the Santa Clara River Watershed: Synthesis of the Lower and Upper Watershed Studies and CBEC (2015), Santa Clara River Estuary Habitat Restoration and Enhancement and Feasibility Study: Existing Conditions Technical Report, and Kelley (2004), Information synthesis and priorities regarding steelhead (*Oncorhynchus mykiss)* on the Santa Clara River." p. 148

Figure 5. Lower Santa Clara River – Looking northwest from Harbor Boulevard 11-4-04

The Santa Clara Estuary is known to support rearing juvenile steelhead (Kelley 2008). Steelhead that rear with in estuary have the potential for accelerated growth because of the abundance of food sources in the estuary; this accelerated growth prior to entering the ocean has been shown to increase ocean survival and growth (Bond 2006, Hayes, *et al*. 2008,).

The necessity of addressing the estuary is corroborated through studies that indicate the Santa Clara River Estuary is hydrologically connected to the upper aquifers within the Oxnard Subbasin (whether semi-perched, or simply shallow groundwater aquifers). According to a water balance assessment conducted by Stillwater Sciences (2011a, 2011b) for the fall/winter period of 2010, "groundwater was estimated to contribute approximately 15% of the inflow volume . . ." For the summer/spring 2010 period, "the groundwater contribution was estimated at 10 percent . . .". The Stillwater study also indicates that in the "Santa Clara River reach upstream of the estuary, groundwater provides the dry summer baseflow, if it exists, and is a quarter of the winter flow, based on the 2010 water year assessment." (TNC 2017, pp. 3-4).

The current conditions described in the TNS study and reflected in the Draft GSP do not represent the unimpaired groundwater elevations or surface flow conditions with the boundaries of the Mound Basin. Groundwater (whether semi-perched, or simply shallow groundwater aquifers) can also contribute to surface flows, influencing in the timing, duration, and magnitude of surface flows, particularly base flows. Groundwater that only seasonally supports surface flows can also contribute to the life-cycle of migratory fishes, such as steelhead, that can make use of intermittent flows for both migration and rearing.

Figure 6. Santa Clara River Estuary – Looking southwest from Harbor Boulevard 8-21-21

The Draft GSP also relies heavily on the Nature Conservancy's guidance for GDE analysis (TNC 2018, 2019, 2020)   According to this guidance, GDE are defined on their dependence on groundwater for all or a portion of their water needs. This method involves mapping vegetation that can tap groundwater through their root systems, assessing where the depth of groundwater is within the rooting depth of that vegetation, and mapping the extent of surface water that is interconnected with groundwater. The method used by The Nature Conservancy in identifying GDE is based on statewide data on "vegetation known to use groundwater", and therefore does not adequately reflect the uses made of groundwater by other biological resources, such as seasonal migration of fishes, or other organisms such as invertebrates that have differing life-cycle than plants (TNC 2018, 2019, 2020). While changes to riparian or other aquatic vegetation is an important component in assessing the ecological health aquatic habitats (Capelli and Stanley 1984, Faber *et al*. 1989), as it is used in the Draft GSP, it essentially as a substitute for other metrics, *e.g.,* such as measured effects on surface flows, or depth or extent of pool habitat (including estuarine habitat) in response to artificial depletion of groundwater levels.

In addition to supplying water to the root zone of plants, groundwater can also contribute to surface flows, influencing the timing, duration, and magnitude of surface flows, particularly base flows. These baseflows provide essential support to aquatic invertebrates, avian fauna, and fish species, including native resident and anadromous fishes.[4] Groundwater that only seasonally supports surface flows can still contribute to the life-cycle of migratory fishes, such as steelhead, and other native aquatic species. We would note that the pattern of alternating perennial and intermittent/or ephemeral surface flows are known as an “interrupted” surface flow regime, and is common in southern California watersheds, particularly where groundwater play a role in maintaining surface flows. These surface flows are important for juvenile *O. mykiss* attempting to emigrate out of the Santa Clara River watershed. Interrupting the timing, magnitude, and duration of these flows as a result of groundwater extraction can be deleterious to juvenile *O. mykiss*, and this potential effect should be addressed in the revised Draft Memorandum.

Figure 7. Santa Clara River Steelhead Smolts – From Santa Clara River Estuary 9-17-10

[4] The Santa Clara River also supports the anadromous Pacific lamprey (*Entosphenus tridentatus*) which currently falls under the jurisdiction of the U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife (Reid 2015, Booth 2015, 2017).

It should also be recognized that groundwater levels can be and often are exacerbated by groundwater extractions, as well as droughts. One of the primary purposes of SGMA is to identify these anthropogenic effects on groundwater levels (and the related GDE) so that groundwater resources may be managed in a way to protect all beneficial uses of groundwater, including fish and wildlife, such a southern California steelhead (as well as other native aquatic resources). Therefore, when revising the Draft GSP, every effort should be made to ensure that (1) all anthropogenic effects on the amount and extent of groundwater are properly and accurately cataloged, (2) practices are defined to remedy the cataloged effects on GDE, and (3) the practices are instituted and the effects adaptively managed to ensure GDE receive sufficient protection in accordance with the SGMA.

In addition to designating critical habitat for the federally listed endangered Southern California Steelhead DPS, NMFS identified intrinsic potential habitat in the watershed for this species as part of its recovery planning process (*See* Figure 3). As noted above, this habitat includes migration corridors to spawning and rearing habitat. Within the Mound Basin, NMFS identified intrinsic potential habitat in lower Santa Clara River and Santa Clara River Estuary. The ability of these habitats to provide a migratory corridor to spawning rearing opportunities (including within the Santa Clara River Estuary) has been negatively affected by surface water diversions and groundwater extractions. Reducing the connectivity between the mainstem of the Santa Clara River and the Santa Clara River Estuary impairs the intrinsic potential of these designated critical habitats. Restoring and maintaining surface hydrologic connectivity for steelhead attempting to migrate to or emigrate out of these major tributaries to the middle and lower reaches of the Santa Clara River is an important objective of NMFS's Southern California Steelhead Recovery Plan.

Ensuring groundwater recharge (and control of groundwater extraction for out-of-stream uses) can be an important mechanism for protecting base flows that are critical for the rearing phase of juvenile steelhead (as well as other native aquatic resources). Maintaining groundwater levels can serve as a buffer against projected climate change effects on stream flow. For a recent assessment of the effects of climate change of mean and extreme river flows, and effects of over pumping of groundwater basins on stream flow, *see* Burke *et al.* (2021), Gudmundsson *et al*. (2021), Jasechko (2021).

While groundwater-influenced flows by themselves may not be sufficient to support perennial flows in the lower Santa Clara River, or maintain appropriate water levels in the Santa Clara River Estuary, they can nevertheless support seasonal use of this reach of the Santa Clara River for migratory or rearing purposes, depending on the amount and timing of annual rainfall and runoff and the groundwater elevation. Recognition of these GDE should be explicit, and the GSP should ensure that these GDE are not unreasonably impacted by groundwater extraction from the Mound Basin.

The statements that "neither geologic units [*i.e.*, shallow alluvial aquifer and stream terrace deposits] has any know groundwater extractions within the Mound Basin" and "there is not significant evidence for interactions between the groundwater in the principal aquifers and shallow groundwater" is not supported by the analysis or the applicable regulations. As noted above, while there may be no regular withdrawals form the shallow alluvial aquifer, withdrawals from the deeper geologic units can, because of the fault discontinuities, create a hydraulic connection between aquifers and "aquitards". Lowering the hydraulic head in deep aquifers will induce a vertical downward movement of groundwater from the shallow aquifer, which in turn, is hydraulically connected to the Santa Clara River and the Santa Clara River Estuary.

The Draft GSP notes that:

> Given the possible, but likely limited, connection between Mound Basin shallow groundwater and the iGDEs, Area 11 is retained as a GDE pursuant to TNC's 'precautionary principle' (TNC 2018). However, given the lack of potential for significant impacts to the GDE by principle aquifer pumping, Area 11 will not be considered further in the development of sustainable management criteria for the principal aquifers. p. 8.

And adds:

> "However, the GSP will include a management action to monitor well permit applications for proposed uses of shallow groundwater in the vicinity of Area 11. If any shallow wells are proposed, MBGSA will require the applicant to evaluate impacts to the Area 11 GDEs pursuant to the California Environmental Quality Act prior to issuing a permit. Proposed uses that would have a significant impact to Area 11 GDEs would be required to mitigate those impacts as a condition of MBGSA permit approval" p. 8

These statements warrants several comments:

First, the TNS "precautionary principle" is focused, as is the general approach, on GDE that are defined largely by vegetative characteristics, and does not provide specific guidance for other types of GDE such as aquatic habitats that are dependent in or in part on groundwater inputs, such as the lower Santa Clara River and the Santa Clara Estuary;

Second, the conclusion that there is little potential for significant impacts to the Area 11 GDE (or the other 10 GDE within the Mound Basin) is not supported by the evidence presented in the Draft GSP, and in fact is inconsistent with the evidence (see, in particular, the longitudinal cross-section A-A' in Figure 3.1-05 of the Draft GSP); and

Third, the related proposal to limit consideration of impacts only to wells drawing directly from the shallow alluvial aquifer overlying the Mound Basin is not consistent with the requirements of SGMA. The proposal to rely on the procedures of the California Environmental Quality Act (CEQA) to identify and mitigate any impacts is also inappropriate. CEQA is not a substitute for SGMA (Belin 2018, Rohde *et al*. 2018, California Department of Fish and Wildlife 2019)

GSPs are required to: a) identify and consider impacts to GDE; b) consider all beneficial uses and users of groundwater; c) identify and consider potential effects on all beneficial uses and users of groundwater; d), establish sustainable management criteria that avoid undesirable results, including depletion of interconnected surface waters that have a significant and unreasonable adverse impact on the beneficial uses of surface waters (including instream beneficial uses), e) describe monitoring networks that can identify adverse impacts to beneficial uses of interconnected surface waters; and f).account for groundwater extraction for all uses or sectors, including wetlands such as those associated with the lower Santa Clara River and Santa Clara River Estuary. (23 CCR, Sections 354.10 et. Seq.)

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67

Global Comments

Please update references to City's most recent UWMP, CWRR, and WSECP.

68

ES-1, page ES-iii

"Other sources of water supply for the Basin include groundwater pumped from City of Ventura wells located in the adjacent Santa Paula and Oxnard Basins and from the Upper Ventura River Basin (not an immediately adjacent basin), and surface water imported from the Ventura River Watershed, which is purchased from Casitas MWD. Although Mound Basin groundwater is an important source of water supply for the communities located within the Basin, the communities are not considered to be "dependent" on Mound Basin groundwater because it is only one component of the City's water supply portfolio. In contrast, agricultural beneficial users are heavily dependent on groundwater pumped from the Mound Basin as they currently do not have an alternative water supply."

For the first sentence above, the City's Ventura River water should be characterized as subsurface water extracted from shallow groundwater wells in the Upper Ventura River Basin.

For the second sentence above, the City *is* dependent on the Mound Basin groundwater. The sentence should be revised to state that, "The communities located within the Basin rely on Mound Basin groundwater, even though the City does have other sources of water supply in its water supply portfolio." For the third sentence, the phrase "in contrast," should be deleted.

69

Table ES-1, page ES-vii

The term "Change in Storage" should be clarified to mean change in storage available, as opposed to a change in the amount of groundwater in storage. Upon first use, please add a footnote clarifying the meaning for the non-technical reader, and please note that this applies to the use of that term throughout the GSP.

70

Acronyms and Abbreviations, page xx

Please change the definition of "Ventura Water" to "the City of Ventura's water and wastewater department"

71

2.1.4 Legal Authority, page 5

Comment also from MBGSA public hearing on 11/11/21

Please replace the paragraph on the City of San Buenaventura with the following:

"The City of San Buenaventura (usually referred to as Ventura), located on the shore of the Pacific Ocean in western Ventura County, was founded as a Spanish mission in 1782 and incorporated as a town in 1866 and is the county seat of Ventura County. The City administers land use within its municipal boundaries and is the largest land use jurisdiction within the Basin. Ventura Water (the City of Ventura's water and wastewater department) provides retail potable water service within the City limits and portions of unincorporated Ventura County that meet the City's policy for water connections outside City limits (Municipal Code Section 22.110.055). The City's potable water supply is derived from a variety

71 of sources, including Mound Basin groundwater. Sources located outside of the Mound Basin include groundwater pumped from the adjacent Santa Paula and Oxnard Basins, subsurface water from the Ventura River (Upper Ventura River Valley Basin), and Lake Casitas (Casitas Municipal Water District [Casitas MWD]). The City also provides recycled water from the Ventura Water Reclamation Facility (VWRF). The City operates its water supply system by utilizing a conjunctive use operating procedure. The City relies more heavily on surface water sources (such as the Ventura River and Lake Casitas) during wet years while letting groundwater sources rest. During dry years, when the surface water sources are reduced, the City relies more heavily on groundwater sources to meet demands. Conjunctive use of groundwater sources is limited by the requirement to maintain long-term production from the groundwater basins within their safe or operational yield. Conjunctive use also requires treatment and blending ratios to meet water quality goals. The City also has an entitlement from the California State Water Project (SWP) of 10,000 acre-feet per year (AF/yr). To date the City has not received any of this water because there are no existing facilities to get the water directly into the City's distribution system. However, the City is currently working on the design of the State Water Interconnection Project that will enable the City to receive its State Water allocation through a connection to Calleguas Municipal Water District. Additionally, the City is currently in the planning and design phases for the proposed VenturaWaterPure Program, which includes diversion of tertiary treated effluent to a new Advanced Water Purification Facility for potable reuse. Construction of these Projects is expected to begin in 2023."

72 **2.2.1, page 7**

Please change this sentence: "Sources of water for the M&I sector in Mound Basin include local groundwater pumped from City of Ventura wells in the Basin, groundwater pumped by the City of Ventura from the adjacent Santa Paula and Oxnard Basins and from the Upper Ventura River Basin (not an immediately adjacent basin), and surface water imported from the Ventura River Watershed, which is purchased from Casitas MWD."

To the following: "Sources of water for the M&I sector in Mound Basin include local groundwater pumped from City of Ventura wells in the Basin, groundwater pumped by the City of Ventura from the adjacent Santa Paula and Oxnard Basins, subsurface water pumped by the City from the Ventura River / the Upper Ventura River Basin (not an immediately adjacent basin), and surface water purchased from Casitas MWD."

73 **2.2.1, page 8**

"Although Mound Basin groundwater is an important source of water supply for the communities located within the Basin, the communities are not considered to be "dependent" on Mound Basin groundwater because it is only one component of the City's water-supply portfolio."

The City is dependent on Mound Basin groundwater. Please modify accordingly.

74 **2.2.2.2, page 9**

Update reference to City's Urban Water Management Plan and Water Shortage Event Contingency Plan to 2020.

75 **2.2.3.1, page 9**

Comment also from MBGSA public hearing on 11/11/21

75 Comment also from MBGSA public hearing on 11/11/21

Replace reference to “Oxnard” Subbasin in the last full paragraph on Page 9 with “Mound” Subbasin.

76 **2.2.3.2, page 18** Comment also from MBGSA public hearing on 11/11/21

Please add the following sentence: “Additionally, groundwater production wells within the City limits of the City of Ventura require a water well agreement with the City of Ventura pursuant to Chapter 8.150 of the San Buenaventura Municipal Code.”

77 **Page 21** Comment also from MBGSA public hearing on 11/11/21

Typo in City of San Ventura – should be City of San Buenaventura.

78 **Section 3.1.4.4**

We discussed potential issues with the City well depictions. Please review the text and update as you see appropriate.

Appendix G

Assessment of Shallow Alluvial Deposits and Interconnected Surface Water in the Mound Basin

Appendix G

Assessment of Shallow Alluvial Deposits and Interconnected Surface Water in the Mound Basin

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1.0 Introduction

This appendix was prepared in response to comments on the draft version of the Mound Basin Groundwater Sustainability Plan (Draft GSP) that was released for public review in June 2021. In general, the comments received from several resource agencies and non-governmental organizations expressed concerns about the absence of sustainable management criteria (SMC) and limited monitoring of the Shallow Alluvial Deposits to address concerns about groundwater dependent ecosystems (GDEs, both riparian and aquatic), including the “depletions of interconnected surface water” sustainability indicator. The Draft GSP explained that the riparian GDEs may, in some cases, utilize groundwater from the Shallow Alluvial Deposits (particularly within the floodplain of the Santa Clara River). Similarly, the Draft GSP stated that the Shallow Alluvial Deposits discharge minor amounts of groundwater to Santa Clara River and its estuary. However, the Draft GSP also explained that there is no current or planned groundwater extraction from wells screened in the Shallow Alluvial Deposits and that groundwater extractions from the deep, confined aquifers of the Basin do not materially affect groundwater levels in the Shallow Alluvial Deposits or surface flows in the Santa Clara River. For this reason, there are no impacts to the riparian and aquatic GDE beneficial uses that needed to be considered during SMC formulation. Similarly, owing to the lack of impacts, the need for detailed monitoring of Shallow Alluvial Deposits and Santa Clara River flows is limited. In review of the comments, it was clear that the Draft GSP could be improved by providing more information about groundwater conditions in the Shallow Alluvial Deposits and further information to support the conclusion that shallow groundwater levels and Santa Clara River flows are not materially affected by groundwater extraction in the Mound Basin. Hence, the development of this appendix.

The purpose of this appendix is to provide additional documentation of the technical data that support the conclusions that the Shallow Alluvial Deposits hydrostratigraphic unit (HSU) is not a principal aquifer and that that shallow groundwater levels and Santa Clara River flows are not materially affected by groundwater extraction in the Mound Basin. Specifically, this appendix provides the following information:

1) The characteristics of the Shallow Alluvial Deposits HSU and explanation of why it is not considered a principal aquifer in Mound Basin.
2) Additional evidence supporting the conclusion that there is a lack of material hydraulic connection between the shallow groundwater with the much deeper principal aquifers used for water supply in Mound Basin (the Mugu and Hueneme Aquifers).
3) Additional evidence supporting the conclusion that there is a lack of material hydraulic connection between the Santa Clara River (and its estuary) and the principal aquifers used for water supply in Mound Basin (the Mugu and Hueneme Aquifers).

These topics are meant to provide further explanation as to why the Shallow Alluvial Deposits HSU is not a principal aquifer and why SMC included in the GSP do not have significant effects on beneficial uses of shallow groundwater and interconnected surface water in the Mound Basin GSP. This appendix addresses the approximately 1-mile reach of the Santa Clara River within Mound Basin between the estuary and the Oxnard Basin boundary, as shown on Figures G-1 and G-2, where a GDE has been identified. The sources of data and interpretations provided in this appendix largely consist of the references cited in the Draft GSP document and the groundwater modeling conducted by United Water Conservation District (United) in support of GSP development. Additional sources of information that were not referenced or included in the Draft GSP are referenced in this appendix.

2.0 Comparison of Shallow Alluvial Deposits to Principal Aquifer Criteria

The Sustainable Groundwater Management Act (SGMA) defines "principal aquifers" as "aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems." Review of hydrogeologic studies ranging in publication date from six decades ago (DWR, 1959; John F. Mann & Associates, 1959) to just 1 year ago (Hopkins, 2020) indicate that groundwater from the Shallow Alluvial Deposits of Mound Basin has rarely, if ever, been extracted for water supply. Groundwater-use data from Ventura County and United confirm that no significant groundwater extraction has occurred in the Shallow Alluvial Deposits in the available period of record (starting in 1980; included in the GSP dataset submitted to DWR). This appears to be because these shallow deposits are thin, discontinuous, and provide unreliable quantity and quality of groundwater due to natural conditions; specifically, the depositional history and environments for the sediments present in the shallow zone, exacerbated by the lack of hydraulic connection of these deposits with deeper aquifers that could otherwise provide a significant source of acceptable quality groundwater.

United and a few other investigators (referenced below) have occasionally referred to the shallow, relatively coarse-grained Holocene alluvial fan deposits, stream-terrace deposits, and active wash (or floodplain) deposits along the Santa Clara River and smaller barrancas in the basin as an "aquifer." However, the Shallow Alluvial Deposits in Mound Basin have never been reported to store, transmit, or yield significant or economic quantities of groundwater to wells or springs, and the most recent comprehensive investigation of the lower Santa Clara River to date (Stillwater Sciences, 2018) indicates that the contribution of groundwater from this HSU to surface water is small compared to other sources of surface flow; this comports with the GSP water budget calculations (GSP Section 3.3), which are discussed further below.

Based on these assessments and comparisons, in addition to the review of historical references below, the Shallow Alluvial Deposits HSU does not fit the definition of a principal aquifer.

2.1 Review of Historical References to the Shallow Alluvial Deposits HSU

As was noted in the GSP, the Shallow Alluvial Deposits HSU is composed of moderately to poorly sorted interbedded sandy clay with some gravel (See GSP Section 3.1). An early comprehensive investigation of hydrogeologic conditions in the groundwater basins along the Santa Clara River (John F. Mann Jr. & Associates, 1959) did not recognize the Shallow Alluvial Deposits within Mound Basin as an aquifer, nor were extraction rates reported from the depth-equivalent "Semi-perched Aquifer" in the adjacent Oxnard Basin. Also in 1959, DWR's Bulletin No. 75 noted that the alluvial deposits in Mound Basin "consist of yellow clay that has intercalated lenses of sand and gravel," and noted that the upper part of the San

Pedro Formation (which includes the Hueneme and Fox Canyon Aquifers) "form the principal sources of ground water in this basin."

In 1972, Geotechnical Consultants, Inc. (GTC), conducted a hydrogeologic investigation of the Mound Basin "for the purpose of locating well sites for additional groundwater supplies for the City of San Buenaventura." GTC did not identify the Shallow Alluvial Deposits as a potential source of developable groundwater in their report. The GTC (1972) investigation tabulated water quality data for wells less than 300 feet deep, noting that the data indicated the presence of "exceptionally high concentrations of sulfate, chloride, nitrate, boron, and total dissolved solids (TDS) for all time periods considered" (1950-1969), implying that groundwater in the Shallow Alluvial Deposits and underlying clay-rich strata were unsuitable for water supply purposes.

In 1996, Fugro West, Inc. (Fugro), provided an update on an investigation they were conducting on behalf of the City of Ventura for further development of groundwater supplies in Mound Basin. In their update report, Fugro stated that the "aquifers in Mound Basin are confined by an approximate 300-foot-thick layer of low permeability, aquiclude materials . . . Recharge occurs as subsurface underflow from the Santa Paula Basin and as local recharge from the Ventura foothills" (Fugro, 1996). Fugro's update report did not mention the Shallow Alluvial Deposits as an aquifer.

In the 1990s, the U.S. Geological Survey (USGS) investigated hydrogeologic conditions throughout the Santa Clara River and Calleguas Creek watersheds, including Mound Basin, for the purpose of developing a regional-scale groundwater flow model (Hanson et al., 2003). The USGS investigation report did not describe the Shallow Alluvial Deposits specifically within Mound Basin as an "aquifer," but did extend the area they mapped as "Alluvium (Shallow Aquifer)" across their entire model domain, which includes the Mound Basin. They noted that "With the exception of recent coarse-grained channel deposits along the Santa Clara River and Calleguas Creek, the thin layer of Holocene deposits that are not coincident with minor tributaries are relatively fine grained and relatively low in permeability," indicating that they would not likely yield much water to wells, springs, or surface water systems. Hanson et al. (2003) added that "water quality (in the shallow aquifer) is poor throughout most of the Oxnard Plain and Pleasant Valley subbasins and consequently few wells are perforated opposite this aquifer." Water quality in the Shallow Alluvial Deposits in Mound Basin was not explicitly called out by Hanson et al. (2003) in their report; however, data reviewed for this GSP demonstrate that shallow water quality conditions are also poor in the Mound Basin. As noted above, this line of thinking (that poor groundwater quality and yield makes the shallow groundwater unusable as an aquifer for water supply) applies to the Mound Basin as well as the Oxnard and Pleasant Valley Basins.

In 2018, Stillwater Sciences conducted a detailed analysis of "Physical and Biological Conditions of the Santa Clara River Estuary" (the estuary is abbreviated as "SCRE" throughout the Stillwater Sciences report), including investigation of groundwater conditions within the Shallow Alluvial Deposits underlying and adjacent to the lower Santa Clara River in Mound Basin and the adjacent Oxnard Basin. Stillwater Sciences (2018) notes that, "The lowermost reach" (of the Santa Clara River) "leading into the SCRE supports perennial, albeit low volume, flow during most water-year types. This baseflow, which is driven by inputs from the semi-perched aquifer, is partly enhanced by seasonal agricultural runoff, particularly on the northern floodplain." The Stillwater Sciences reference to the Semi-perched Aquifer in this sentence suggests that the source of the observed perennial flow is primarily upstream from Mound Basin, in Oxnard Basin, where the Semi-perched Aquifer is present. As discussed later in this appendix, the quantity of groundwater discharged from the Shallow Alluvial Deposits in Mound Basin to the Santa Clara River is very small in relation to other sources.

The most recent investigation of groundwater production and hydrogeologic conditions in Mound Basin was conducted by Hopkins Groundwater Consultants, Inc. (Hopkins), in 2020. The Hopkins investigation refers to "shallow confined zones," sometimes referred to in the Hopkins report as a "shallow aquifer," that are not used as a source of groundwater for water supply in the basin, and therefore do not meet the SGMA definition of a principal aquifer. Hopkins (2020) further notes that the HSUs used for water supply in Mound Basin are those HSUs identified in the GSP as the Mugu, Hueneme, and Fox Canyon aquifers.

In summary, historical investigators of the Mound Basin have not identified the Shallow Alluvial Deposits as an important water-bearing unit in the Mound Basin that would fit the SGMA definition of a "principal aquifer."

2.2 Distinct Lithologic Facies of the Shallow Alluvial Deposits

As noted in Section 3.1 of the GSP, the Shallow Alluvial Deposits HSU is present across much of Mound Basin (absent only in the foothills in the north part of the basin). Considered in their entirety, the thickness of these deposits ranges from 50 to 100 feet, and they consist mostly of Holocene alluvial fan deposits (USGS, 2003a, 2003b, 2004; Gutierrez et al., 2004), including moderately to poorly sorted interbedded sandy clay with some gravel. Such poorly sorted deposits dominated by clay are not a suitable target for groundwater development, explaining why no wells are known to target the Shallow Alluvial Deposits in Mound Basin for water supply. However, some important distinctions are worth noting with regard to the lithologic facies present within the near-surface deposits along the Santa Clara River in Mound Basin.

Stillwater Sciences (2018) reported that the piezometers installed for the City of Ventura's estuary studies along the Santa Clara River encountered varying lithologies, including silty sand, gravelly sand, and clay layers, as well as clayey, silty, and gravelly sands, with highly variable hydraulic conductivities (ranging from 1 to 100 feet per day). Geologic maps (USGS, 2003a, 2003b, 2004; Gutierrez et al., 2004) indicate that surficial and near-surface sediments in this area consist of the following (shown on Figure 3.1-03 of the Draft GSP; attached herein as Figure G-3):

- Recent active wash deposits within the main channel of the Santa Clara River containing abundant sand and gravel, and up to 40 feet thick.
- Up to three levels of Holocene stream terrace deposits adjacent to and within ½ mile of the north and south banks of the Santa Clara River, including point bar and overbank deposits consisting of poorly sorted clayey sand and sandy clay with gravel, typically several feet thick, but potentially up to 20 feet thick or more in some locations.
- Holocene alluvial and colluvial deposits associated with the Santa Clara River but located ¼ to ½ mile from the river between the Holocene stream terrace deposits and the Holocene alluvial fan deposits.
- Recent artificial fill, typically less than 10 feet thick, but up to 15 feet thick in some locations, consisting of sand, asphalt, and concrete (Hopkins, 2018).

As described in Section 3.1 of the Draft GSP, some of these thin terrace and other alluvial deposits associated with the Santa Clara River can be expected to contain shallow perched zones where agricultural return flows and infiltrated rainfall have collected above low-permeability layers (e.g., clay). Groundwater in these perched zones can flow laterally toward the Santa Clara River to contribute very small amounts (relative to the total Mound Basin groundwater budget, as described in Section 3.3 of the Draft GSP) to surface water flows or to meeting the evapotranspiration (ET) demands of vegetation near the river. In addition to water in these shallow perched zones, perched groundwater within saturated layers and lenses of the Holocene alluvial fan deposits in Mound Basin (north of the active channel and stream terrace deposits along the Santa Clara River) likely flows southward toward the river and may be able to enter the stream-terrace deposits or active channel deposits, possibly contributing to surface flows. Specific quantities of groundwater estimated by previous investigators to discharge to the Santa Clara River are discussed below.

2.3 Groundwater Discharge to the Santa Clara River

As noted in the most recent and detailed study specific to the Santa Clara River estuary (Stillwater Sciences, 2018), the Shallow Alluvial Deposits along the lower Santa Clara River in Mound Basin and the adjacent Oxnard Basin are "underlain by a clay layer, thereby disconnecting the SCRE (estuary) from the deeper subbasin aquifers…" Because the lower reach of the river is hydraulically disconnected from principal aquifers in Mound and Oxnard basins, the "low volume" of perennial baseflow observed in this reach during most years "is driven by inputs from the semi-perched aquifer" (the referenced "semi-perched aquifer" is only present in the Oxnard Basin, and is believed to discharge some groundwater to the Santa Clara River upstream from Mound Basin) and "is partly enhanced by seasonal agricultural runoff, particularly on the northern floodplain" (Stillwater Sciences, 2018).

Stillwater Sciences (2018) provided details regarding surface-water flows in the Santa Clara River and its estuary in Mound Basin, including an estimate of the quantity of groundwater discharge to surface flows in the river. Stillwater Sciences (2018) summarized flows in the portion of the river in Mound Basin as follows: "Overall, the river and SCRE (estuary) naturally experience a wide variation of flows, punctuated episodically by short-duration but intensive channel-/lagoon-adjusting flood events." They also note that "Over the long-term record, February has experienced the highest monthly flows (~750 cfs [cubic feet per second] in the lower river) while August and September have experienced the lowest flows (~1 cfs in the lower river)." The high flows (750 cfs) represent storm flows occurring during and immediately following precipitation events, usually in winter, while the low flows (1 cfs, equivalent to 724 acre-feet per year [AF/yr]) generally occur in summer and fall, and include, among other sources, a small component of groundwater discharge to surface water (Stillwater Sciences, 2018).

Stillwater Sciences (2018) estimated groundwater discharge to the Santa Clara River from Mound Basin during the period from January 2015 to December 2016 to be 0.2 to -0.3 cfs (negative values represent flow of surface water to groundwater, as recharge). These discharge and recharge quantities occurred along the area designated "North Bank Floodplain-West" in the Stillwater Sciences (2018) report, located along the north bank of the river between Harbor Boulevard and the boundary with the Oxnard Basin.

Stillwater Sciences (2018) listed other, higher-volume discharges to the Santa Clara River along other reaches of the Santa Clara River in Mound Basin as "groundwater." However, the sources for these larger discharge volumes include treated wastewater (0.7 to 1.6 cfs) from the Ventura Water Reclamation

Facility wildlife/polishing ponds ("North Bank Floodplain-Ponds"), and river bank storage changes (-5 to +5 cfs, averaging approximately 0 cfs) resulting from short-term, groundwater-surface water exchanges in response to changes in surface-water levels in the estuary following breaching or formation of the barrier berm ("South Bank Floodplain [GW-1 through GW-3]"). Stillwater Sciences (2018) also estimated "unmeasured flows" consisting of groundwater discharging to surface water in the Santa Clara River between the Victoria Avenue bridge (in Oxnard Basin) to the estuary (in Mound Basin) ranging from a minimum of 0.08 cfs (July 2017) to 2.1 cfs (2009 and 2010).

The Stillwater Sciences' (2018) summary of contributors to surface flow in the lower Santa Clara River in Mound Basin indicates that groundwater discharge from the Shallow Alluvial Deposits is a small component of total flow in the river, compared to other flow components entering and exiting Mound Basin. This conclusion is further supported by modeling, as discussed below. Moreover, a significant portion of the groundwater discharge reported above is likely tile drain and/or perched groundwater associated with agricultural return flows in the irrigated fields, which border the Santa Clara River.

Groundwater modeling conducted by United in support of GSP development (United, 2021; detailed tables, figures, and additional references provided in the main text of the GSP) indicate that groundwater discharge to the Santa Clara River within Mound Basin is typically 0.2 to 0.6 cfs during low-rainfall ("dry") years, and -2 to -3 cfs (representing recharge, rather than discharge) during high-rainfall ("wet") years (see Figure 3.3-02 of the Draft GSP for annual model-estimated groundwater/surface water exchanges in the Santa Clara River in Mound Basin; attached herein as Figure G-4). These values are much smaller than the estimated average of 197 cfs entering Mound Basin from Oxnard Basin as surface flows in the Santa Clara River from 1986 through 2019 (Draft GSP Table 3.3-02, flows converted from acre-feet).

3.0 Lack of Material Influence of Principal Aquifer Pumping on Shallow Groundwater Levels and Santa Clara River Flows

Prior investigations and available data clearly indicate negligible influence of groundwater extraction from the principal aquifers on shallow groundwater levels and interconnected surface water along the Santa Clara River within the Mound Basin.

3.1 Summary of Hydrogeologic Investigations

As described in the GSP and supported by multiple references cited in the Draft GSP (e.g., John F. Mann Jr. & Associates, 1959; GTC, 1972; Fugro, 1996; United, 2012; Stillwater Sciences, 2018; Hopkins, 2018), a 100- to 400-foot thick, low-permeability aquitard consisting largely of silt and clay referred to as "fine-grained Pleistocene deposits" separates the Shallow Alluvial Deposits from the underlying Mugu Aquifer both physically and hydraulically in the Mound Basin. A similar, albeit thinner, fine-grained zone known as the "clay cap" separates the semi-perched aquifer from the underlying Oxnard Aquifer in the adjacent Oxnard Basin (Hanson et al., 2018; United, 2018). Plate 10 in the Hopkins (2018) report, included herein as Figure G-5, provides a detailed hydrogeological cross section (F-F') depicting the stratigraphy of the Shallow Alluvial Deposits and fine-grained Pleistocene deposits under the Santa Clara River and its estuary in Mound Basin. The Mugu Aquifer occurs below the base of cross-section F-F', separated from the Shallow Alluvial Deposits by at least 250 feet of clay and sandy clay, as determined from well and boring logs in the area.

For reference, cross-section D-D' from the GSP, included herein as Figure G-6, depicts the depths of the HSUs in Mound Basin under the Santa Clara River and its estuary, but with less detail than shown on cross-section F-F'. From cross-section D-D', it can be seen that the Hueneme and Fox Canyon aquifers are further disconnected from the Shallow Alluvial Deposits (compared to the Mugu Aquifer) by a maximum of 2,000 feet of vertical separation and additional aquitards. Importantly, most of the groundwater extraction in the Mound Basin is by wells screened in the Hueneme Aquifer, which is separated from the Shallow Alluvial Deposits and Santa Clara River by two aquitards that are approximately 300 to 400 feet in total thickness.

Based on calibration of its regional groundwater flow model, United (2021) estimated the horizontal hydraulic conductivity of the Shallow Alluvial Deposits to be 200 ft/d in Mound Basin, and the vertical hydraulic conductivity to be 20 ft/d. The specific yield of the Shallow Alluvial Deposits in the groundwater flow model is 15% (United, 2021). These values do not apply to localized stream terrace deposits along the Santa Clara River where shallow groundwater interconnects with the Santa Clara River and GDEs are present (i.e. GDE Area No. 11). The presence of tile drains on agricultural lands situated on the stream terrace deposits (see GSP Figures 2.1-03 and 3.1-09) suggests that the stream terrace deposits are poorly permeable and, therefore, are not considered to be an aquifer, but may contain perched groundwater zones. No estimates of the vertical hydraulic conductivity of the fine-grained Pleistocene Deposits from field investigations were found during review of available reports; however, United (2021) achieved good calibration of its groundwater flow model by applying a vertical hydraulic conductivity of 0.001 feet per day, which is a reasonable value for silt and clay deposits in alluvial aquitards (Heath, 1983). This hydraulic conductivity value is three orders of magnitude smaller than what is generally considered a minimum acceptable value for hydraulic conductivity in a water supply aquifer (1 foot per day or larger).

Given the substantial area (approximately 11,000 acres) where the fine-grained Pleistocene deposits underlie the Shallow Alluvial Deposits, even a relatively low degree of hydraulic communication between these HSUs can still allow downward infiltration of groundwater from the Shallow Alluvial Deposits to the fine-grained Pleistocene deposits. As indicated in Table 3.3-04 of the Draft GSP and the zone budget analysis below (Section 3.5), groundwater modeling indicates that approximately 1,600 AF/yr (~130 AF/month) of groundwater moved downward from the Shallow Alluvial Deposits to the fine-grained Pleistocene deposits, on average, from 1986 through 2019. The zone budget analysis (see section 3.5 below) shows the historical variability of the vertical flows (in AF/month) from layer 1 to layer 2 of the groundwater model. If this downward migration were distributed equally across the 11,000-acre extent of the fine-grained Pleistocene deposits, that would imply 0.15 AF/yr of downward groundwater flux per acre. However, most of this downward flux occurs in the central and eastern portions of Mound Basin, and much smaller vertical fluxes occur near the hydraulic low point of Mound Basin, along the lower Santa Clara River. Downward vertical flow of water across the fine-grained Pleistocene deposits does not mean that principal aquifer pumping has a significant influence on shallow groundwater levels or interconnected Santa Clara River flows, because the significant thickness and low permeability of the fine-grained Pleistocene deposits greatly limits propagation of head changes between the Shallow Alluvial Deposits and the principal aquifers and flows. This is further verified with the model sensitivity analysis below (Section 3.4).

3.2 Groundwater Elevation Data

Review of available groundwater elevation data for piezometers screened in the Shallow Alluvial Deposits and in wells screened in the principal aquifers in Mound Basin confirm that there is no discernible effect of groundwater-level declines in the principal aquifers on shallow-alluvial groundwater levels during the recent (2012-16) drought. Figure G-7 shows significant declines (up to 50 feet) in measured groundwater elevations at wells screened in the Mugu and Hueneme Aquifers in Mound Basin near the Santa Clara River during the 2012-2016 drought, while groundwater elevations in the piezometers screened in shallow alluvial or stream terrace deposits adjacent to and underlying the Santa Clara River estuary remain relatively constant near 10 feet relative to the 1988 North American vertical datum (NAVD88), with occasional sharp departures and returns from that base elevation in response to river-mouth breaching events. Locations for these wells are shown on Figure G-1. Total groundwater extractions from the Mound and Oxnard basins are also shown on Figure G-7, for reference. As shown on Figure 3.1-26 of the Draft GSP (included herein as Figure G-8), there is just one active water supply well screened in the Mugu Aquifer, and one active water supply well with an unknown screened interval, located within 1 mile of the reach of the Santa Clara River within Mound Basin. A total of 155 AF of groundwater was extracted from the Mugu Aquifer well (02N22W19M04S) in 2019 and a total of 2 AF was extracted from the unknown-screened-interval well (02N23W24F01S) during 2019, as summarized in Table 3.1-02 of the Draft GSP. Two Hueneme Aquifer wells are also located within 1 mile of the Santa Clara River in Mound Basin, but as noted above, the Hueneme Aquifer is hydraulically disconnected from the Shallow Alluvial Deposits (and Santa Clara River) not just by the fine-grained Pleistocene deposits, but also by the Mugu Aquifer and the Mugu-Hueneme aquitard. Indeed, there is no relationship between groundwater extraction in Mound or Oxnard Basins and groundwater elevations measured in the piezometers screened in the Shallow Alluvial Deposits in Mound Basin that can be discerned in Figure G-7.

In summary, the groundwater levels data demonstrate the lack of material influence of principal aquifer groundwater levels on shallow groundwater levels and, by extension, Santa Clara River flows.

3.3 Geochemical Data

As explained in the GSP (Section 3.2), geochemical data do not indicate significant interactions between groundwater in the principal aquifers and shallow groundwater. Results of a recent geochemical investigation in Mound Basin conducted by S.S. Papadopulos & Associates, Inc. (SSP&A, 2020) include the following key conclusions regarding potential interactions of surface water, shallow groundwater, and the principal aquifers of Mound Basin (which are typically present at depths of hundreds of feet below land surface):

- "There appear to be limited interactions vertically between aquifers, regardless of formation. Shallower groundwater (≤500 ft.-bgs) is geochemically- and isotopically distinct."
- "There is no evidence for significant interactions between shallower groundwater (≤500 ft.-bgs) and the Santa Clara River. In fact, δ18O and δD signatures of shallower groundwater are distinctly different than the Santa Clara River."

3.4 Numerical Modeling Analysis

The groundwater elevation and geochemical data described provide clear evidence that the principal aquifers do not materially influence conditions in the shallow alluvial deposits and Santa Clara River. Additional evaluation was completed using United's (2021) numerical model to conduct a sensitivity analysis to evaluate whether hypothetical large changes in groundwater extraction rates in Mound Basin could cause significant changes in groundwater elevations in the shallow aquifer or impact rates of shallow groundwater discharge to surface water.

The sensitivity analysis assumed changes in overall groundwater extraction rates throughout the historical and current water budget periods (January 1985 through December 2019) relative to the actual extraction rates over the same periods (base case scenario), with the following adjustments:

- 125 percent of historical/current Mound Basin extraction rates.
- 75 percent of historical/current Mound Basin extraction rates.
- No Mound Basin pumping (0 percent) during the historical/current period.

The differences in groundwater discharge to surface water under all three sensitivity runs are nearly identical to the base case (Figure G-9), suggesting that groundwater extraction in the principal aquifers has a negligible influence on groundwater levels in the Shallow Alluvial Deposits and flows in the Santa Clara River. The differences between average groundwater discharge to surface water throughout the modeled period (1985-2019) in the base case versus the sensitivity runs that assume 75 and 125 percent of historical groundwater extraction range from 15 AF/yr more to 15 AF/yr less than the base case values, respectively (15 AF/yr is equal to 0.02 cfs). As noted in Section 2.3 of this appendix, these values are a very small fraction of the total flow in the lower reach of the Santa Clara River, which ranges from 1 to 750 cfs (Stillwater Sciences, 2018). In the sensitivity run where no groundwater is extracted from Mound Basin, simulated groundwater discharge to surface water increases by 61 AF/yr (0.08 cfs), which again is a very small fraction of total flow in the lower reach of the river. The small change in simulated surface water flows demonstrates that groundwater conditions in the principal aquifers (Mugu and Hueneme aquifers), including groundwater extraction, do not materially influence surface water flows, consistent with the data summarized in preceding sections of this appendix.

The differences in groundwater elevations for the sensitivity runs compared to the base case are mostly less than 0.1 feet, except for the no-pumping sensitivity run, as shown on Figure G-10. The locations where these differences in groundwater elevations were calculated are shown on Figure G-11. In the no-pumping sensitivity run, simulated groundwater elevations in the Shallow Alluvial Deposits increase 0.2 to 0.4 feet compared to the base case. The small change in simulated shallow groundwater levels demonstrates that groundwater conditions in the principal aquifers (Mugu and Hueneme aquifers), including groundwater extraction, do not materially influence groundwater conditions in the Shallow Alluvial Deposits. The model estimated groundwater elevation changes are considered negligible and additionally are conservative because the United (2021) model may overestimate the degree of hydraulic connection between the saturated sediments in contact with the Santa Clara River and the deeper principal aquifers in Mound Basin. This is because the model uses a single layer to represent the entire thickness of the Shallow Alluvial Deposits, and therefore, the model assumes instantaneous and direct responses occur throughout Layer 1 (from land surface to the base of the Shallow Alluvial Deposits) to changes in extraction rates and recharge in deeper layers or HSUs. The Shallow Alluvial Deposits actually consist of multiple layers and lenses with varying storativity, vertical leakance, and degrees of interconnection, which buffers shallow groundwater level responses to changes in groundwater extraction rates in the principal aquifers of Mound Basin.

3.5 Zone Budget Analysis

A zone budget analysis for the baseline historical numerical model utilized MODFLOW's zone budget tool to focus on the modeled flows between the Santa Clara River and the upper layers of the model. Three zones were delineated (Figure G-12):

1. Model cells coincident with the Santa Clara River boundary condition (STR) cells within layer 1

2. Non-STR cells in layer 1

3. Layer 2 model cells

Stream leakage flows from the Santa Clara River STR cells to zone 1 were also included in the analysis, computed from the STR boundary condition package from the numerical model. Observing the top chart in Figure G-12, during most of the simulated historical period lateral flows between zones 1 and 2 are negative (flow from zone 2 to zone 1) and are generally less than 100 AF/month. During high-stage, short-term storm events, flows are positive (flow from zone 1 to zone 2), with maximum rates for two events at approximately 1,000 AF/month. Overall, the net exchange (average flow) is essentially zero (5 AF/month). The upper graph also shows that flows from zone 1 to zone 3 (vertical exchange between the groundwater cells coincident with the Santa Clara STR boundary and layer 2) are negligible. Flows from zone 2 to zone 3 are notable and are always positive (from zone 2 to zone 3; downward from layer 1 to layer 2). These downward flows are usually greater in magnitude than the lateral flows between zones 1 and 2 except during a few peak events but are overall generally small (average 136 AF/month) and unevenly distributed across the 11,000-acre extent of the layer, with the highest rates in the central and eastern portions of the model, away from the Santa Clara River. For context, the overall average rate of inflows/outflows for the combined historical and current surface water budget is ~13,000 AF/month (~160,000 AF/yr; see GSP sections 3.3.1/3.3.2, Table 3.3-02).

The bottom chart on Figure G-12 is similar to the top chart flow between zone 1 and zone 2, and similarly indicates that during most of the historical time period flow is from zone 1 to the STR boundary cells, feeding it at low volumes. During peak events, the direction reverses and the stream is providing larger volumes to the cells directly beneath. In addition, the net exchange is zero.

The zone budget analysis validates the conceptual model that the Shallow Alluvial Deposits HSU (zone 2, layer 1) is hydraulically connected to the Santa Clara River (zone 1, STR cells) with very low flow rates, but is disconnected from the deeper aquifers (zone 3, layer 2).

4.0 Conclusions

The results of this assessment are as follows:

1. The Shallow Alluvial Deposits HSU has not been considered an important water-bearing unit by historical investigators and does not meet the definition of a principal aquifer, as defined in the GSP Emergency Regulations, because MBGSA has concluded that this HSU does not store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems.

2. Available data and numerical modeling analysis indicate that groundwater conditions in the principal aquifers (Mugu and Hueneme Aquifers), including groundwater extraction, do not materially influence groundwater levels in the Shallow Alluvial Deposits. Therefore, groundwater-dependent ecosystems (GDEs) present in Area 11 of the GSP (i.e., GDEs associated with the Santa Clara River and its estuary) will not be materially impacted by groundwater extraction or GSP implementation and, therefore, do not need to be considered in the SMC for the GSP.

3. Available data indicate that the Santa Clara River and its estuary are interconnected with shallow groundwater present in the Shallow Alluvial Deposits. However, available data and numerical modeling analysis indicate that groundwater conditions in the principal aquifers (Mugu and Hueneme aquifers), including groundwater extraction, do not materially influence interconnected surface water flows. Therefore, depletion of interconnected surface water is not an applicable sustainability indicator for the GSP.

4. MBGSA will partner with the City of Ventura and United to collect interim shallow groundwater levels and perform a hydrogeologic study to further assess the hydraulic connection of the river with the Shallow Alluvial Deposits and the Shallow Alluvial Deposits and the deeper principal aquifers, providing further data to support the current HCM and Appendix G. The interim water level study will also analyze shallow groundwater levels against pumping data from the principal aquifers to confirm the lack of groundwater extraction impacts in the deeper principal aquifers on groundwater in the Shallow Alluvial Deposits.

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Figures

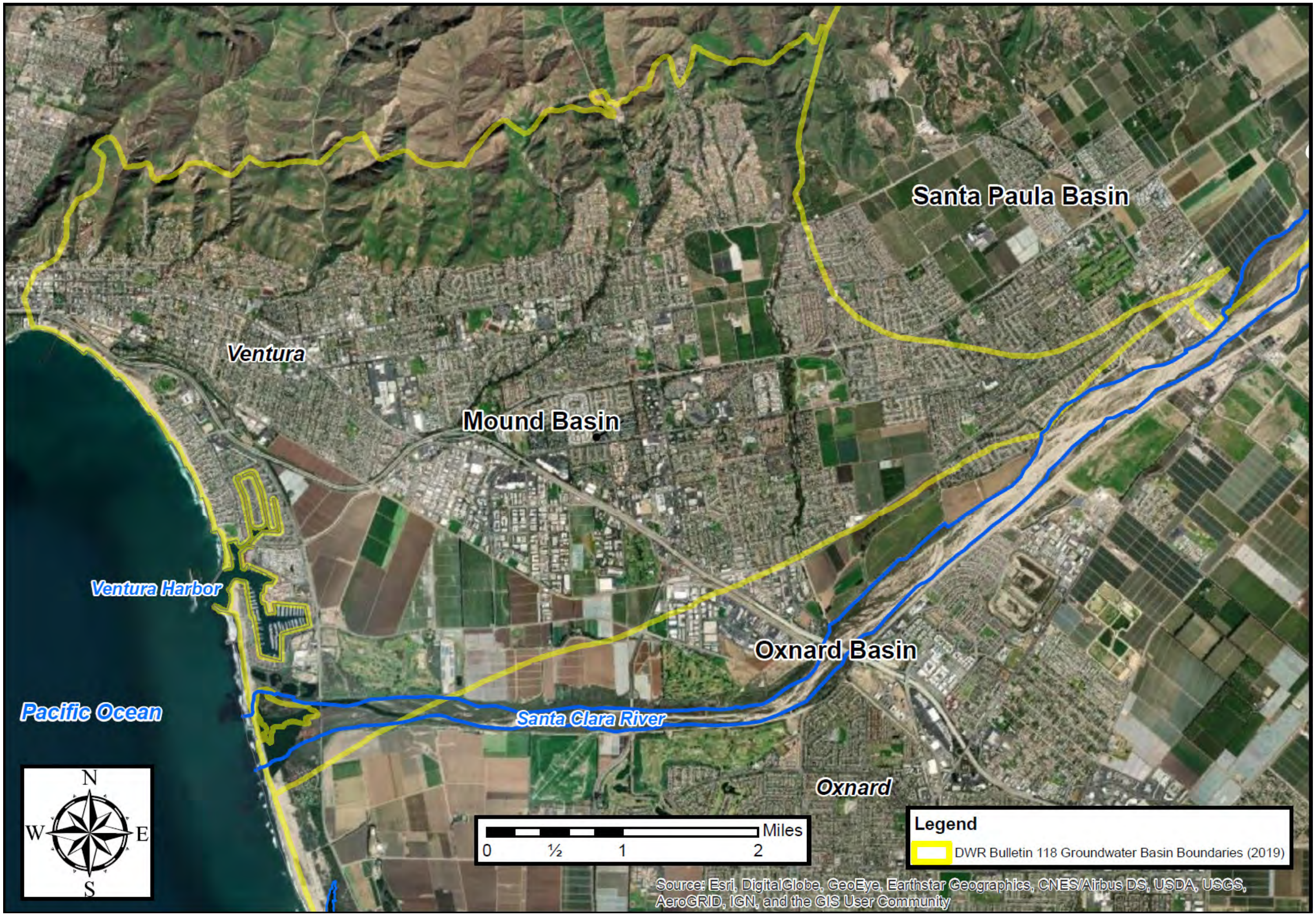
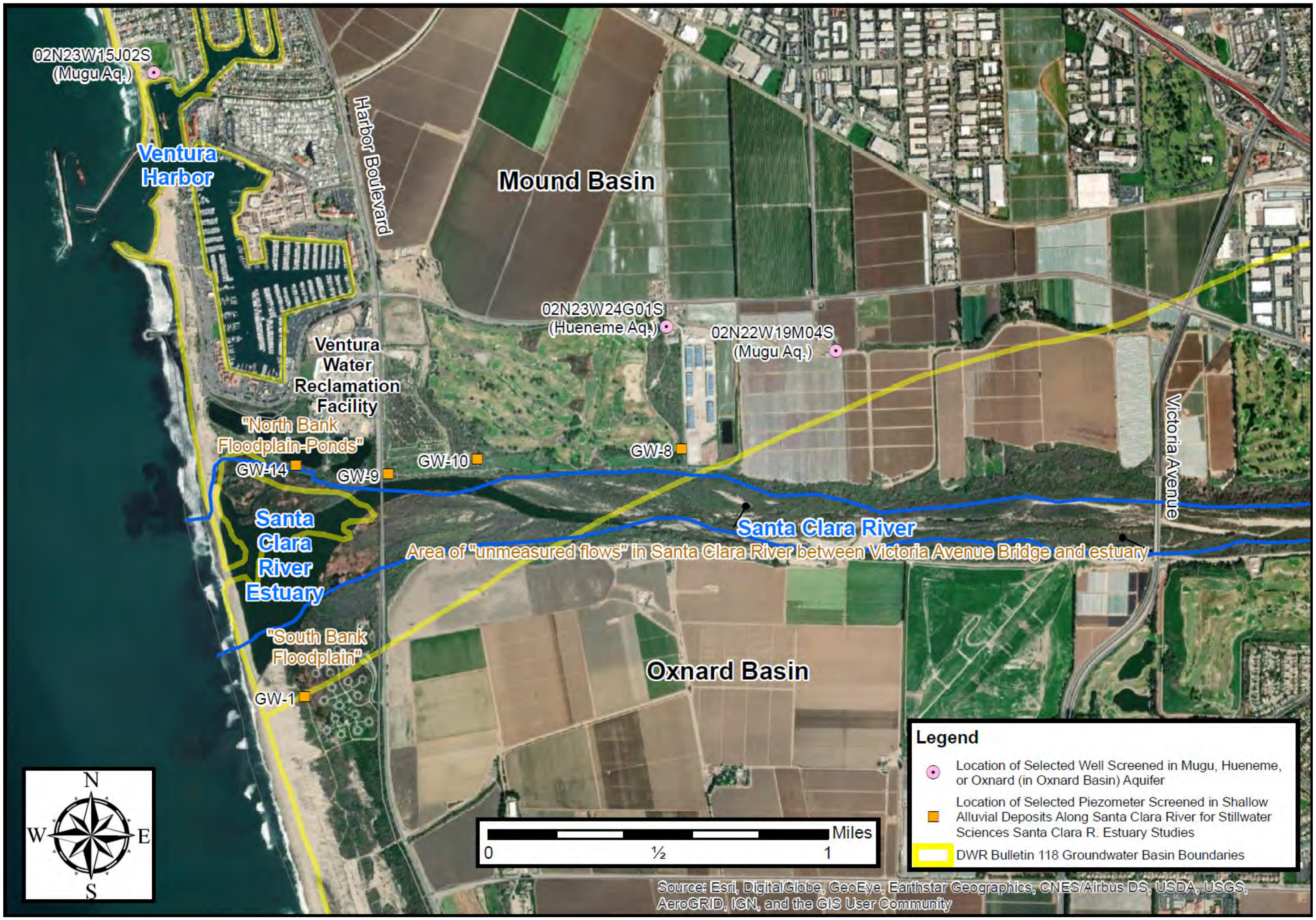


Figure G-1. Location Map for Mound Basin.



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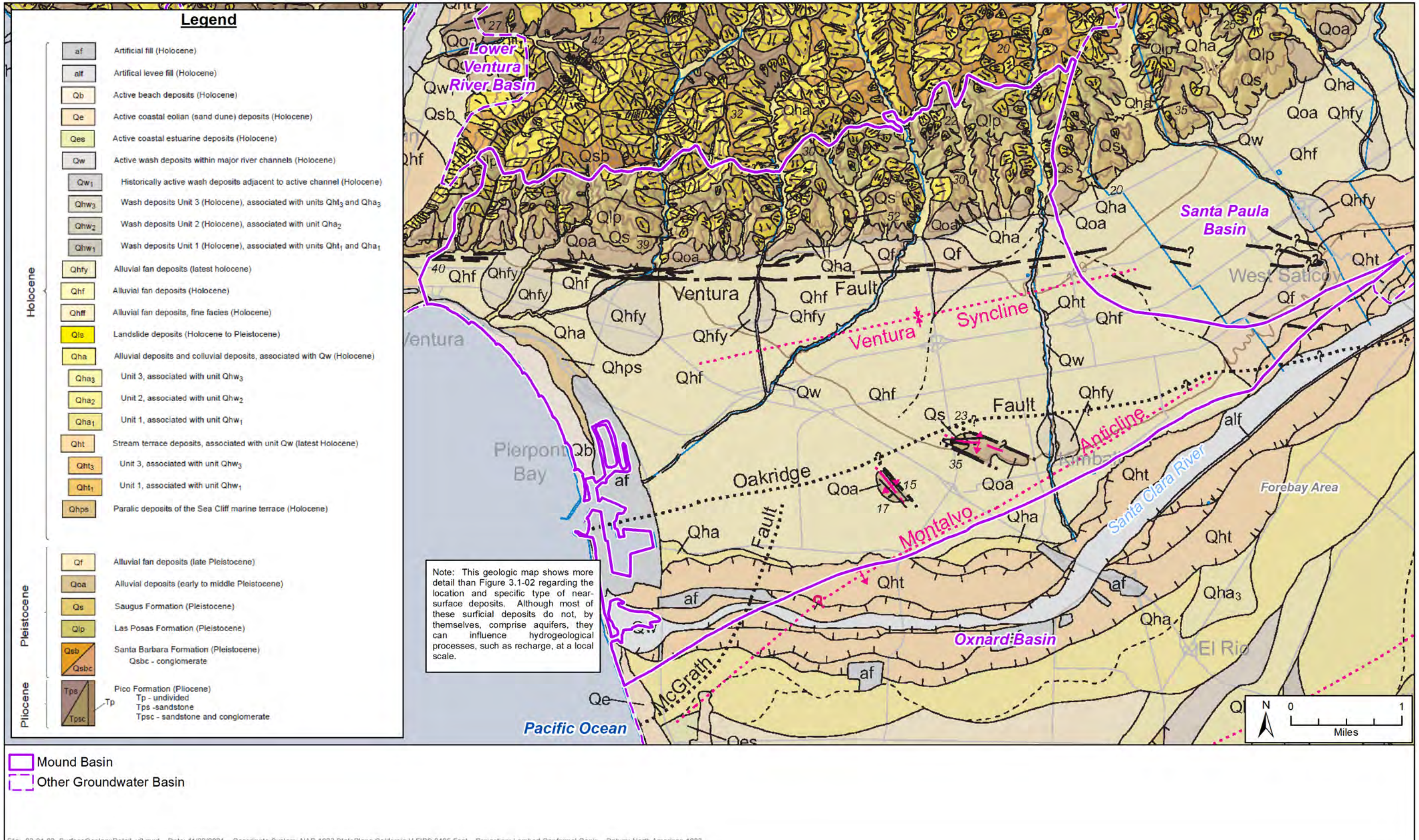
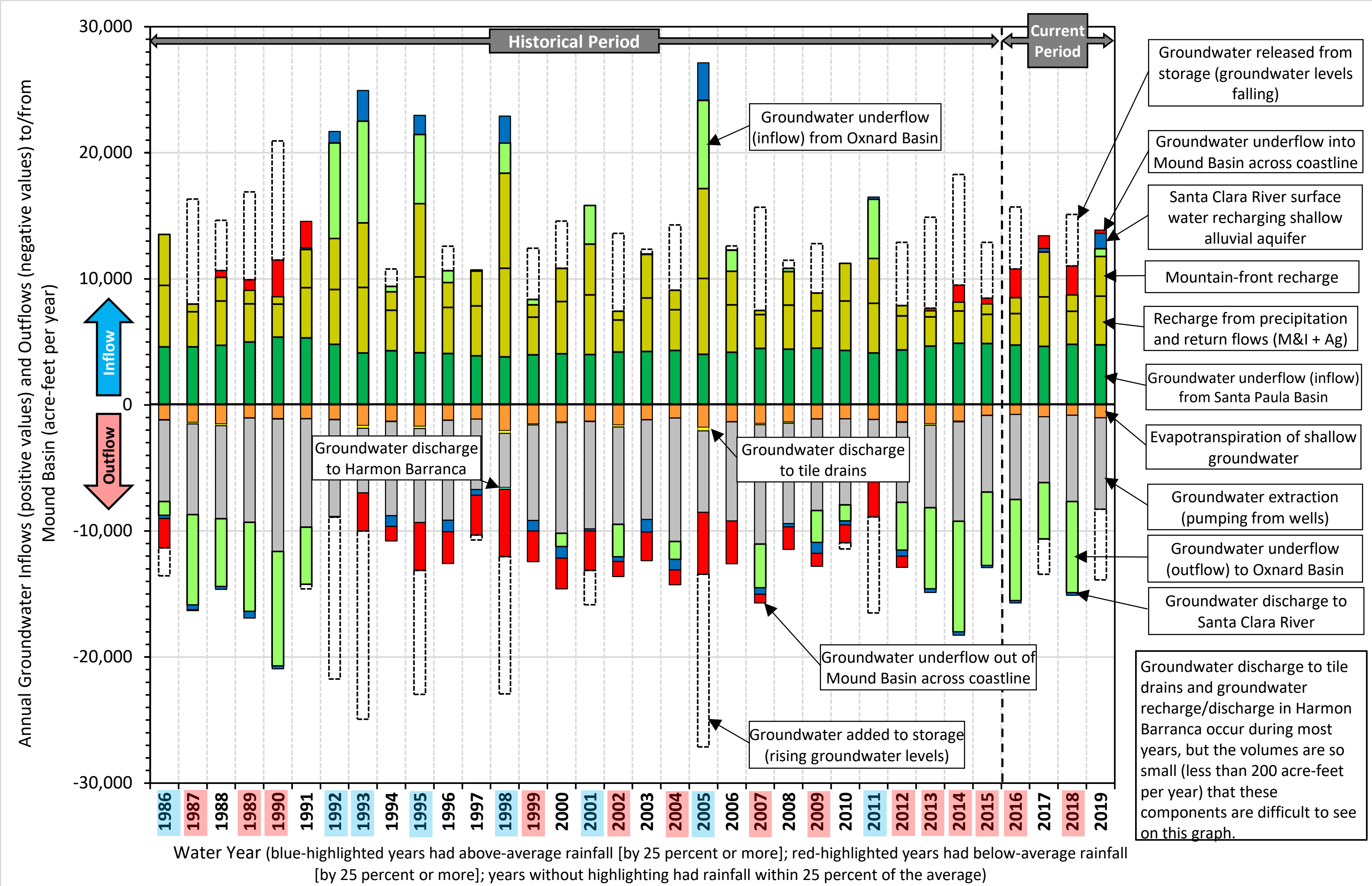


Figure G-3. Detailed Surface Geologic Map of Mound Basin, from Gutierrez et al. (2008) (Figure 3.1-03 of the Draft Mound Basin GSP).



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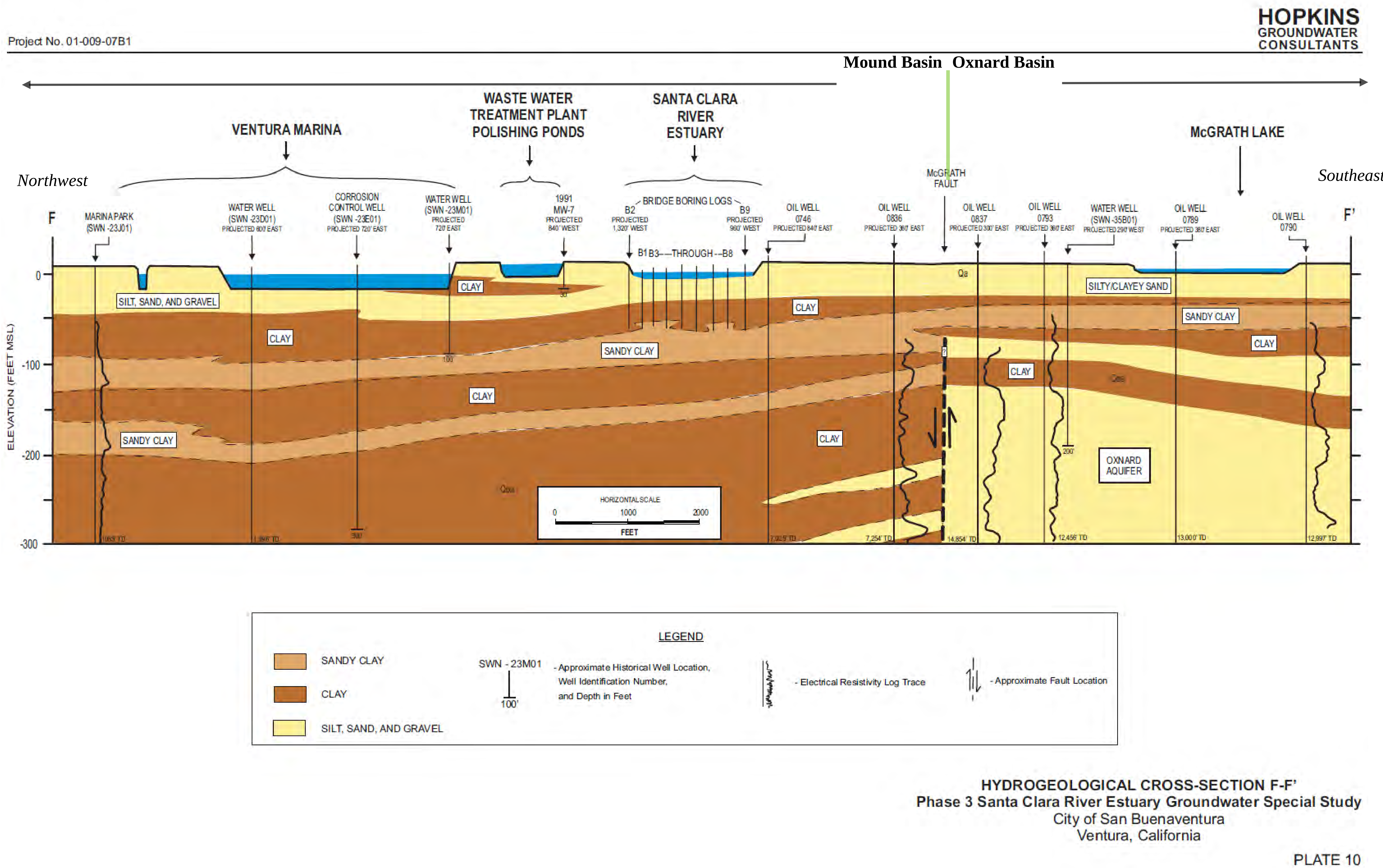
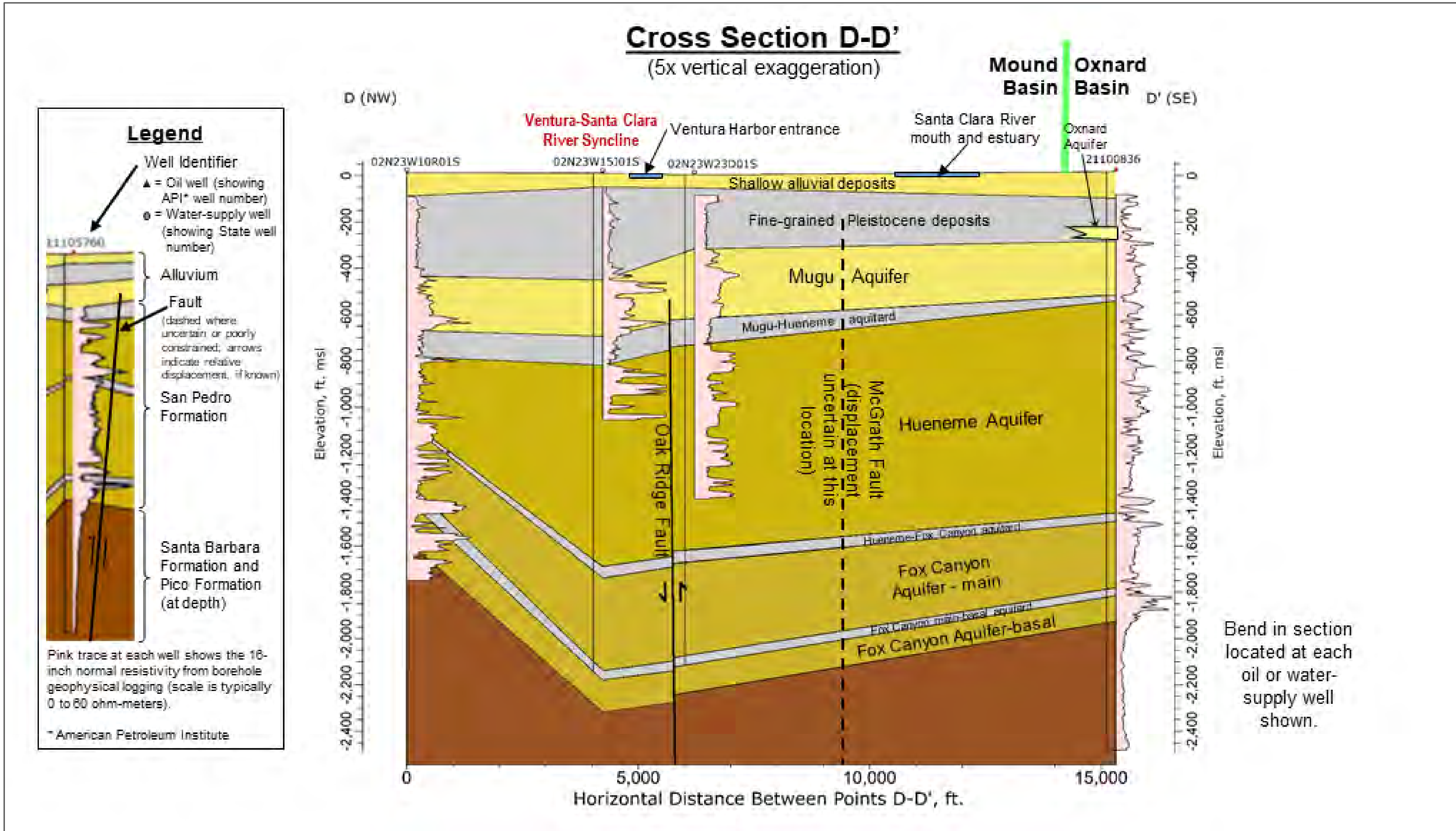


Figure G-5. Hydrogeological Cross Section F-F' from Hopkins, 2018, Showing Detailed Stratigraphy Below the Santa Clara River in Mound Basin (Plate 10 in Hopkins, 2018, report).



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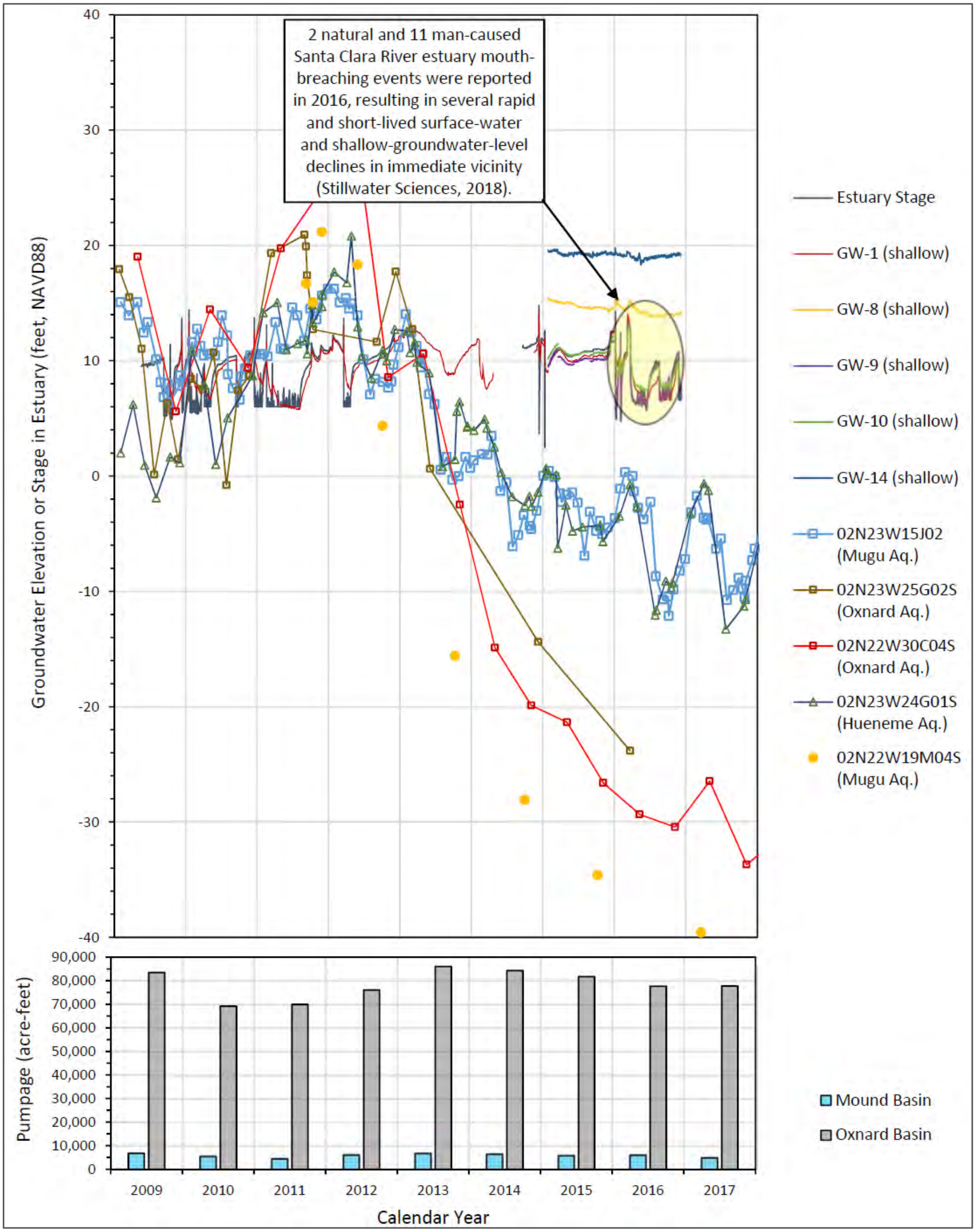

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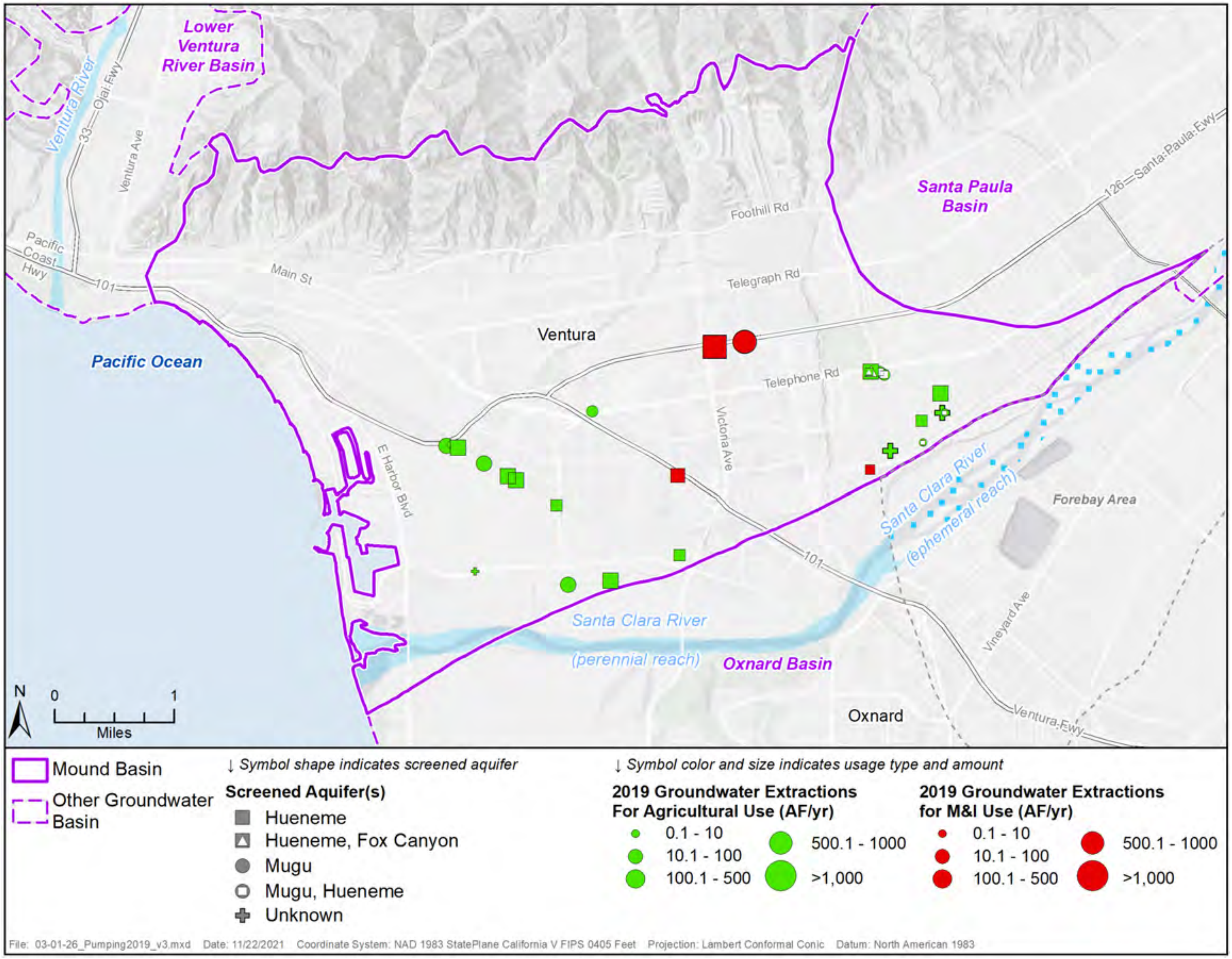
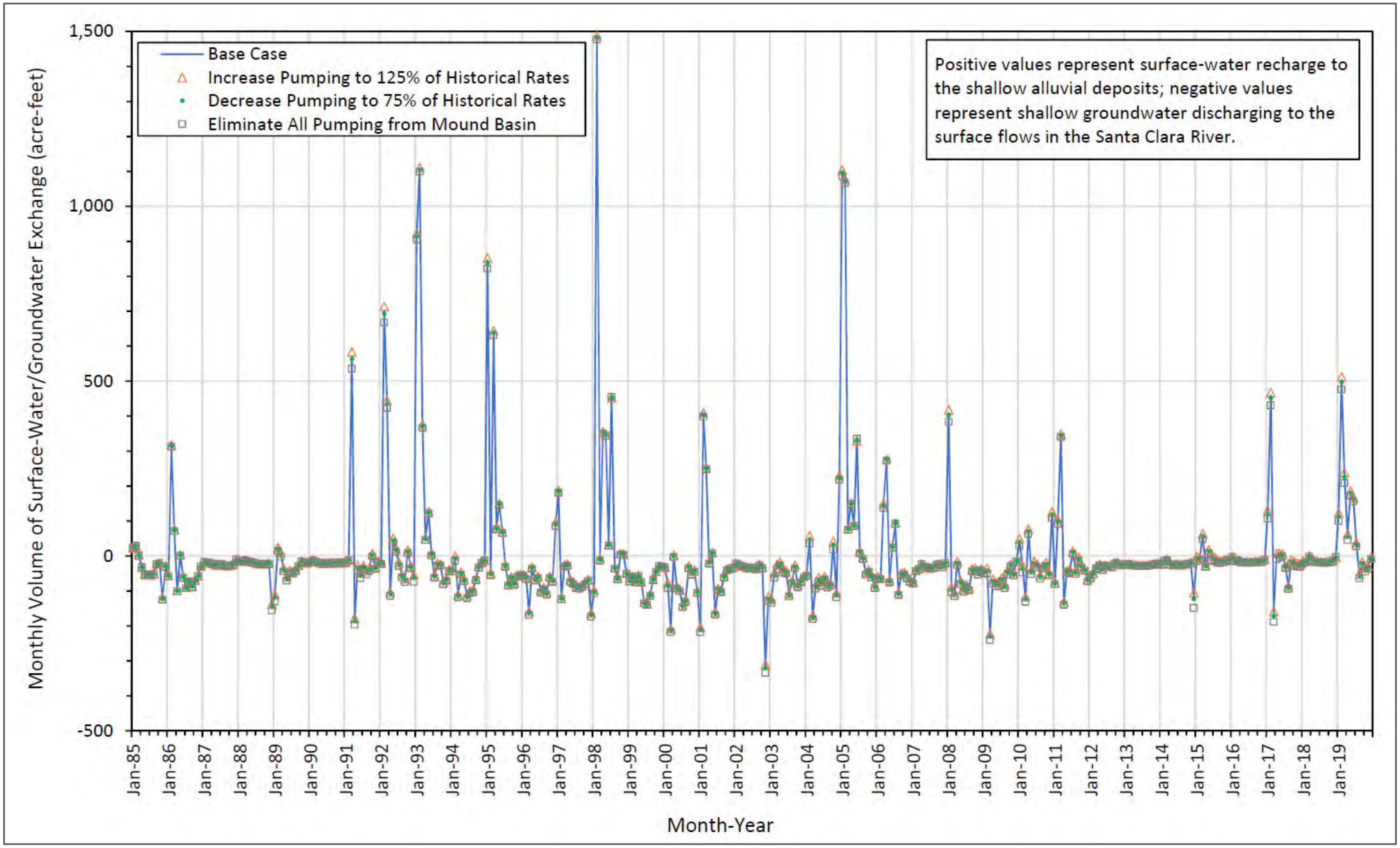


Figure G-8. Map of Active Water Supply Wells in Mound Basin, Showing Extractions in 2019 (Figure 3.1-26 of the Draft Mound Basin GSP).



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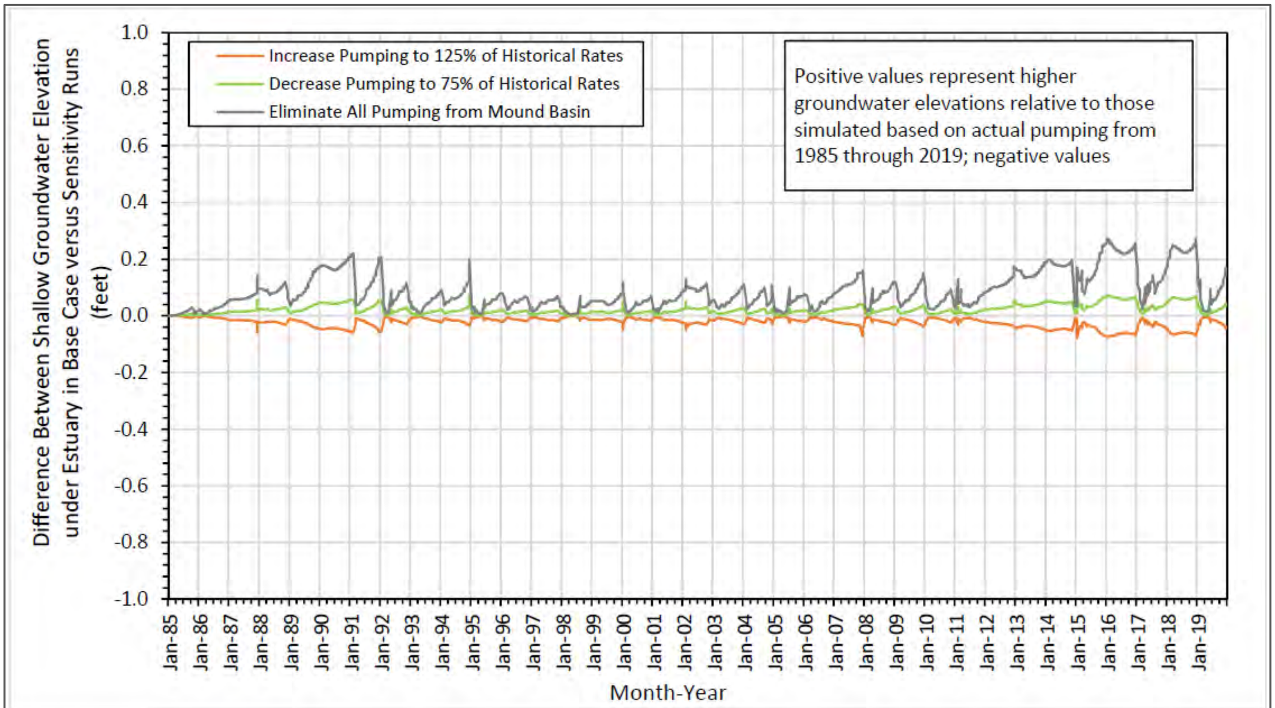

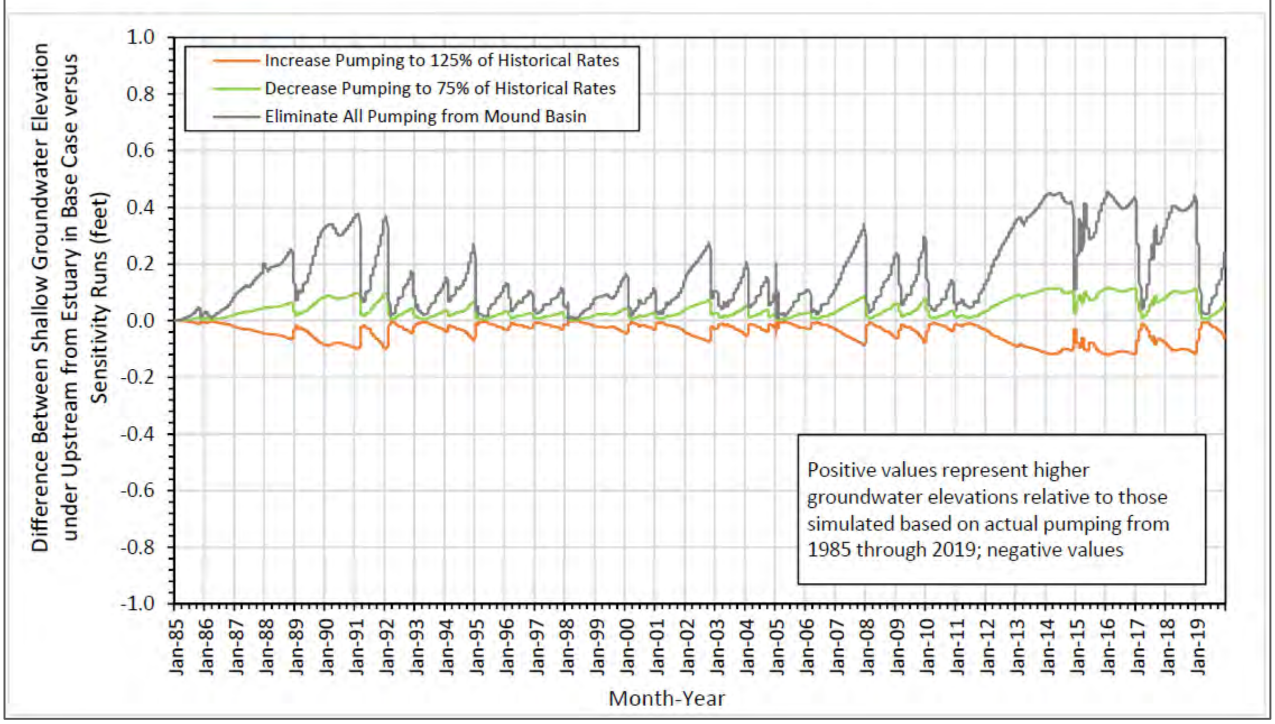

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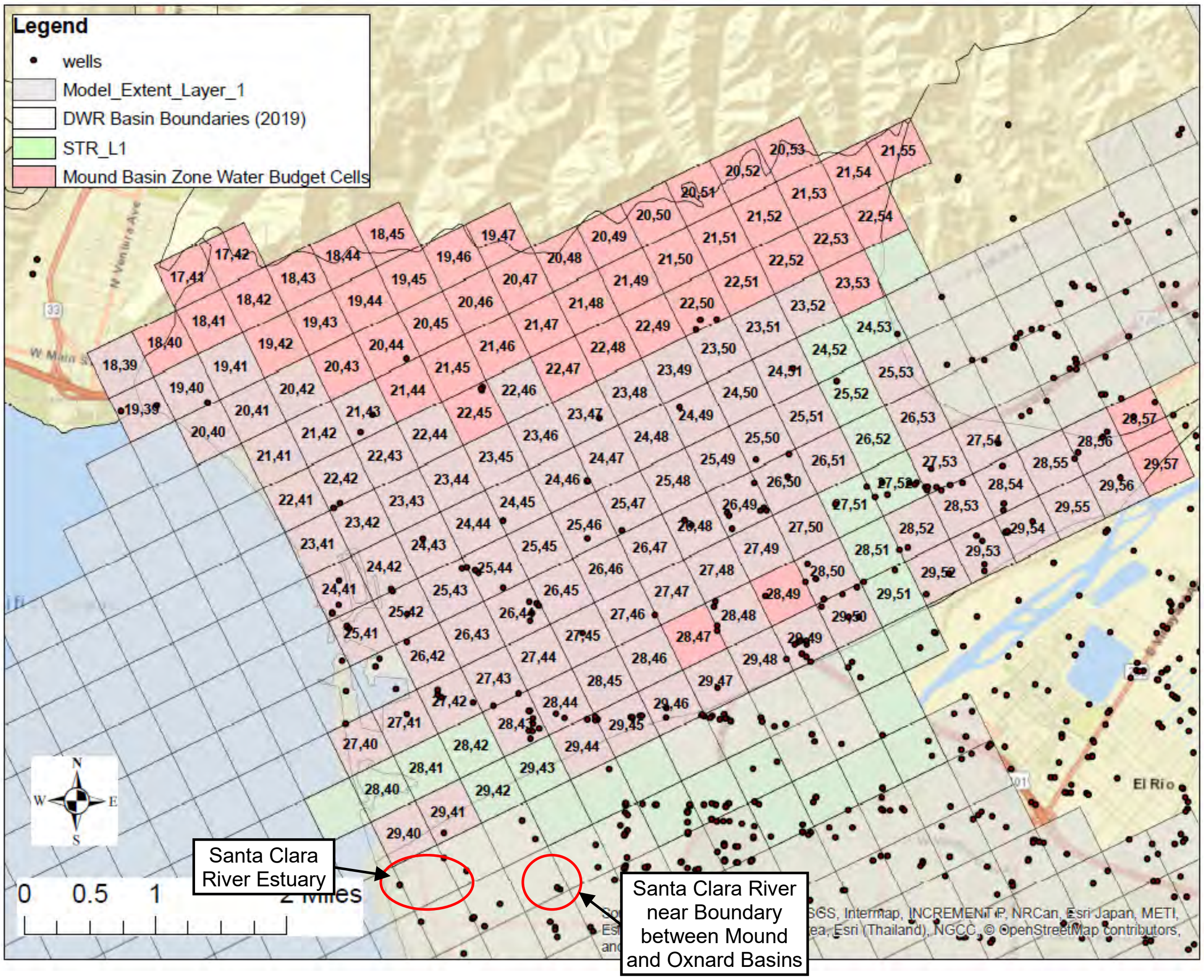

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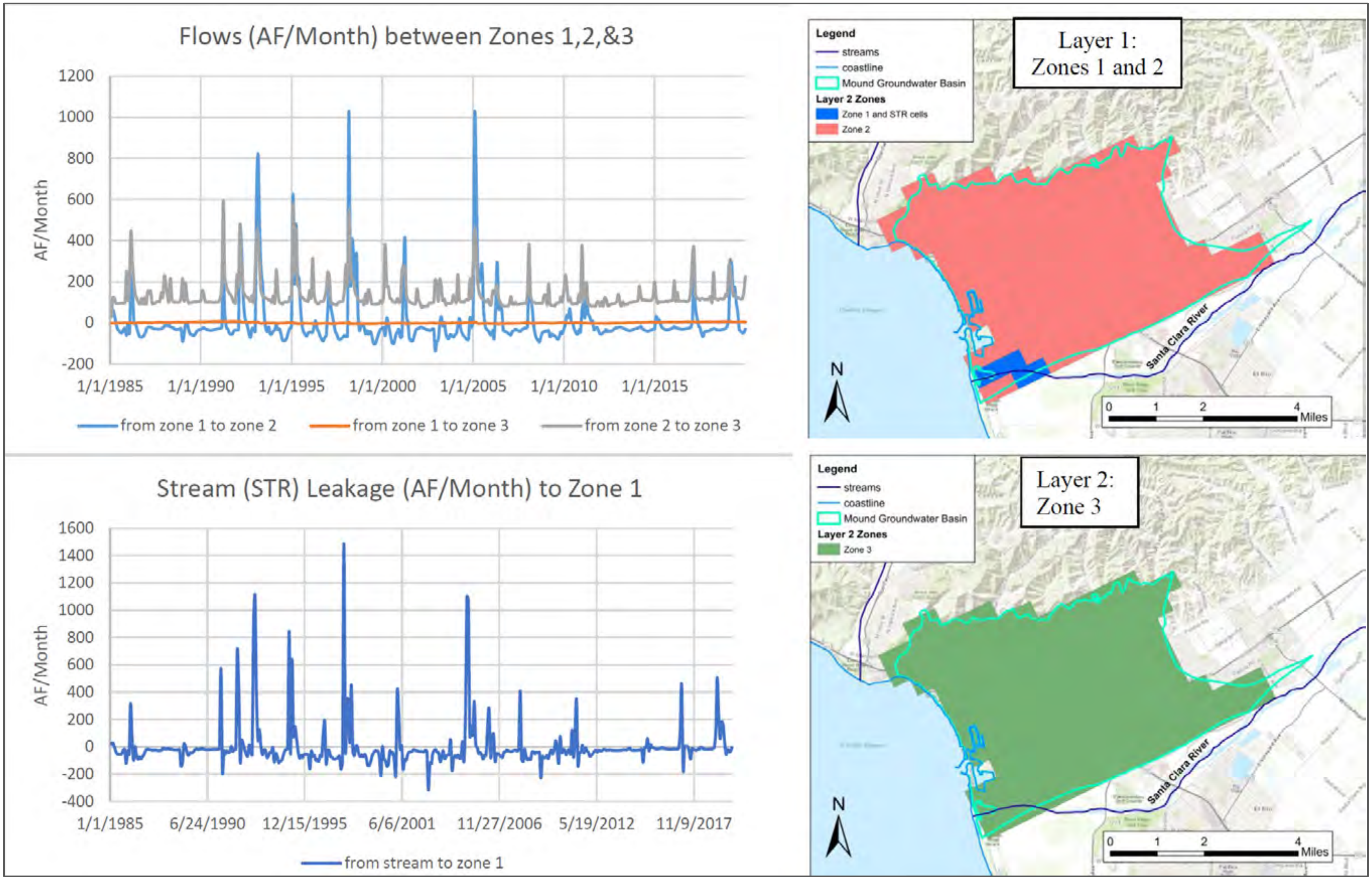

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Appendix H

Review of Areas Mapped as Containing Indicators of Potential Groundwater Dependent Ecosystems

MoundBasin
GROUNDWATER SUSTAINABILITY AGENCY

Appendix H

Review of Areas Mapped as Containing Indicators of Potential Groundwater Dependent Ecosystems

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Introduction

This appendix presents the screening results for the 11 areas of mapped "indicators of groundwater dependent ecosystems" (iGDEs) within Mound Basin (Areas 1 through 11) (Figure H-1). Figures H-2 through H-12 include aerial imagery and mapping of specific "vegetation types commonly associated with the sub-surface presence of groundwater" and "wetland features commonly associated with the surface expression of groundwater under natural, unmodified conditions" (CNRA, 2020) within each of Areas 1 through 11. As noted in Mound Basin Groundwater Sustainability Plan (GSP, Section 3.2.7), mapping of iGDEs is recommended as a starting point for the identification and analysis of potential groundwater dependent ecosystems (pGDEs) under the Sustainable Groundwater Management Act (SGMA) (Klausmeyer et al., 2018). Determining whether an iGDE is actually a groundwater dependent ecosystem (GDE) requires local-scale information regarding land use, groundwater levels, surface water hydrology, and geology. That local-scale information is provided in this appendix, together with an evaluation of whether each iGDE is dependent on groundwater from a principal aquifer in Mound Basin. The following presents a summary of the iGDE screening results in addition to a detailed assessment of each of the 11 iGDE areas identified in the GSP.

Summary of iGDE Screening Results

In Areas 1-10, it was observed that plant communities are generally established in topographic areas that concentrate surface water flow, and which can retain soil moisture and/or in areas where there is irrigation. These areas include incised drainages, north-facing slopes, depressions and barrancas conveying runoff from upstream and adjacent irrigated parks and residential developments. In some cases, very shallow, perched water sustained by nearby irrigation may supply some water for transpiration; however, localized shallow perched water is not an aquifer and is therefore not managed under this GSP. MBGSA concludes that Areas 1-10 are not GDEs for the purposes of this GSP because the plant communities observed in these areas appear to be reliant on sources of water other than groundwater in an aquifer, particularly that of a principal aquifer.

To aid discussion for each iGDE area, a historic photo plate is provided for Areas 1-10 to display general historic and present conditions for each iGDE area (Attachment H-1).

Area 11 is considered a GDE because the surface water of the Santa Clara River and its estuary is interconnected with groundwater in the Shallow Alluvial Deposits and the vegetation in Area 11 is likely utilizing Shallow Alluvial Deposits groundwater for some of its transpiration needs. However, it is important to note that there is no groundwater extraction from the shallow groundwater of the Shallow Alluvial Deposits. In addition, Appendix G to the GSP explains that the Santa Clara River and its estuary and groundwater in the Shallow Alluvial Deposits are not material affected by pumping in the principal aquifers. Given the lack of potential for significant impacts to the GDEs by principal aquifer pumping, there are no potential impacts to the Area 11 GDE that need to be considered in the development of sustainable management criteria for the principal aquifers. However, MBGSA will monitor well permit applications for proposed uses of shallow groundwater in the vicinity of Area 11. If any shallow wells are proposed, MBGSA will evaluate impacts to the Area 11 GDEs. Proposed uses that would have a significant impact to Area 11 GDEs may be required to mitigate those impacts as a condition of MBGSA permit approval.

Area 1—Harmon Canyon

Area 1 is located in Harmon Canyon near the northern boundary of Mound Basin (Figure H-1), in an area underlain by “alluvial deposits and colluvial deposits” associated with “active wash deposits” of Holocene age, and landslide deposits of Holocene to Pleistocene age (Gutierrez et al., 2008). A surficial geologic map of Mound Basin is provided on Figure 3.1-02 of the GSP. These alluvial, colluvial, and landslide deposits occupy the narrow bottom and portions of the flanks of Harmon Canyon and overlie partially consolidated sedimentary deposits of the San Pedro Formation (Gutierrez et al. [2008] refer to these deposits by the nomenclature used by Dibblee [1988, 1992]; specifically, the Saugus and Las Posas Formations). The narrow, shallow “shoestring” deposits of alluvium in the foothills of northern Mound Basin are not known to store or transmit significant quantities of groundwater, nor are they currently used for groundwater supply. However, they may become partially saturated following major storms, particularly in winter and spring, potentially creating temporary perched groundwater conditions. It is unlikely that groundwater in these alluvial deposits is hydraulically connected with groundwater in the Hueneme and Fox Canyon aquifers (which are present in the underlying San Pedro Formation), as groundwater elevations in the underlying aquifers are generally hundreds of feet below ground surface in the northern Mound Basin (see Section 3.2 of the Mound Basin GSP). No seeps, springs, or perennial streams are shown on the U.S. Geological Survey (USGS) topographic maps of the Santa Paula 15-minute quadrangle or on the Saticoy 7.5-minute quadrangle in the vicinity of Area 1 (the USGS Santa Paula quadrangle map, originally published in 1903, included the area of the USGS Saticoy 7.5-minute quadrangle published in 1951 and photo-revised in 1967).

The iGDE mapped in Area 1 consists of coast live oak trees (CNRA, 2020), as shown on Figure H-2. Stands of coast live oak are also present outside of Area 1, most commonly in canyon bottoms and on north-facing slopes (Figure H-2) in areas where the substrate consists of San Pedro Formation, rather than alluvial and colluvial deposits. Photographs 1 through 4 in Attachment H-1 provide historic images from 1927 through 2021, showing continued presence of this vegetation in areas that concentrate surface water flow and which retain soil moisture. Considering the substantial depth to groundwater in the underlying principal aquifers (Hueneme and Fox Canyon aquifers), and the presence of coast live oak trees on hillsides outside of Area 1, it is unlikely that the coast live oak trees within Area 1 (or on the surrounding hillsides and canyons) are dependent on groundwater from a principal aquifer in Mound Basin. Therefore, Area 1 is not considered to be a GDE for the purpose of this GSP.

Area 2—Sexton Canyon

Area 2 is located in Sexton Canyon near the northern boundary of Mound Basin (Figure H-1), in an area underlain by “alluvial deposits and colluvial deposits” associated with “active wash deposits” of Holocene age (Gutierrez et al., 2008). No seeps, springs, or perennial streams are shown on the USGS topographic maps of the Santa Paula quadrangle (1903 edition) or the Saticoy quadrangle (1967 edition) in the vicinity of Area 2. The iGDEs mapped in Area 2 include “wetland features commonly associated with the sub-surface presence of groundwater under natural, unmodified conditions” (and more specifically as “riverine, unknown perennial, unconsolidated bottom, semipermanently flooded” wetland) along an approximately 400-foot length of the canyon bottom, and coast live oak trees within 400 feet of area mapped as wetland (CNRA, 2020), as shown on Figure H-3. Inspection of the aerial imagery shown on Figure H-3 indicates the presence of single-family residences and irrigated landscaping within and adjacent to Area 2, and citrus or avocado orchards to the north (up-canyon), south, and east from Area 2.

Approximately 100 acres of avocado orchards and a flood-control dam are located 300 to 800 feet farther north from Area 2, outside of the area shown on Figure H-3. Similar to Area 1, stands of coast live oak are also present outside of Area 2 in Sexton Canyon, most commonly occurring in canyon bottoms and on north-facing slopes (Figure H-3) in areas where the underlying geology consists of landslide deposits or San Pedro Formation, rather than alluvial and colluvial deposits.

There is no visual evidence from the aerial photo to support the presence of the “wetland feature” mapped in Area 2. Any saturated zones present in these shallow “shoestring” alluvial deposits are unlikely to be hydraulically connected with groundwater in the Hueneme and Fox Canyon aquifers present in the underlying San Pedro Formation, as groundwater elevations in these aquifers are generally hundreds of feet below ground surface in the northern Mound Basin. Any perched saturated zones within the alluvial and colluvial deposits are almost certainly not in hydraulic connection with the underlying principal aquifers (Hueneme and Fox Canyon aquifers), and coast live oak trees are present on hillsides outside of Area 2 where they do not have access to perched groundwater. Photographs 5 and 6 in Attachment H-1 provide historic images from 1958 and 2021, showing continued presence of this vegetation in areas that concentrate surface water flow and which retain soil moisture.

Based on this analysis, the iGDEs in Area 2 are not believed to be dependent on groundwater from a principal aquifer in Mound Basin, and Area 2 is not considered to be a GDE for the purpose of this GSP.

Area 3—Barlow Canyon (Arroyo Verde Park)

Area 3 is located in Barlow Canyon along the western margin of the irrigated fields in the south part of Arroyo Verde Park, in the foothills of northern Mound Basin (Figure H-1). Similar to Areas 1 and 2, Area 3 is underlain by shallow “alluvial deposits and colluvial deposits” associated with “active wash deposits” of Holocene age (Gutierrez et al., 2008). No seeps, springs, or perennial streams are shown on the USGS topographic maps of the Santa Paula quadrangle (1903 edition) or the Saticoy quadrangle (1967 edition) in the vicinity of Area 3. The iGDE mapped in Area 3 consists of “riparian mixed hardwood” (CNRA, 2020), as shown on Figure H-4. Inspection of the aerial imagery shown on Figure H-4 indicates the presence of approximately 25 acres of irrigated turf, baseball fields, and picnic areas in Arroyo Verde Park immediately adjacent to and up-canyon from Area 3. Field visits confirm this area is irrigated by the City of Ventura.

The iGDE mapped at Area 3 is located approximately 30 feet above Barlow Canyon and is likely dependent on irrigation, rather than groundwater. Groundwater in the Hueneme and Fox Canyon aquifers present in the underlying San Pedro Formation is generally hundreds of feet below ground surface in the northern Mound Basin. Photographs 7 through 10 in Attachment H-1 provide historic images from 1927 through 2021, showing changing land uses from open space to agriculture up to the current parks/recreation. Between photos 9 and 10 we see the establishment of the vegetation community, understood to demonstrate the effect that irrigation has in this area. Because the iGDE present in Area 3 is likely to be dependent on irrigation, as well as the separation from principal aquifers, this iGDE is not believed to be dependent on groundwater from a principal aquifer in Mound Basin. Therefore, it is not considered to be a GDE for the purpose of this GSP.

Area 4—Sanjon Barranca

Area 4 is located in the canyon bottom and east-facing slope of Sanjon Barranca in the foothills north of downtown Ventura near the northern boundary of Mound Basin (Figure H-1). Area 4 is underlain by the "Saugus Formation" (referred to as San Pedro Formation in the GSP) and "alluvial deposits and colluvial deposits" associated with "active wash deposits" of Holocene age in the canyon bottom (Gutierrez et al., 2008). No seeps, springs, or perennial streams are shown on the USGS topographic maps of the Ventura quadrangle (1904 or 1951 editions) in the vicinity of Area 4. The iGDE mapped in Area 4 is coast live oak (CNRA, 2020), as shown on Figure H-5. The aerial imagery shown on Figure H-5 was obtained after the Thomas Fire burned the foothills north of Ventura in December 2017, which is why only grass and some small shrubs are apparent on Figure H-5. Review of older aerial imagery available in Google Earth in the vicinity of Area 4 indicates that trees and shrubs were more abundant prior to the Thomas Fire. Similar stands of trees and shrubs were also present outside of the mapped iGDE area in Sanjon Barranca and nearby drainages, most commonly in canyon bottoms and on north-facing slopes (some can be seen on Figure H-5) in areas where the underlying geology consists of landslide deposits or San Pedro Formation. Photographs 11 through 14 in Attachment H-1 provide historic images from 1927 through 2021, showing the vegetation community in areas that concentrate surface water flow and which retain soil moisture (as well as the Thomas Fire impacts in photo 14).

Considering the absence of mapped springs or seeps, the substantial depth to groundwater in the underlying principal aquifers (Hueneme and Fox Canyon aquifers), and the nature of the coast live oak community to occur in upland areas without access to groundwater, it is unlikely that the coast live oaks within Area 4 (or on the surrounding hillsides and canyons) are dependent on groundwater from a principal aquifer in Mound Basin. Therefore, the iGDE in Area 4 is not considered to be a GDE for the purpose of this GSP.

Area 5—Kennebec Linear Park and North Bank of Santa Clara River near Saticoy

Area 5 includes two iGDEs: one iGDE is in an unnamed barranca within Kennebec Linear Park, and the other is mapped along the north bank of the Santa Clara River near Kennebec Linear Park. Area 5 is underlain by stream terrace deposits "of latest Holocene age" and "active wash deposits within major river channels" of Holocene age (Gutierrez et al., 2008). No seeps, springs, or perennial streams are shown on the USGS topographic maps of the Santa Paula quadrangle (1903 edition) or the Saticoy quadrangle (1967 edition) in the vicinity of Area 5 within Mound Basin.

The iGDEs in Area 5 include mixed willow forest along the north bank of the Santa Clara River, and mixed riparian forest in the unnamed barranca within Kennebec Linear Park (CNRA, 2020), as shown on Figure H-6. Inspection of the aerial imagery shown on Figure H-6 indicates the presence of irrigated turf landscaping on the northeast and southwest flanks of Kennebec Linear Park where the "mixed riparian forest" is mapped, and in residential subdivisions of single-family residences present adjacent to both iGDEs in Area 5. In addition, a storm drain outlet is located at the northern boundary of the iGDE in the barranca, discharging storm water, irrigation runoff, and other non-storm water flows from the upper watershed drainage area.

Small quantities of perched groundwater likely are present at shallow depths in the stream terrace deposits underlying Area 5 as a result of park and residential irrigation in the area. However, the primary source water supporting the iGDEs appears to be landscape irrigation at Kennebec Linear Park and surface water in the unnamed barranca (surface water from urban runoff via storm water drains and precipitation events). Photographs 15 through 18 in Attachment H-1 provide historic images from 1945 through 2021, showing the vegetation communities in these iGDEs. These photos illustrate the land use changes over time, presence of the unnamed barranca, and establishment of the vegetation communities in the barranca and on the slopes below the southern edge of the linear park.

Because the iGDEs present in Area 5 appear to be primarily dependent on upstream surface water sources, irrigation, and return flows occurring in shallow perched zones for their water supply, Area 5 is not considered to be a GDE for the purpose of this GSP.

Area 6—Harmon Barranca and Park

Area 6 occupies an approximately 1,200-foot-long reach of Harmon Barranca near the southern boundary of Harmon Park (Figure H-1). Area 6 is underlain by a narrow band of “active wash deposits within major river channels” of Holocene age and alluvial fan deposits of “latest Holocene” age (Gutierrez et al., 2008). No seeps, springs, or perennial streams are shown on the USGS topographic maps of the Santa Paula quadrangle (1903 edition) or the Saticoy quadrangle (1967 edition) in the vicinity of Area 6.

The iGDE in Area 6 is riparian mixed hardwood (CNRA, 2020), as shown on Figure H-7. Inspection of the aerial imagery shown on Figure H-7 indicates the presence of subdivisions of single-family residences both east and west adjacent to Area 6; not visible on Figure H-7 is Barranca Vista Park, which includes 3 acres of irrigated turf, approximately 1,000 feet north of Area 6 adjacent to Harmon Barranca. Irrigation return flows from Barranca Vista Park and from the residential neighborhoods adjacent to Harmon Barranca would be expected to percolate to thin, shallow perched zones in near-surface soils and then migrate horizontally to Harmon Barranca (the nearest topographic “low”), where the perched water can seep out to land surface in the bed and banks of the barranca.

In addition, surface water in the barranca is another source of water for the iGDE (surface water from urban runoff via storm water drains and precipitation events). The return flows and surface water are believed to be primary sources of water for the iGDE mapped at Area 6. Photographs 19 through 22 in Attachment H-1 provide historic images from 1945 through 2021, showing the changes in agricultural irrigation and land use over time. While the vegetation in the barranca is present in 1927, the density generally increases over time in response to the changing land use. Based on the understanding that shallow perched groundwater conditions likely occur and the separation from the principal aquifers, as well as the presence of stormwater, irrigation runoff, and other non-storm water flows, Area 6 is not considered to be a GDE for the purpose of this GSP.

Area 7—Arundell Barranca (northern)

Area 7 occupies an approximately 1,500-foot-long reach of Arundell Barranca near the mouth of Sexton Canyon in the northeast portion of Mound Basin (Figure H-1). The iGDE in Area 7 consists of “wetland features commonly associated with the sub-surface presence of groundwater under natural, unmodified conditions” (and more specifically as “riverine, unknown perennial, unconsolidated bottom, semipermanently flooded"), according to the CNRA (2020), as shown on Figure H-8. Area 7 is underlain by "active wash deposits within major river channels" of Holocene age (Gutierrez et al., 2008). No seeps or springs are shown on the USGS topographic map of the Santa Paula quadrangle (1903 edition) or the Saticoy quadrangle (1967 edition) in the vicinity of Area 7.

Arundell Barranca conveys surface water from a relatively large drainage area and is supplied by upstream surface water sources. Surface-water flow is shown on the 1967 edition of the USGS Saticoy quadrangle map as perennial within and downstream from Area 7; however, surface flow in Arundell Barranca is not shown as perennial on the 1903 edition of the Santa Paula quadrangle map. The channel is lined just upstream of the mapped iGDE and water is visible in the lined portion of the channel, but the unlined portion appears dry (Figure H-8). The source of water is likely urban runoff and storm water routed to the barranca via storm drains.

Inspection of the aerial imagery shown on Figure H-8 indicates the presence of subdivisions of single-family residences both east and west adjacent to Area 7. Farther upstream (in Sexton Canyon north of Foothill Road, beyond the field of view of Figure H-8) are approximately 150 acres of avocado orchards and additional residential development. Irrigation return flows from the adjacent and upstream residential neighborhoods, as well as the upstream orchards, would be expected to percolate to thin, shallow perched zones in near-surface soils and the active wash deposits, then migrate horizontally to Arundell Barranca (the nearest topographic "low" where surface water and shallow groundwater drainage can collect), and then seep out to the bed and banks of the barranca. These return flows likely are a source of water for the iGDE mapped at Area 7. Photographs 23 through 26 in Attachment H-1 provide historic images from 1938 through 2021. In addition to documenting the changes in land use over time, these photos show the presence of vegetation in the barranca over time.

Based on the understanding that shallow perched groundwater conditions likely occur and the separation from the principal aquifers, as well as the presence of surface water flows and irrigation return flows, Area 7 is not considered to be a GDE for the purpose of this GSP.

Area 8—Arundell Barranca (central)

Area 8 occupies an approximately 1,300-foot-long reach of Arundell Barranca near the center of Mound Basin at the U.S. Highway 101 and State Highway 126 interchange (Figure H-1). As shown on Figure H-9, most of this reach of Arundell Barranca presently is in a closed culvert (a concrete-lined tunnel) beneath Highways 101 and 126 and their on- and off-ramps. Surface-water flow in Arundell Barranca is shown on the 1967 edition of the USGS Saticoy quadrangle map as perennial upstream and downstream of Area 8; however, surface flow in Arundell Barranca is not shown as perennial on the 1903 edition of the Santa Paula quadrangle map. The iGDE in Area 8 consists of "wetland features commonly associated with the sub-surface presence of groundwater under natural, unmodified conditions" (and more specifically as "riverine, unknown perennial, unconsolidated bottom, semipermanently flooded"), according to the CNRA (2020), as shown on Figure H-9. The source of water is likely urban runoff and storm water routed to the barranca via storm drains.

Inspection of the aerial imagery shown on Figure H-9 indicates the presence of a subdivision of single-family residences northwest adjacent to Area 8, and Camino Real Park to the northeast. Upstream of Area 8, most of Arundell Barranca within Mound Basin is flanked by residential subdivisions or orchards (in the foothills in the northern part of Mound Basin). Irrigation return flows from the adjacent and upstream residential neighborhoods, as well as the upstream orchards, would be expected to percolate to thin, shallow perched zones in near-surface soils and the active wash deposits, then migrate horizontally to Arundell Barranca (the nearest topographic "low"), where they can seep out to land surface in the bed and banks of the barranca. These return flows likely are the primary sources of water for the iGDE mapped upstream from State Highway 126 at Area 8. The remainder of Area 8 is located in a closed culvert under State Highway 126 and U.S. Highway 101—the iGDE depicted in the CNRA (2020) database in this reach of Arundell Barranca seems to be in error.

Similar to Area 7, any saturated zones present in the thin active wash deposits present in Area 8 north of State Highway 126 are unlikely to be hydraulically connected with groundwater in the underlying principal aquifers of Mound Basin. Photographs 27 and 28 in Attachment H-1 provide historic images from 1958 and 2021. As is the case with Area 7, these photos document the changes in land use over time (specifically the development of State Highway 126) and show the presence of vegetation in the barranca over time. Because the iGDE present in Area 8 north of State Highway 126 is believed to be primarily dependent on surface water and irrigation return flows for its water supply, and because the area south of State Highway 126 is a culvert, Area 8 is not considered to be a GDE for the purpose of this GSP.

Area 9—Prince Barranca

Area 9 occupies an approximately 5,000-foot-long reach of Prince Barranca from near the mouth of Hall Canyon to Main Street, Ventura, in the northwest portion of Mound Basin (Figure H-1). Area 9 is underlain by "alluvial deposits and colluvial deposits" associated with "active wash deposits" of Holocene age (Gutierrez et al., 2008). No seeps or springs are shown on the USGS topographic maps of the Ventura 15- and 7.5-minute quadrangles (1904 and 1951 editions, respectively) in the vicinity of Area 9. Surface-water flow in Prince Barranca is shown on the 1951 edition of the USGS Ventura quadrangle map as perennial within and upstream of Area 9; however, surface flow in Prince Barranca is not shown as perennial on the 1904 edition.

The iGDE in Area 9 consists of "wetland features commonly associated with the sub-surface presence of groundwater under natural, unmodified conditions" (and more specifically as "palustrine [marsh], scrub-shrub, seasonally flooded"), according to the CNRA (2020), as shown on Figure H-10. Inspection of the aerial imagery shown on Figure H-10 indicates the presence of subdivisions of single-family residences both east and west adjacent to most of Area 9, except in the lower reaches of Hall Canyon where it lies adjacent to irrigated baseball fields. Within Hall Canyon, an approximately 14-acre avocado orchard is present adjacent to the east margin of the iGDE mapped in Area 9. Irrigation return flows from the adjacent residential neighborhoods and orchard would be expected to percolate to thin, shallow perched zones in near-surface soils deposits, then migrate horizontally to Prince Barranca (the nearest topographic "low"), and then seep out of the bed and banks of the barranca. These return flows likely are the primary sources of water for the iGDE mapped at Area 9 outside of precipitation-induced runoff events. Any saturated zones present in the thin active wash deposits present in Area 9 are unlikely to be hydraulically connected with groundwater in the underlying principal aquifers of Mound Basin.

Because the iGDEs present in Area 9 are believed to be primarily dependent on precipitation runoff and irrigation return flows for their water supply, and any perched saturated zones within the shallow alluvial deposits in Area 9 are not likely to be hydraulically connected with the underlying principal aquifers, Area 9 is not considered to be a GDE for the purpose of this GSP.

Area 10—Alessandro Lagoon

Area 10 consists of the Alessandro Lagoon, which occupies approximately 6 acres between U.S. Highway 101 and Alessandro Drive in the west part of Mound Basin (Figure H-1). Area 10 is underlain by "paralic deposits (interfingered marine and non-marine sediments) of the Sea Cliff marine terrace" of Holocene age (Gutierrez et al., 2008). The iGDE in Area 10 consists of "willow shrub" (CNRA, 2020), as shown on Figure H-11. No seeps, springs, or perennial streams are shown on the USGS topographic maps of the Ventura 15- and 7.5-minute quadrangles (1904 and 1951 editions, respectively) in the immediate vicinity of Area 10, although the USGS topographic map edition of 1951 shows marshland present approximately ¼-mile southeast of Area 10. This marshland has subsequently been filled and is now the site of residential and commercial development.

A map of historical estuarine and related habitats for the Ventura area prepared by Grossinger et al. (2011) indicates that both Area 10 and the marshland to the south were occupied by sand dunes in the late 19th century, with no wetland vegetation depicted. In December 1982, the City of Ventura designated Alessandro Lagoon a point of interest due to its history and its value as a freshwater refuge on the Pacific Coast flyway within Ventura County (City of Ventura, 2020). During the late 19th and early 20th centuries, the area was known as "Chautaqua Flats" and was the site of camping and amusement enterprises (City of Ventura, 2020). Neither the map presented by Grossinger et al. (2011) nor the 1951 USGS topographic maps of the Ventura quadrangle indicate the presence of features suggesting water at land surface within Area 10 from the late 19th century through 1951. Thus, it appears that the lagoon formed sometime after 1951. This is consistent with the fact that the lagoon occupies a fully enclosed depression between U.S. Highway 101 on the south and bluffs to the north. It appears that construction of U.S. Highway 101 served to create the southern enclosure of the depression that is now occupied by the lagoon. U.S. Highway 101 was constructed along the southern margin of the lagoon in 1959 and 1960.

Photographs 33 through 36 in Attachment H-1 provide historic images from 1959 through 2021, and document the changes described above. Because this iGDE appears to be dependent on surface water that becomes trapped within a closed artificial depression, Area 10 is not considered to be a GDE for the purpose of this GSP.

Area 11—Lower Santa Clara River and Estuary

Area 11 occupies much of the channel of the lower Santa Clara River within Mound Basin, the river's estuary, and adjacent lowlands (Figure H-1). A map of historical estuarine and related habitats for the Ventura area prepared by Grossinger et al. (2011) shows that "open water," "vegetated wetland," and "vegetated woody" areas existed in Mound Basin within and adjacent to the lower Santa Clara River in the late 19th century. As described by Stillwater Sciences (2011), "The lower Santa Clara River and Santa Clara River estuary (SCRE) have undergone considerable geomorphic change over the past 150 years since European-American settlement due to a combination of land-use practices and climatic conditions. Historically, the SCRE was an expansive ecosystem that included an open-water lagoon and a series of channels that supported intertidal vegetation. Land development since the mid-19th century has resulted in a 75% to 90% decrease in overall SCRE area and available habitat, and the confinement of flood flows by levees." Area 11 is underlain by "active wash deposits within major river channels" of Holocene age, stream terrace deposits, alluvial and colluvial deposits, and artificial fill (Gutierrez et al., 2008).

The iGDEs within Area 11 consist of seven "vegetation types commonly associated with the sub-surface presence of groundwater," and "wetland features commonly associated with the sub-surface presence of groundwater under natural, unmodified conditions," according to the CNRA (2020), as shown on Figure H-12. No seeps, springs, or perennial streams are shown on the USGS 1904 topographic map of the Hueneme 15-minute quadrangle or the USGS 1949 topographic map of the Oxnard 7.5-minute quadrangle (photo revised in 1967). Both the 1904 and the 1949 topographic maps show estuary lakes of 50 to 70 acres in area at the mouth of the Santa Clara River, separated from the Pacific Ocean by a narrow beach area. The 1949 Oxnard quadrangle map also shows a small pond in the Santa Clara River floodplain approximately 1.25 miles upstream from the coastline.

Sources of Water to Area 11

At present, the Olivas Links golf course and Ventura's wastewater treatment plant (WWTP), which includes artificial treatment ponds shaped to fit in the natural landscape, are present adjacent to (and partly within) Area 11 to the north (Figure H-12). Farm fields and the campground at McGrath State Beach are adjacent to Area 11 to the south (Figure H-12). Sources of water and their relative contributions to surface flows within the lower Santa Clara River and its estuary were estimated by Stillwater Sciences (2011) for the period from October 25, 2009, through September 15, 2010, as follows:

- Surface flows in the Santa Clara River originating upstream from Mound Basin—80% of the total inflow.
- Effluent discharge from Ventura's WWTP—8% of total inflow.
- Surface inflows from the Pacific Ocean during high tides—7% of total inflow.
- Groundwater inflow from the Shallow Alluvial Deposits in Mound Basin and from the semi-perched Aquifer in Oxnard Basin—4% (combined) of total inflow.
- Direct precipitation—less than 1% of total inflow.
- Subsurface tidal inflow—less than 1% of total inflow.

Although not included in Stillwater Sciences (2011) accounting of inflows, tile drains underlying farm fields and overland surface runoff produced during storm events likely also contribute water to the lower Santa Clara River (United, 2018). It should be noted that much of the groundwater present in the Shallow Alluvial Deposits in Mound Basin and the semi-perched aquifer of the Oxnard Basin near Area 11 consists of return flows from irrigation water applied to the golf courses and farm fields north and south of the Santa Clara River (United, 2018).

Although surface flows originating upstream from Mound Basin dominate the inflow of water to the lower Santa Clara River (and Area 11), those flows are ephemeral, only reaching the lower Santa Clara River in Mound Basin following major storms, which occur primarily in winter and spring (Stillwater Sciences, 2011). Therefore, the primary sources of water supporting Area 11 iGDEs during dry months and drought periods include tile-drain discharges, effluent from Ventura's WWTP, and groundwater discharge from the semi-perched aquifer in Oxnard Basin.

Following TNC guidance, each of the iGDEs within Area 11 were analyzed and slightly revised to more accurately reflect the vegetation communities present. These potential GDEs were then grouped into the Area 11 GDE Unit. The Area 11 GDE Unit was characterized and evaluated based on the vegetation communities present and the potential to provide habitat for special status plant and wildlife species.

Characterization of the Area 11 GDE Unit

Vegetation Communities

The following iGDEs are mapped within the Natural Communities Commonly Associated with Groundwater (NCCAG) dataset within Area 11 (Figure H-12):

- *Leymus triticoides*
- Mixed willow forest
- *Populus balsamifera – Salix lasiolepis*
- *Salix lasiolepis*
- *Salix lucida*
- *Scirpus* spp.
- Wetlands

These vegetation communities were reviewed by biologists at Rincon Consultants Inc. (Rincon) and compared with previous vegetation mapping that was completed within the SCRE by Stillwater Sciences (2011) and WRA (2014). Based on this analysis, the following vegetation communities with potential to be groundwater dependent were mapped within Area 11 (Figure H-13):

- Arroyo Willow Thicket
- Black Cottonwood Forest
- Freshwater Marsh
- *Arundo* stands
- Wetlands

Stands of *Arundo donax* (giant reed) are widespread throughout Area 11 (Stillwater Sciences, 2011). Arundo is a highly invasive species that utilizes up to six times more water than native riparian plant species (Giessow et al., 2011). Other invasive plant species that are prevalent within Area 11 include salt cedar (*Tamarisk* spp.) and iceplant (*Carpobrotus* spp.). These invasive plant species can provide habitat for wildlife but have an overall detrimental impact on the ecosystems within which they occur due to their rapid growth rates and ability to out-compete native species for resources (i.e., water and nutrients).

Critical Habitat

Rincon queried the U.S. Fish and Wildlife Service (USFWS) Critical Habitat Portal (USFWS 2021) and the NOAA Critical Habitat maps (NOAA, 2021) for information on federally designated critical habitat within Area 11 (Figure H-14). The area includes critical habitat for four federally listed species: Southern California distinct population segment (DPS) steelhead (*Oncorhynchus mykiss irideus*), tidewater goby (*Eucyclogobius newberryi*), southwestern willow flycatcher (*Empidonax traillii extimus*), and western snowy plover (*Charadrius nivosus nivosus*). Critical habitat for Ventura Marsh milk vetch (*Astragalus pycnostachyus var. lanosissimus*) lies approximately 0.7 miles south of the Mound Basin boundary.

Special Status Species

For the purposes of this document, special status species are defined as those:

- Listed, proposed, or candidates for listing as endangered or threatened under the federal Endangered Species Act (ESA) or the California Endangered Species Act (CESA).
- Designated by the CDFW as a Species of Special Concern (SSC) or Watchlist Species (WL).
- Designated by the CDFW as Fully Protected (FP) under the California Fish and Game Code (Sections 3511, 4700, 5050, and 5515).
- Included on CDFW's most recent Special Vascular Plants, Bryophytes, and Lichens List (CDFW 2021c) with a California Rare Plant Rank (CRPR) of 1 or 2.
- Protected by the Migratory Bird Treaty Act (MBTA) or California Fish and Game Code Section 3503.

Special Status Plant Species

Rincon queried the California Natural Diversity Database (CNDDB; CDFW, 2021a), the California Native Plant Society (CNPS, 2021) Inventory of Rare Plants, and Calflora (Calflora, 2021) for occurrences of special status plant species within the Ventura, Oxnard, and Saticoy 7.5-minute USGS quadrangles. Based on these queries, 14 plant species were evaluated for their potential to occur within Mound Basin and Area 11 (Attachment H-2). Of these, eight special status plant species have some potential to occur within Area 11. Table H-1 provides a summary of these species, their regulatory status, their potential to occur, and their potential GDE Association.

Table H-1 Special Status Plant Species with Potential to Occur within Area 11

Scientific Name Common Name	Status Fed/State ESA CDFW	Potential to Occur[1]	GDE Association[1]
Aphanisma blitoides aphanisma	None/None G3G4/S2 1B.2	Likely to Occur	Unlikely
Astragalus pycnostachyus var. *lanosissimus* Ventura Marsh milk-vetch	FE/SE 1B.1	Present	Likely
Atriplex coulteri Coulter's saltbush	None/None G3/S1S2 1B.2	May Occur	Unlikely
Atriplex pacifica south coast saltscale	None/None G4/S2 1B.2	May Occur	Unlikely
Chaenactis glabriuscula var. *orcuttiana* Orcutt's pincushion	None/None G5T1T2/S1 1B.1	Likely to Occur	Unlikely

Scientific Name Common Name	Status Fed/State ESA CDFW	Potential to Occur[1]	GDE Association[1]
Chloropyron maritimum ssp. *maritimum* salt marsh bird's-beak	FE/SE G4?T1/S1 1B.2	May Occur	Likely
Lasthenia glabrata ssp. *coulteri* Coulter's goldfields	None/None G4T2/S2 1B.1	May Occur	Likely
Pseudognaphalium leucocephalum white rabbit-tobacco	None/None G4/S2 2B.2	May Occur	Unlikely

[1] Attachment H-2 presents criteria for assessing species' potential to occur and GDE association.

CRPR (California Rare Plant Rank)

1A=Presumed Extinct in California.

1B=Rare, Threatened, or Endangered in California and elsewhere.

2A=Plants presumed extirpated in California, but more common elsewhere.

2B=Plants Rare, Threatened, or Endangered in California, but more common elsewhere.

CRPR Threat Code Extension

.1=Seriously endangered in California (over 80% of occurrences threatened/high degree and immediacy of threat).

.2=Fairly endangered in California (20-80% occurrences threatened).

.3=Not very endangered in California (<20% of occurrences threatened).

CDFW Rare

G1 or S1 = Critically Imperiled Globally or Subnationally (state).

G2 or S2 = Imperiled Globally or Subnationally (state).

G3 or S3 = Vulnerable to extirpation or extinction Globally or Subnationally (state).

G4/5 or S4/5 = Apparently secure, common and abundant.

GNR/SNR= Globally or Subnationally (state) not ranked.

Special Status Wildlife Species

Rincon queried the CNDDB, eBird (Cornell Lab of Ornithology, 2021a), and other literature sources (e.g., Stillwater Sciences 2011; WRA, 2014; Labinger et al., 2011) for occurrences of special status wildlife species within the Ventura, Oxnard, and Saticoy 7.5-minute USGS quadrangles. Based on these queries, thirty-six species were evaluated for their potential to occur within Mound Basin and Area 11 (Attachment H-2). Of these, eight special status plant species have some potential to occur within Area 11. Table H-1 provides a summary of these species, their regulatory status, their potential to occur, and their potential GDE Association.

Table H-2 Special Status Wildlife Species with Potential to Occur within Area 11

Scientific Name Common Name	Status Fed/State ESA CDFW	Potential to Occur[1]	GDE Association[1]
Invertebrates			
Danaus plexippus pop. 1 monarch - California overwintering population	FC/None G4T2T3/S2S3	May Occur (non-roosting)	Indirect
Fish			
Catostomus santaanae Santa Ana sucker	FT/None G1/S1	May Occur	Direct

Scientific Name Common Name	Status Fed/State ESA CDFW	Potential to Occur[1]	GDE Association[1]
Eucyclogobius newberryi tidewater goby	FE/None G3/S3	Present	Direct
Entosphenus tridentatus Pacific lamprey	None/None SSC	Present	Direct
Gila orcuttii arroyo chub	None/None SSC (Non-Native to Santa Clara River)	May Occur	Direct
Oncorhynchus mykiss irideus pop. 10 Southern California DPS steelhead	FE/None	Present	Direct
Amphibians			
Rana draytonii California red-legged frog	FT/None SSC	May Occur	Direct
Reptiles			
Anniella ssp. California legless lizard	None/None G3G4/S3S4 SSC	Likely to Occur	Indirect
Anniella stebbinsi Southern California legless lizard	None/None G3/S3 SSC	Likely to Occur	Indirect
Aspidoscelis tigris stejnegeri coastal whiptail	None/None G5T5/S3 SSC	May Occur	No known dependence on groundwater
Actinemys pallida (Emys marmorata) Southwestern pond turtle	None/None SSC	May Occur	Direct
Phrynosoma blainvillii coast horned lizard	None/None G3G4/S3S4 SSC	May Occur	No known dependence on groundwater
Thamnophis hammondii Two-striped gartersnake	None/None SSC	Likely to Occur	Direct
Birds			
Agelaius tricolor tricolored blackbird	None/ST G1G2/S1S2 SSC	Present	Indirect
Athene cunicularia burrowing owl	None/None G4/S3 SSC	Present	No known dependence on groundwater
Charadrius nivosus western snowy plover	FT/None G3T3/S2 SSC	Present	Indirect
Circus hudsonius northern harrier	None/None G5/S3 SSC	Present	Indirect
Coccyzus americanus occidentalis western yellow-billed cuckoo	FT/SE G5T2T3/S1	May Occur	Indirect

Scientific Name Common Name	Status Fed/State ESA CDFW	Potential to Occur[1]	GDE Association[1]
Elanus leucurus white-tailed kite	None/None G5/S3S4 FP	Present	Indirect
Empidonax traillii extimus Southwestern willow flycatcher	FE/SE	May Occur	Indirect
Falco peregrinus anatum American peregrine falcon	None/ST G3G4T1/S1 FP	Present (foraging)	Indirect
Passerculus sandwichensis beldingi Belding's savannah sparrow	None/SE G5T3/S3	Present	Indirect
Polioptila californica coastal California gnatcatcher	FT/None G4G5T3Q/S2 SSC	Unlikely to Occur	Indirect
Riparia bank swallow	None/ST G5/S2	Present	Indirect
Setophaga petechia Yellow warbler	None/None SSC	Present	Indirect
Sternula antillarum browni California least tern	FE/SE G4T2T3Q/S2 FP	Present	Indirect
Vireo bellii pusillus Least Bell's vireo	FE/SE G5T2/S2	Present	Indirect
Mammals			
Antrozous pallidus pallid bat	None/None G4/S3 SSC	Unlikely to Occur	No known dependence on groundwater

[1] Attachment H-2 presents criteria for assessing species' potential to occur and GDE association.

Fed = Federal
ESA = Endangered Species Act
CDFW = California Department of Fish and Wildlife
FE = Federally Endangered
FT = Federally Threatened
SSC= CDFW Species of Special Concern
SE = State Endangered
ST = State Threatened
SCE = State Candidate Endangered
FP = State Fully Protected

Ecological Value

The Area 11 GDE Unit includes the lower Santa Clara River and the SCRE and has a high ecological value. This area includes federally designated critical habitat for southern California DPS steelhead, southwestern willow flycatcher, tidewater goby, and western snowy plover. The estuary also provides known or potential habitat for eight special status plant species and 28 special status wildlife species (Tables H-1 and H-2), in addition to providing habitat for numerous other species. The SCRE is a highly productive ecosystem that provides important foraging, breeding, rearing, and migration habitat for shore birds, fishes, and other wildlife species.

Consideration of Area 11 GDE in the GSP

It is important to note that there is no groundwater extraction from the shallow groundwater of the Shallow Alluvial Deposits. In addition, Appendix G to the GSP explains that the Santa Clara River and its estuary and groundwater in the Shallow Alluvial Deposits are not material affected by pumping in the principal aquifers. Given the lack of potential for significant impacts to the GDEs by principal aquifer pumping, there are no potential impacts to the Area 11 GDE that need to be considered in the development of sustainable management criteria for the principal aquifers. However, MBGSA will monitor well permit applications for proposed uses of shallow groundwater in the vicinity of Area 11. If any shallow wells are proposed, MBGSA will evaluate impacts to the Area 11 GDEs. Proposed uses that would have a significant impact to Area 11 GDEs may be required to mitigate those impacts as a condition of MBGSA permit approval.

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_____. 1904. Topographic Map of the Hueneme 15' Quadrangle.

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Figures

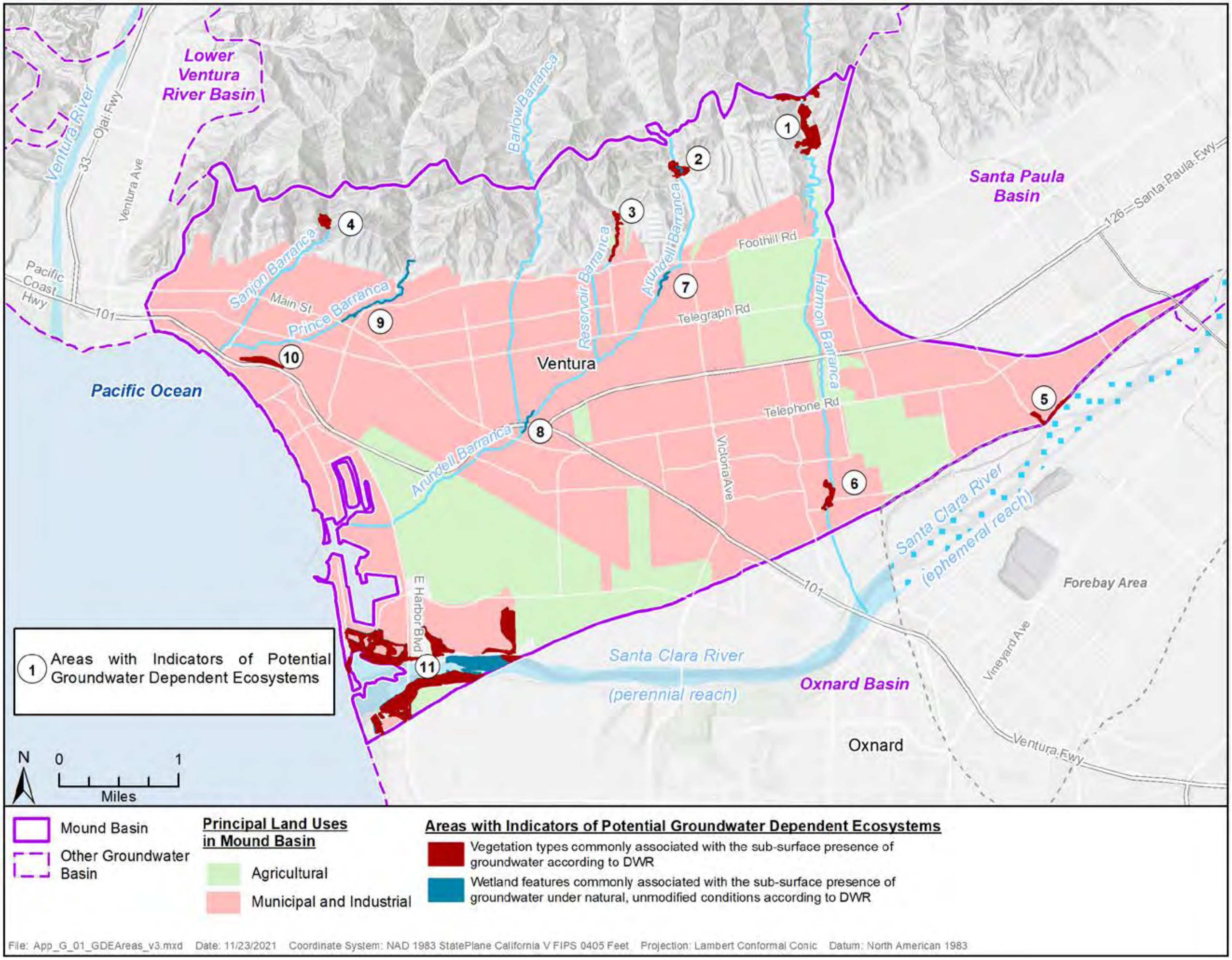


Figure H-1 Map of Areas with Indicators of Potential Groundwater Dependent Ecosystems.

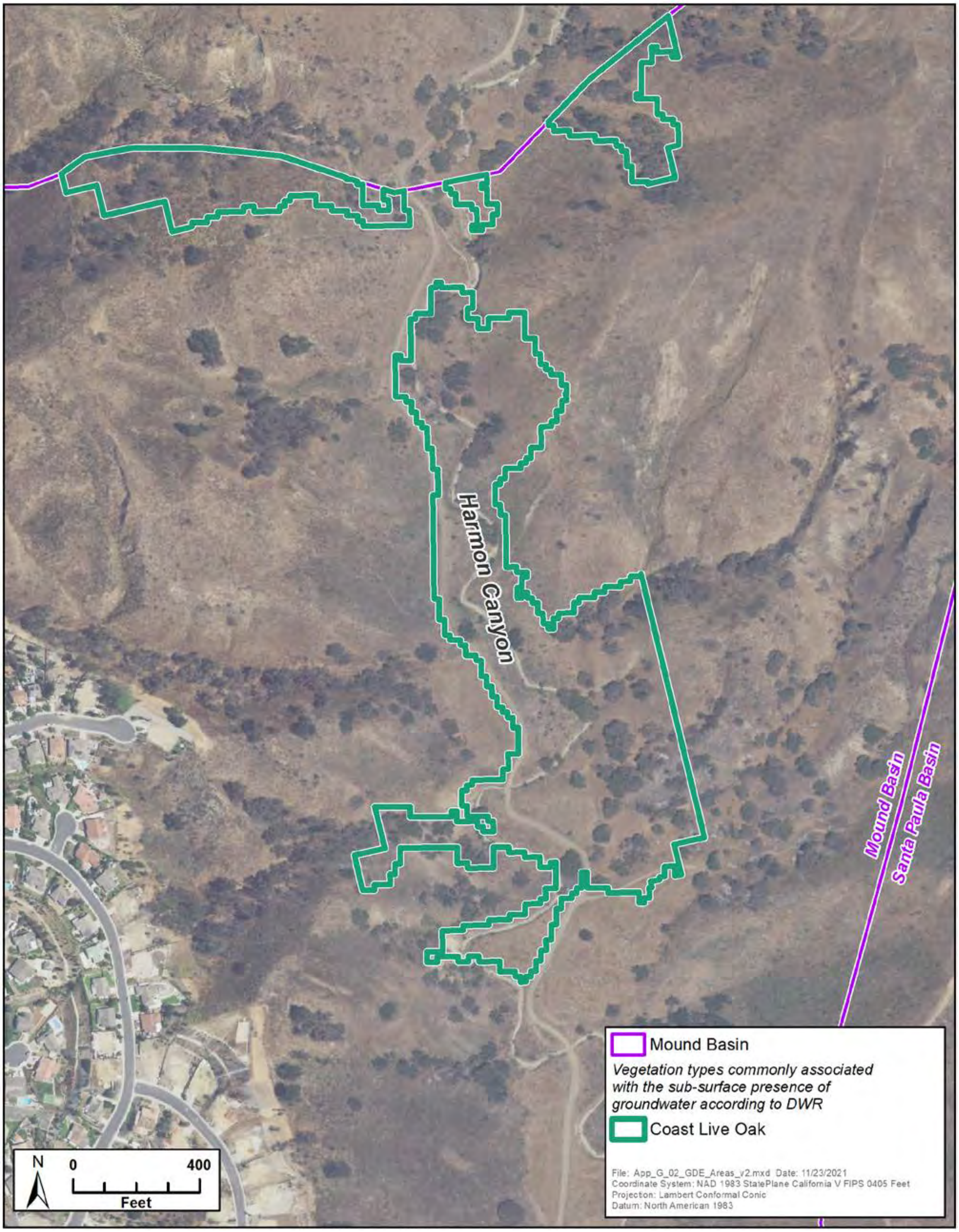


Figure H-2 Potential GDE Area 1.

Figure H-3 Potential GDE Area 2.

Figure H-4 Potential GDE Area 3.

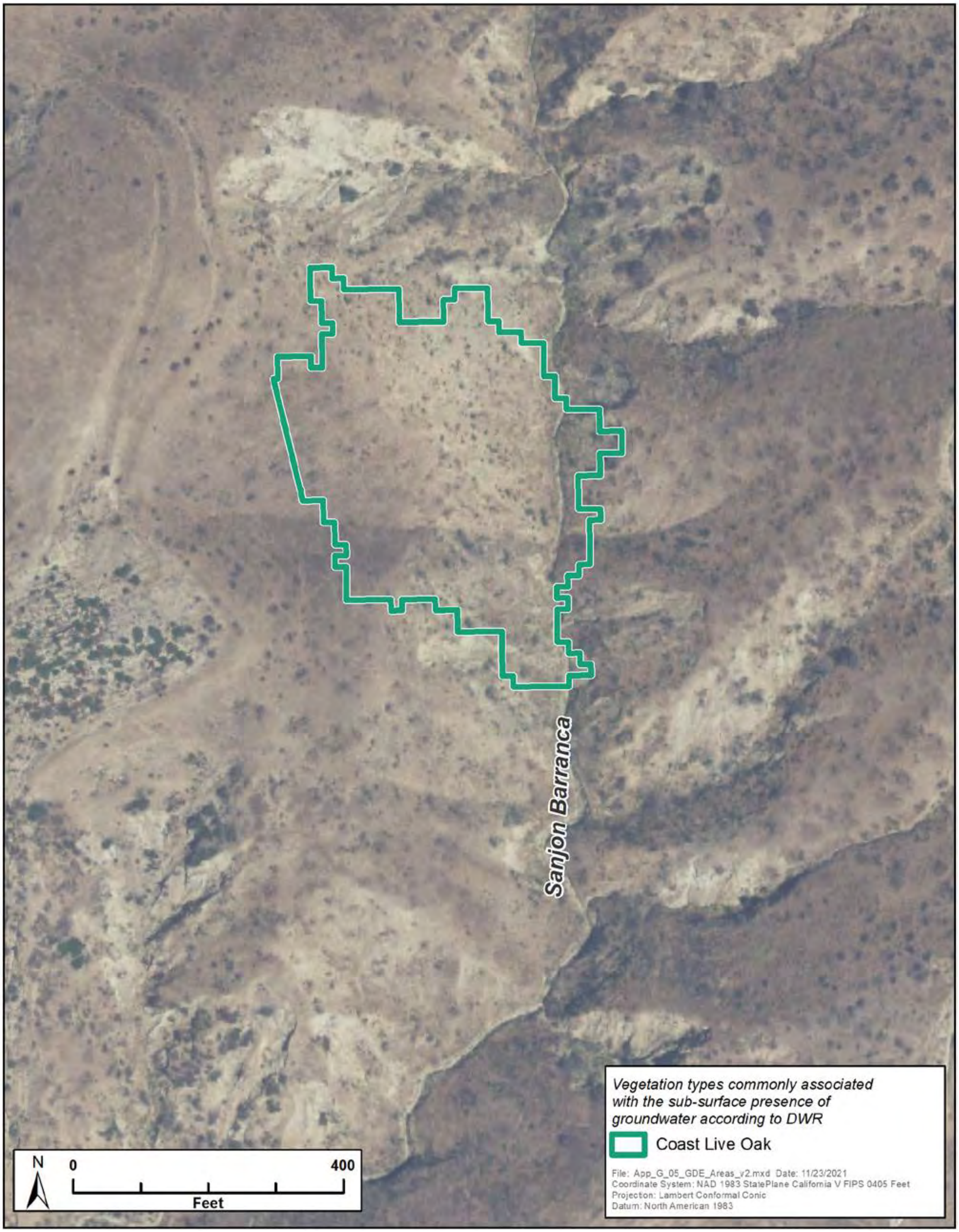


Figure H-5 Potential GDE Area 4.

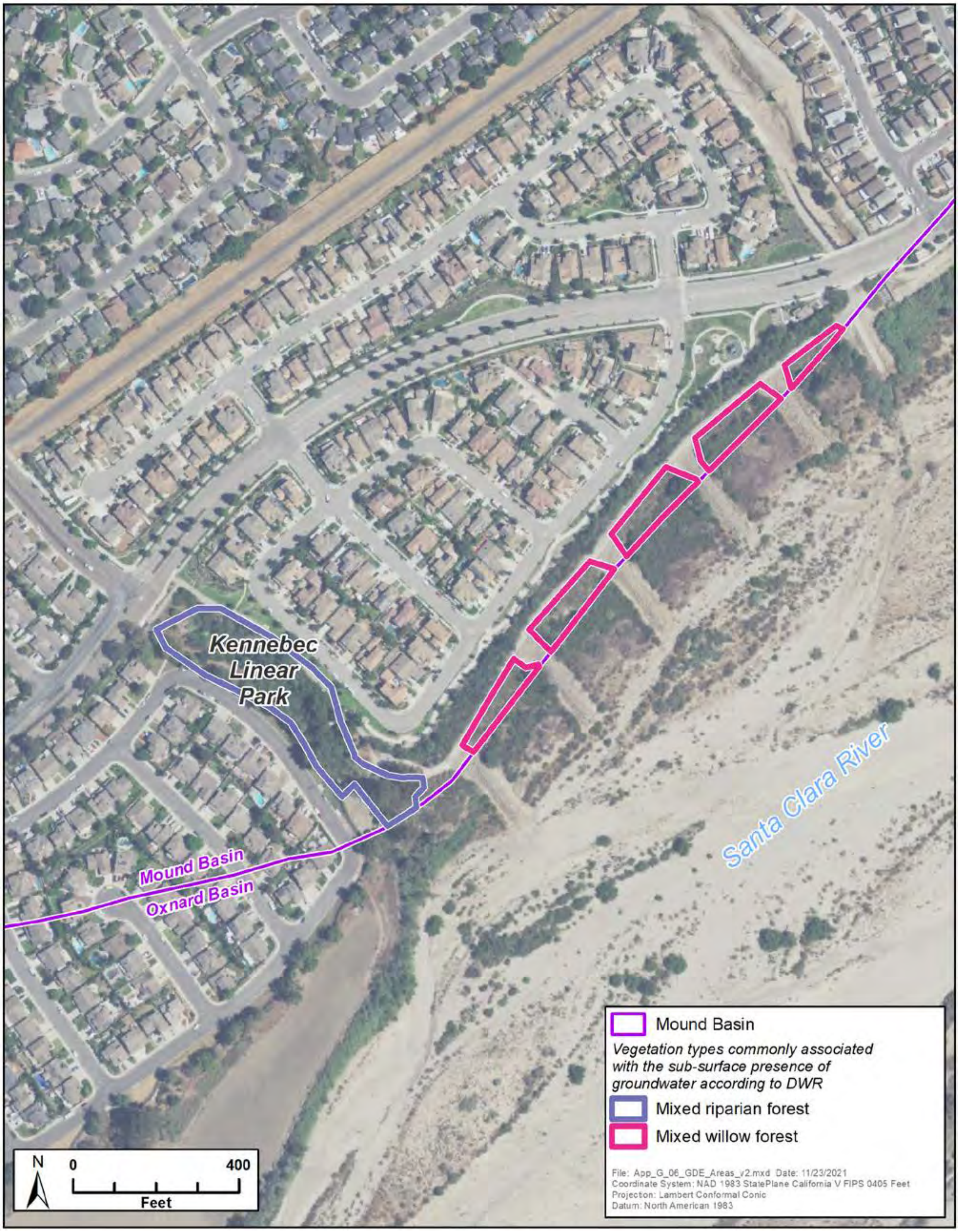


Figure H-6 Potential GDE Area 5.

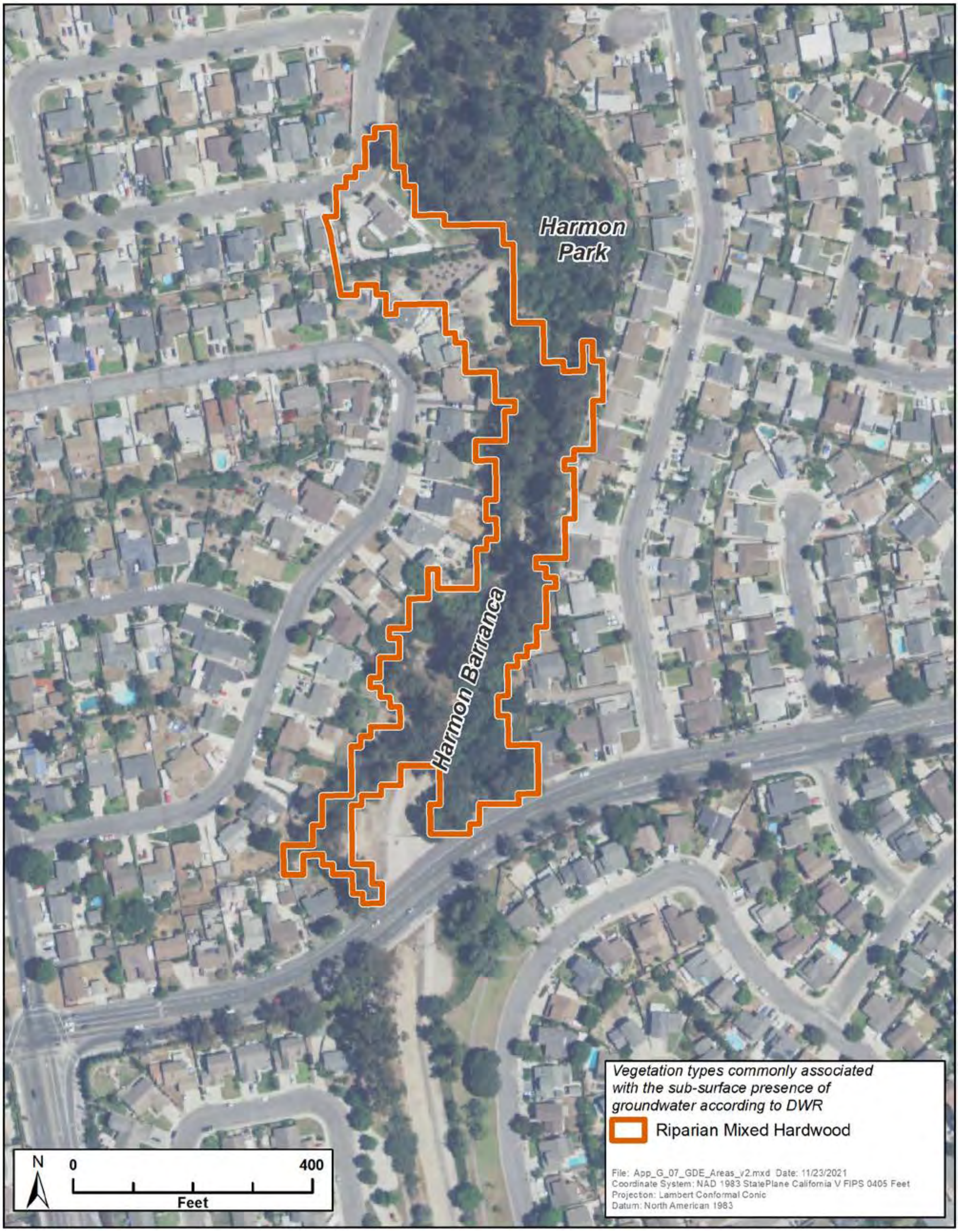


Figure H-7 Potential GDE Area 6.

Figure H-8 Potential GDE Area 7.

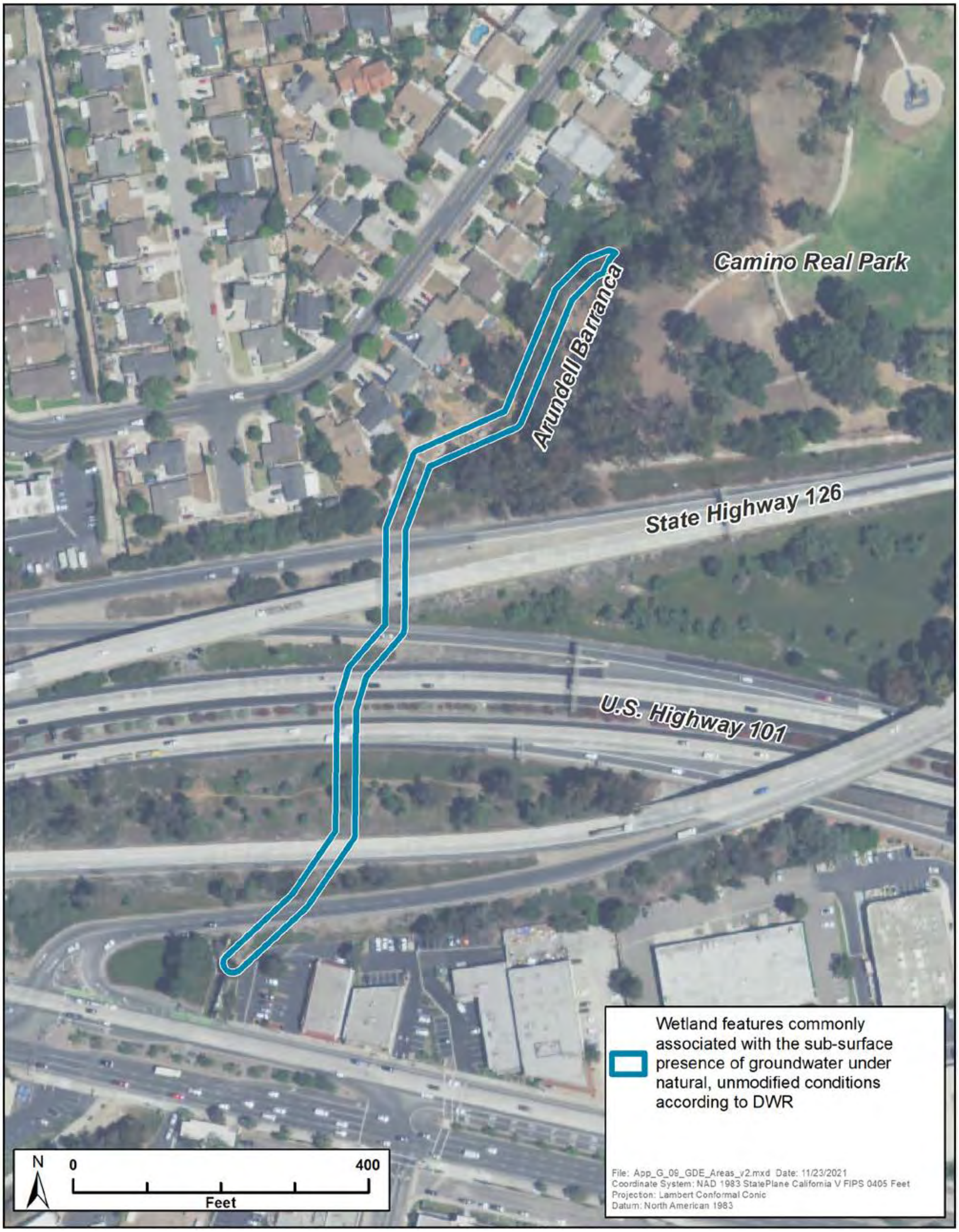


Figure H-9 Potential GDE Area 8.

Figure H-10 Potential GDE Area 9.

Figure H-11 Potential GDE Area 10.

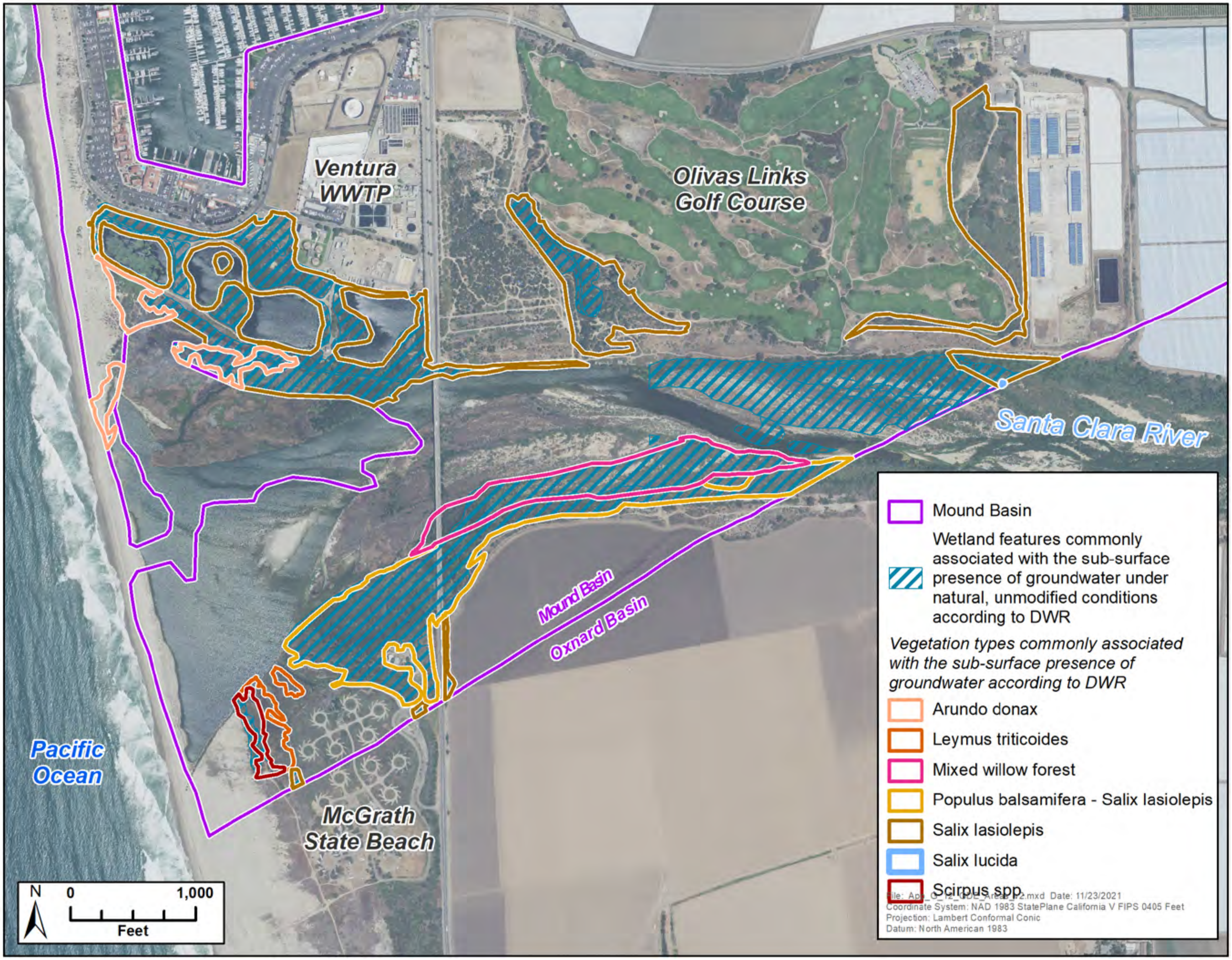
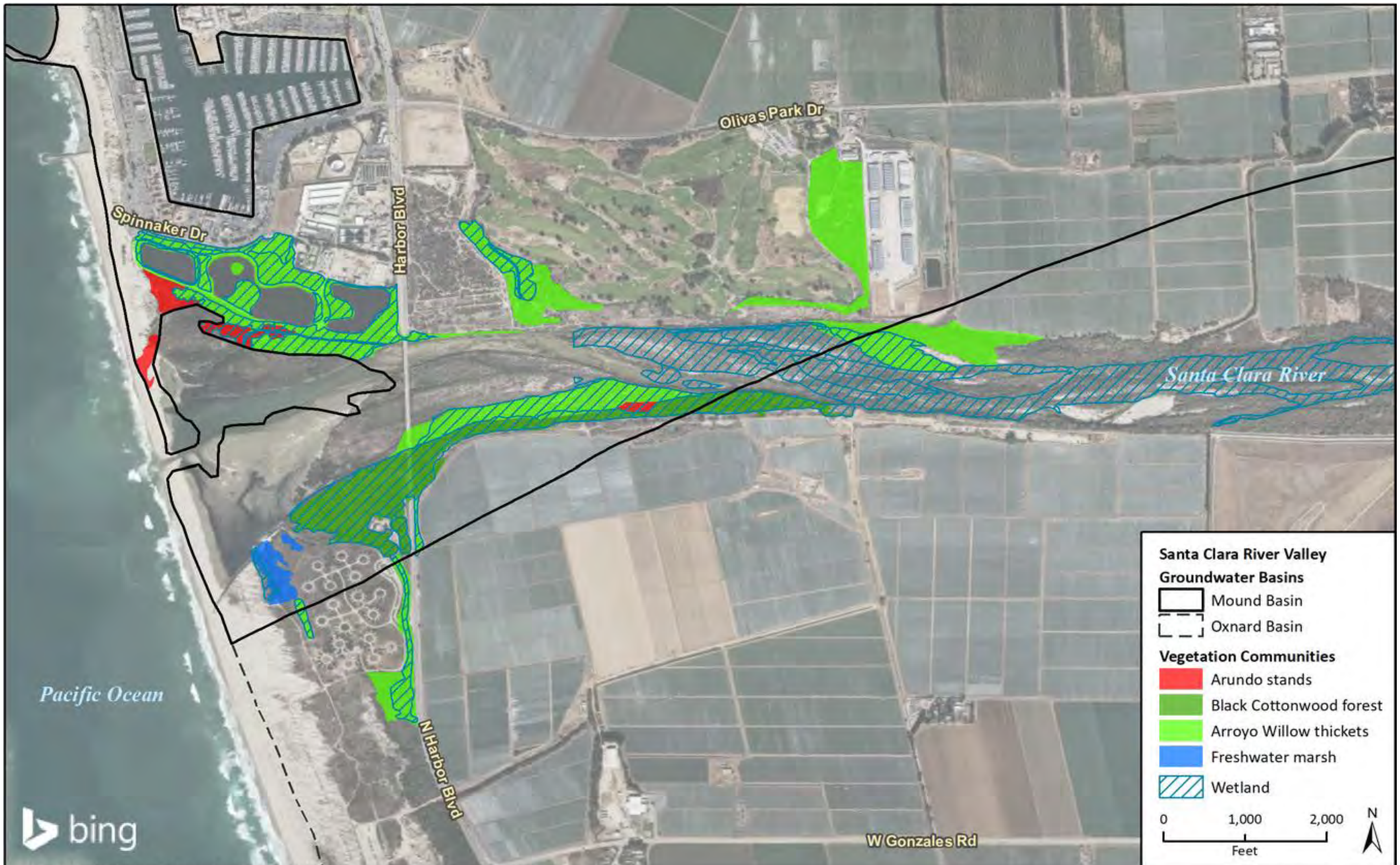


Figure H-12 Potential GDE Area 11.



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Additional data provided by California Natural Resources Agency (CNRA), 2020

Figure H-13 Area 11 Vegetation Communities with Potential to be Groundwater Dependent.

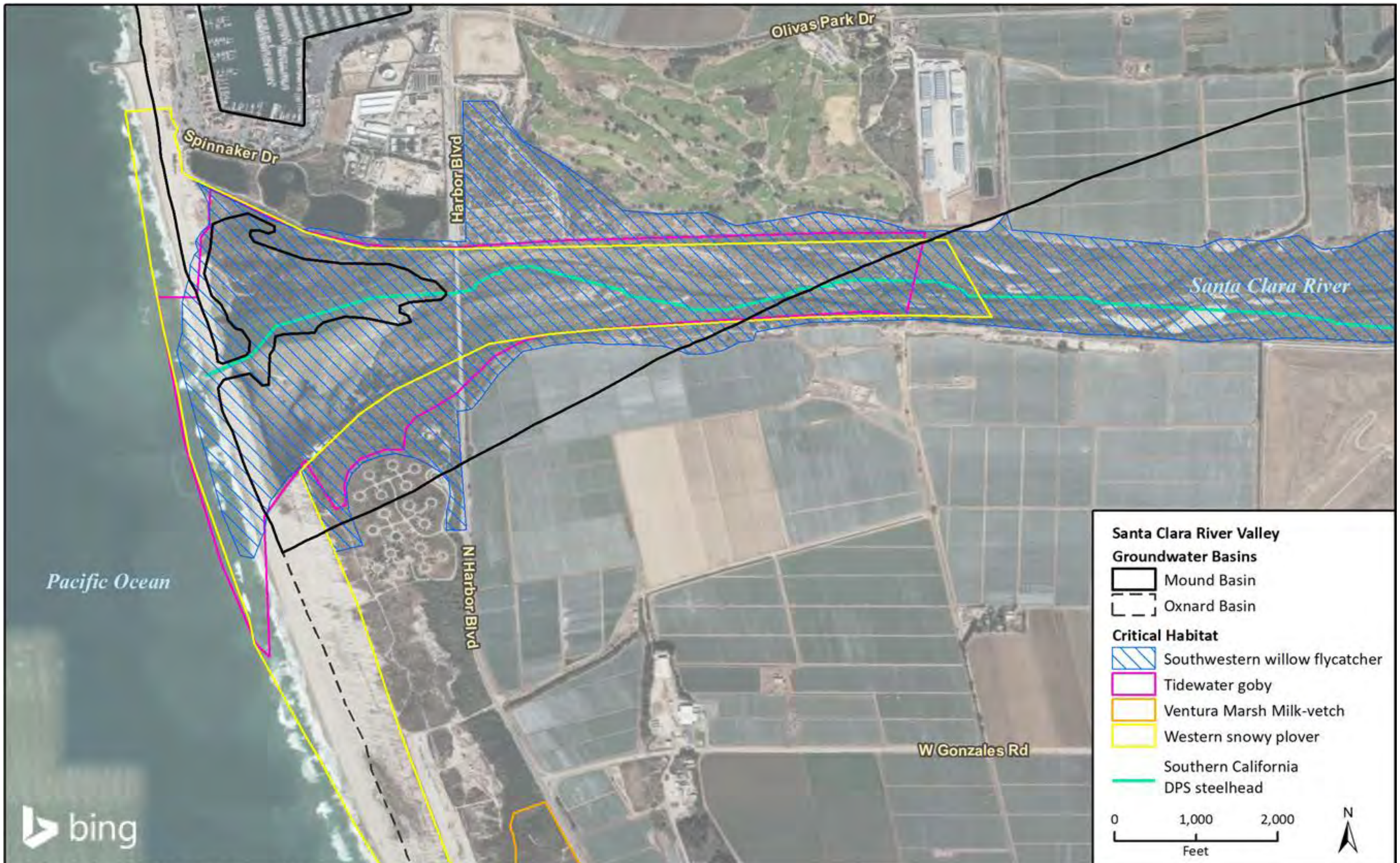

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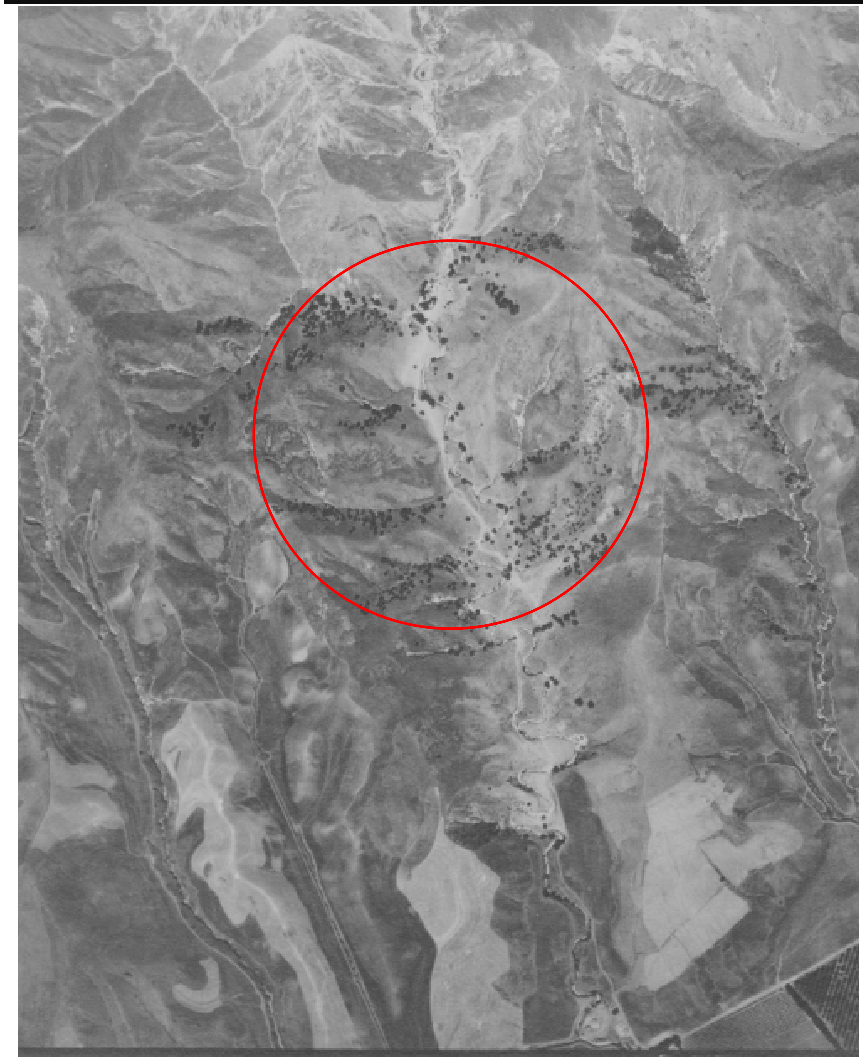
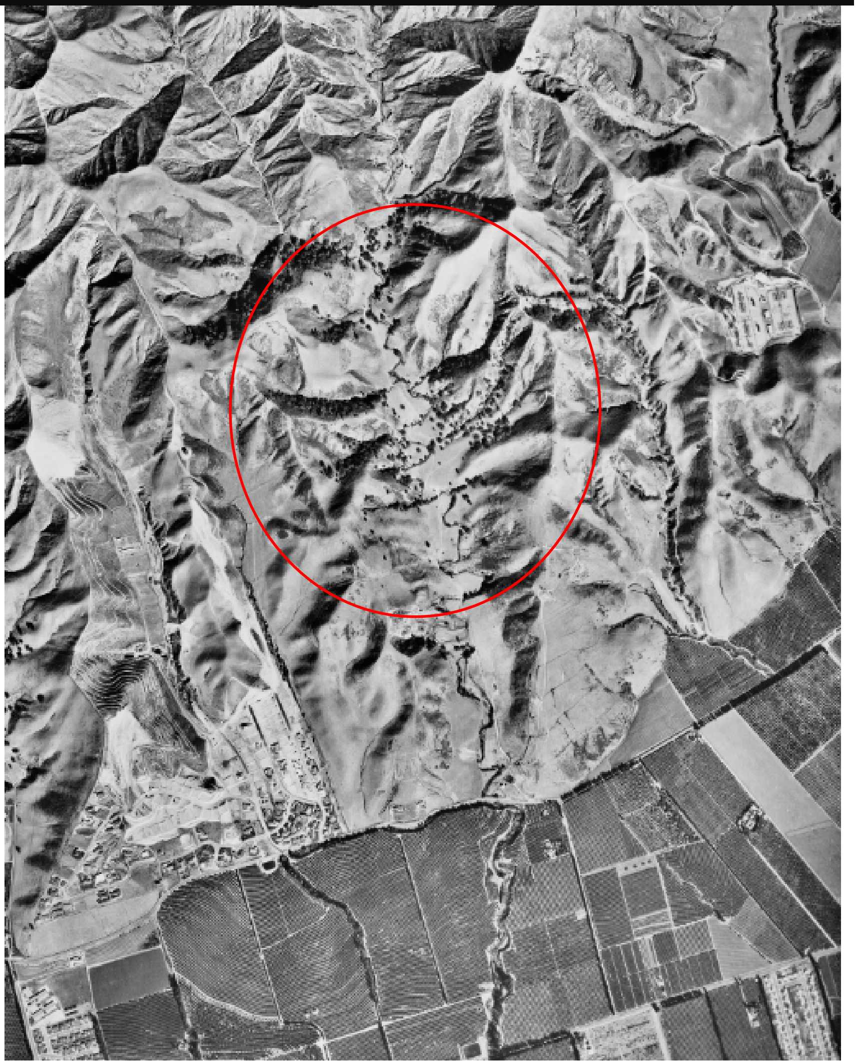
Figure H-14 Area 11 Critical Habitat.

Attachment H-1. Historic Photo Plate for Areas 1 – 10

Area 1 (1927, 1959, 1964, 2021)



Photograph 1. Area 1, 1927

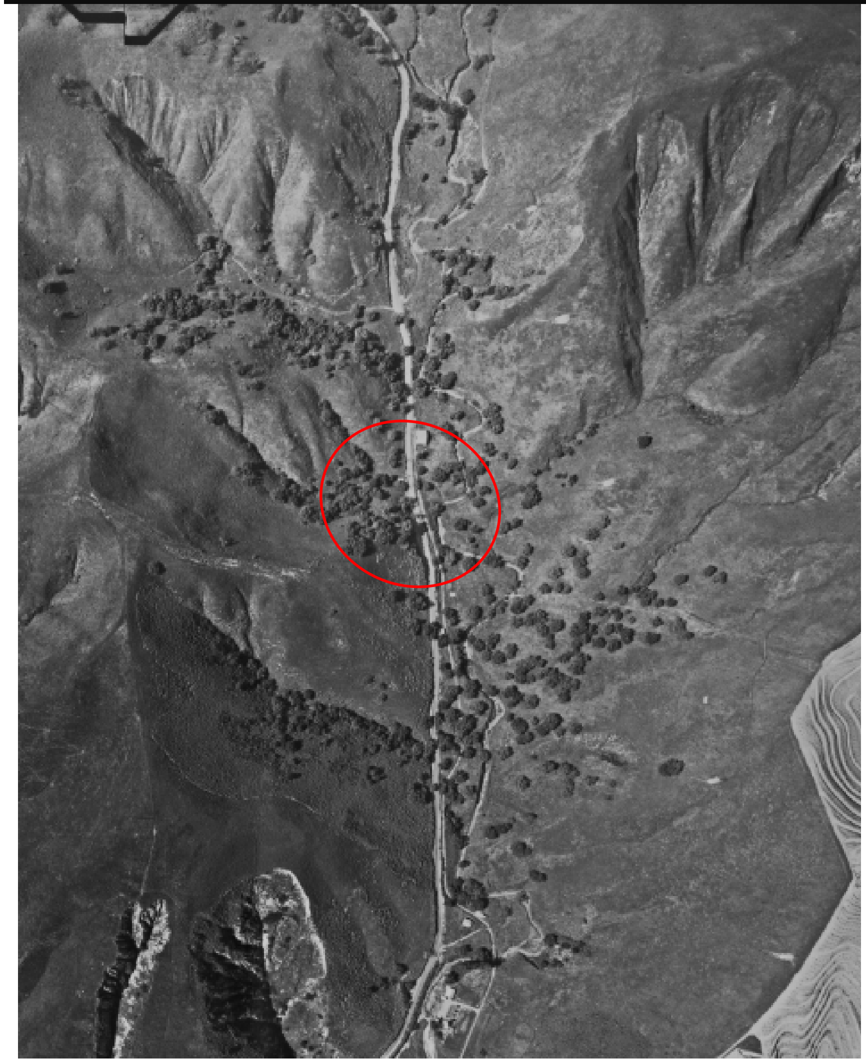


Photograph 2. Area 1, 1959

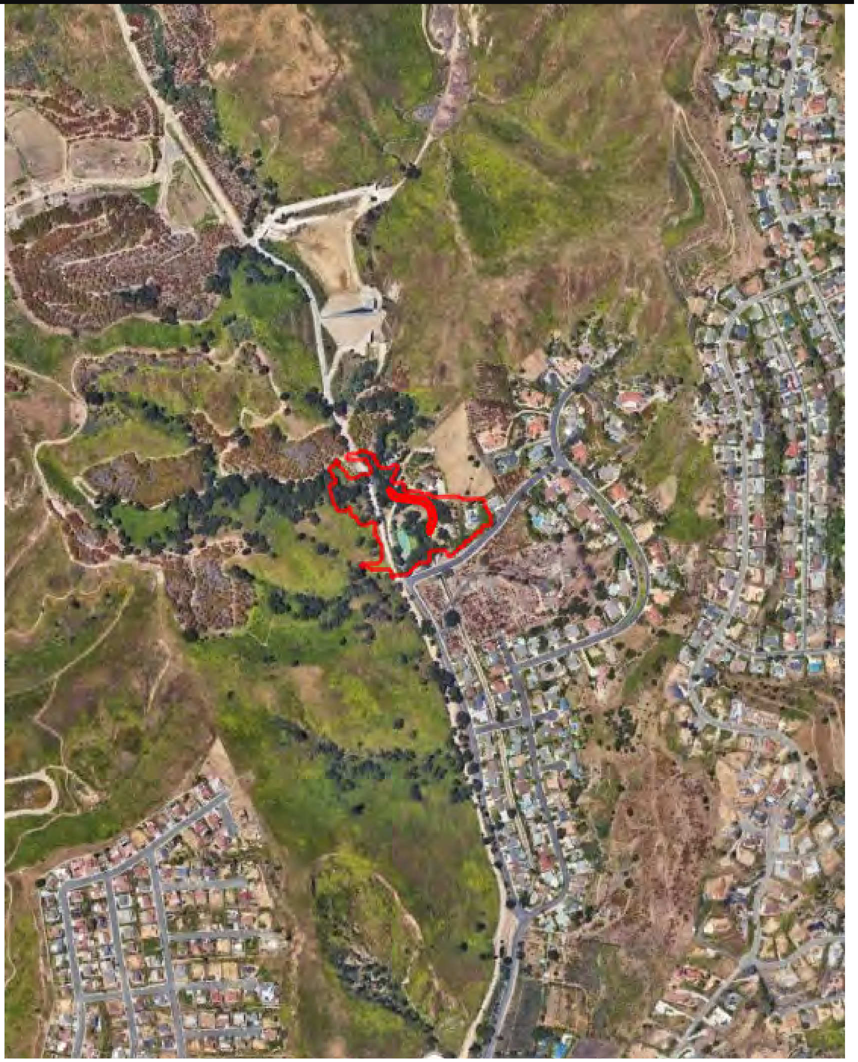
Photograph 3. Area 1, 1964

Photograph 4. Area 1, 2021

Area 2 (1958,2021)



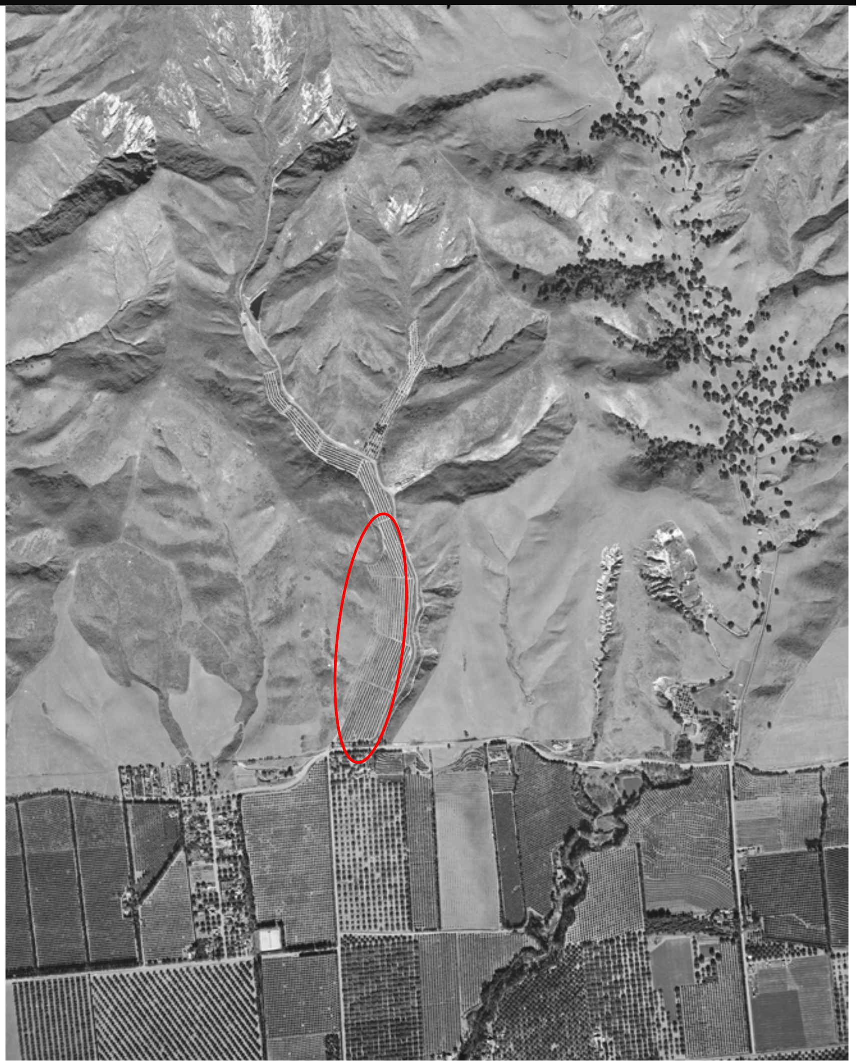
Photograph 5. Area 2, 1958



Photograph 6. Area 2, 2021

Area 3 (1927, 1945, 1963, 2021)

Photograph 7. Area 3, 1927

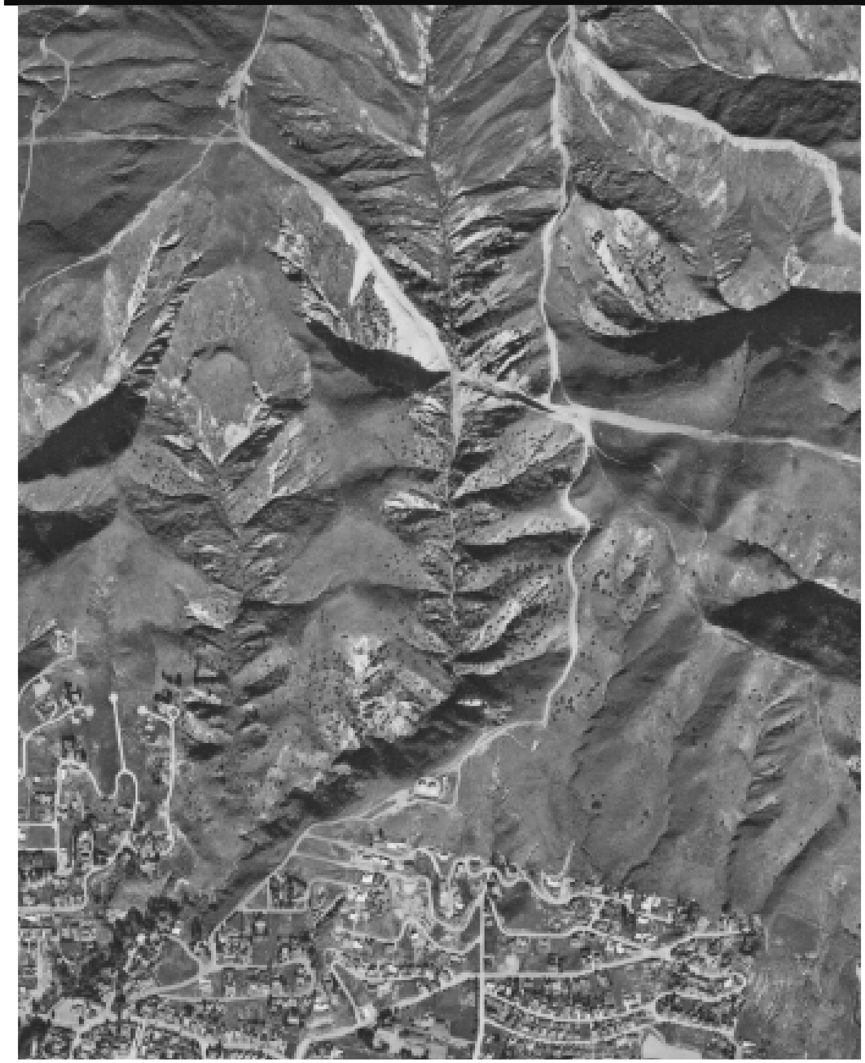


Photograph 8. Area 3, 1945

Photograph 9. Area 3, 1963

Photograph 10. Area 3, 2021

Area 4 (1927, 2021)



Photograph 11. Area 4, 1927

Photograph 12. Area 4, 1996

Photograph 13. Area 4, 2009

Photograph 14. Area 4, 2021

Area 5 (1945, 1958, 1970, 2021)

Photograph 15. Area 5, 1945

Photograph 16. Area 5, 1958

Photograph 17. Area 5, 1970

Photograph 18. Area 5, 2021

Area 6 (1927, 1947, 1963, 2021)

Photograph 19. Area 6, 1927

Photograph 20. Area 6, 1947

Photograph 21. Area 6, 1963

Photograph 22. Area 6, 2021

Area 7 (1938, 1961, 1994, 2021)

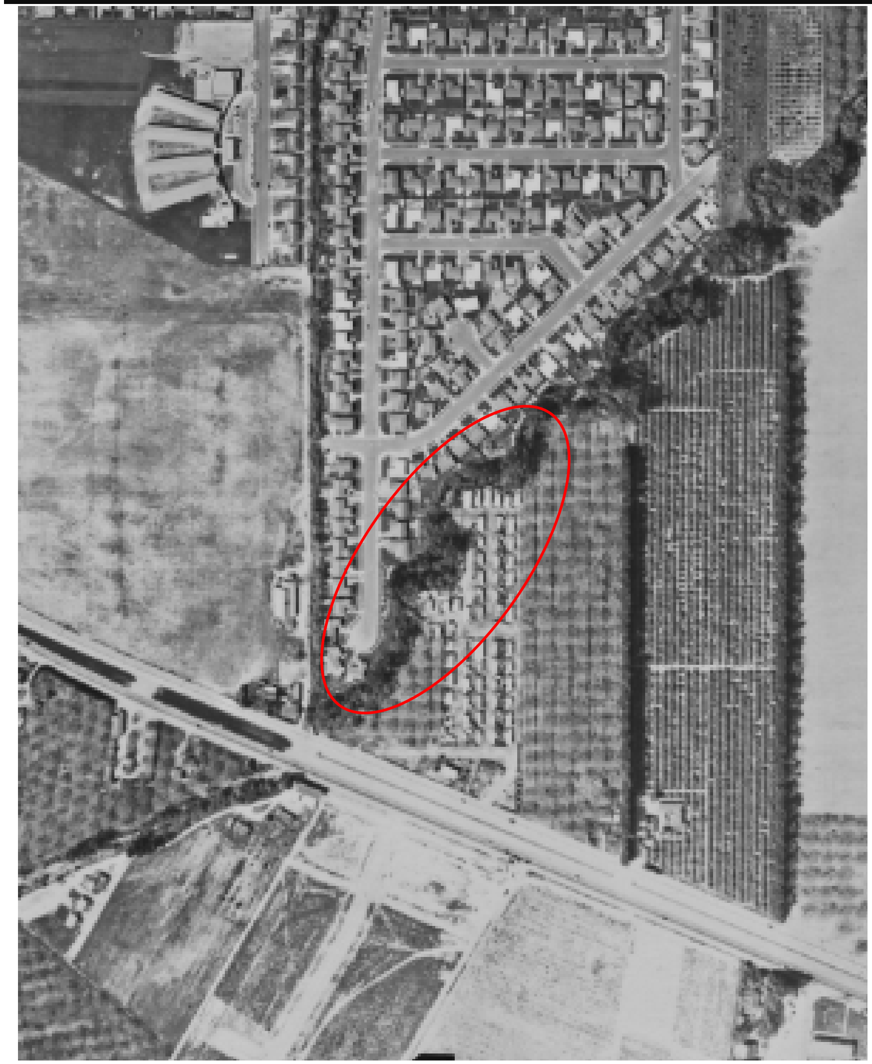
Photograph 23. Area 7, 1938

Photograph 24. Area 7, 1961

Photograph 25. Area 7, 1994

Photograph 26. Area 7, 2021

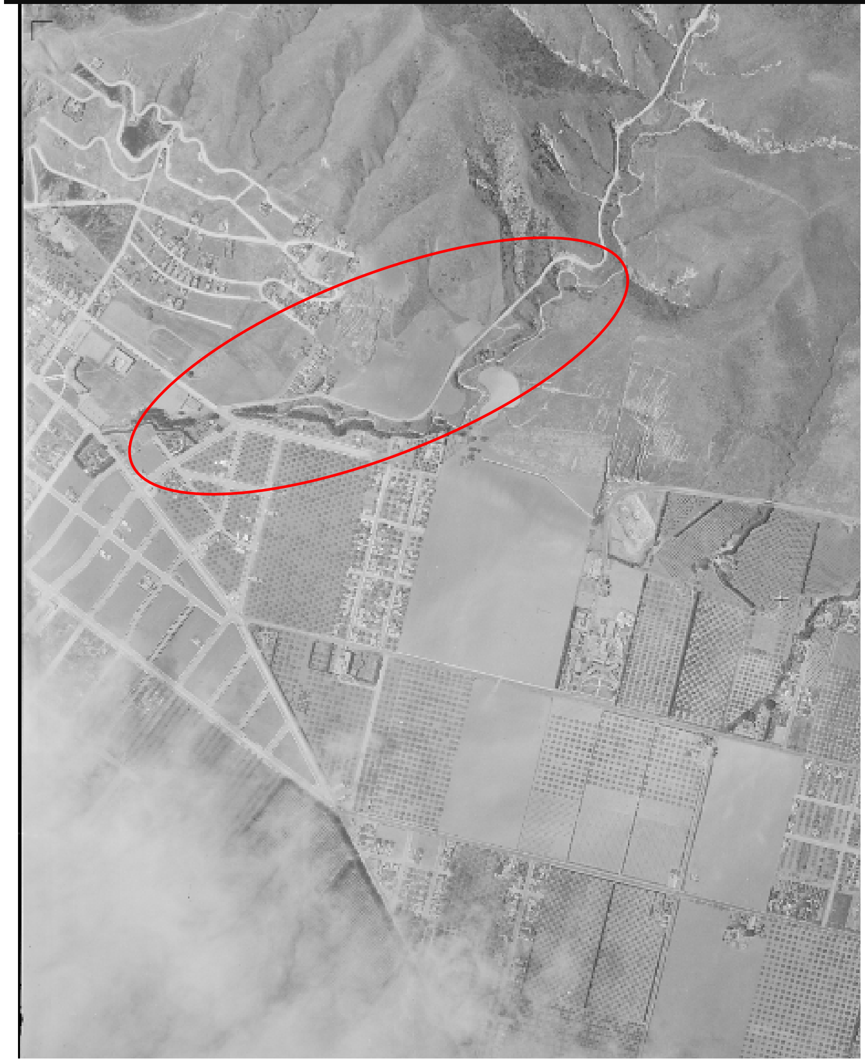
Area 8 (1958, 2021)



Photograph 27. Area 8, 1958

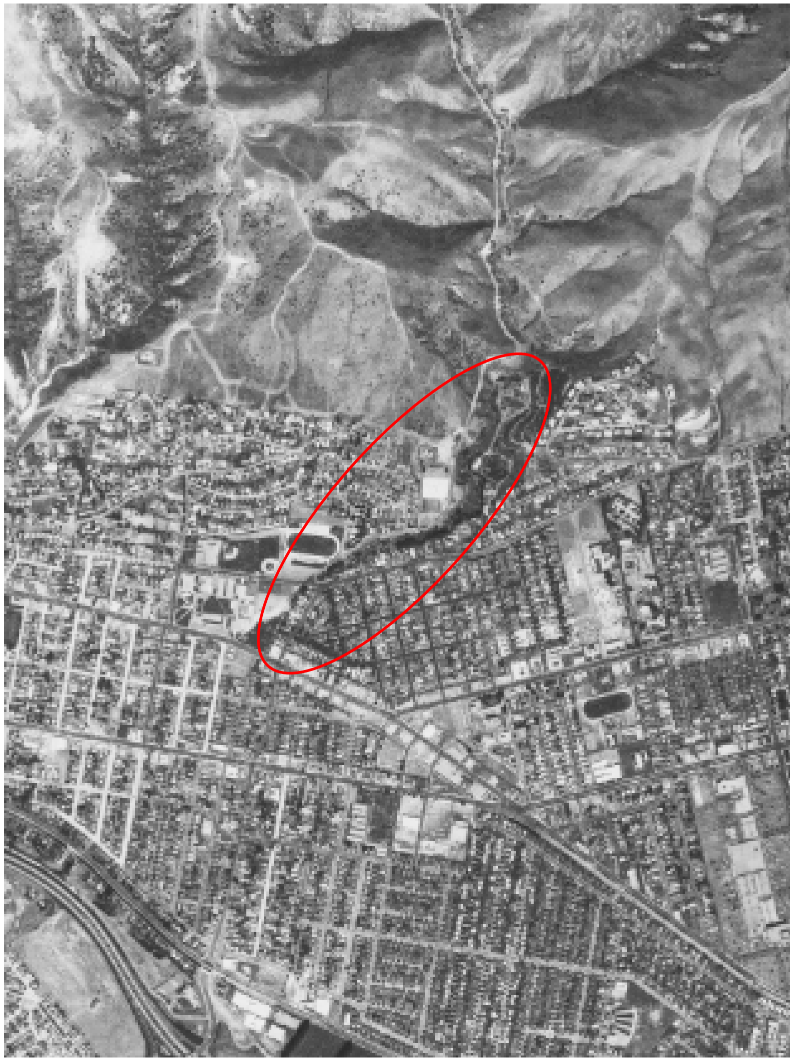
Photograph 28. Area 8, 2021

Area 9 (1938, 1958, 1968, 2021)



Photograph 29. Area 9, 1938

Photograph 30. Area 9, 1958



Photograph 31. Area 9, 1968

Photograph 32. Area 9, 2021

Area 10 (1959, 1964, 1994, 2021)

Photograph 33. Area 10, 1959

Photograph 34. Area 10, 1964

Photograph 35. Area 10, 1994

Photograph 36. Area 10, 2021

Attachment H-2. Evaluation of Special Status Species with Potential to Occur in Mound Basin and Area 11

Evaluation of Special Status Species with Potential to Occur in Mound Basin and Area 11

Data Sources

Rincon queried the following databases for information on special status species and sensitive natural communities with documented occurrences within Mound Basin:

- California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB, CDFW 2021a)
- California Native Plant Society Online Inventory of Rare and Endangered Plants of California (CNPS, 2021)
- Calflora Database (Calflora, 2021)
- eBird Online Database of Bird Distribution and Abundance (Cornell Lab of Ornithology, 2021a)
- California Freshwater Species Database (TNC, 2020)
- VegCAMP (CDFW, 2021d)

Rincon reviewed additional literature for information on special status species and sensitive natural communities with potential to occur within Mound Basin and Area 11, including the following sources:

- CDFW Special Animals List (CDFW, 2021b)
- CDFW Special Vascular Plants, Bryophytes, and Lichens List (CDFW, 2021e)
- CDFW Sensitive Natural Communities List (CDFW, 2021c)
- All About Birds Online Bird Guide (Cornell Lab of Ornithology, 2021b)
- A Manual of California Vegetation, Second Edition, California Native Plant Society (CNPS, 2009)
- Estuary Subwatershed Study Assessment of the Physical and Biological Condition of the Santa Clara River Estuary (Stillwater Sciences, 2011)
- Biological Resources Technical Report, Santa Clara River Estuary Habitat Restoration Project (WRA, 2014)

Evaluation Criteria

The following criteria were used to evaluate the potential for special status species to occur, as well as their potential dependency on groundwater. Due to the presence of important habitat for special status species within and around the SCRE, as well as the uncertainty of material connection of the surface water and shallow groundwater to the managed aquifer, Area 11 was specifically assessed for special status species potential to occur.

- **Present.** The species has been observed by a qualified local biologist within the basin/Area 11 within the past five years and/or has a documented occurrence within the basin within the past five years.

- **Likely to Occur.** Suitable habitat is present within the basin/Area 11 and there are documented occurrences within the basin/Area 11 (or nearby locations with similar habitat) within the past ten years.
- **May Occur.** Some suitable habitat currently exists within the basin/Area 11 and/or there are documented occurrences in the vicinity within the past 20 years.
- **Unlikely to Occur.** Only marginally suitable habitat for the species exists within the basin/Area 11 and/or there are no documented occurrences of the species within basin in the past 30 years.
- **Not Expected.** No suitable habitat for the species exists within the basin/Area 11, the species is considered extirpated in the region, and/or there are no documented occurrences of the species within the basin in the past 30 years.

Special status plant species were classified as either **likely** or **unlikely** to depend on groundwater, and therefore be associated with a Groundwater Dependent Ecosystem (GDE), based on rooting depths, habitat and water requirements, current distribution within the basin and/or the location of documented occurrences within the basin, and depth to water data within areas of documented occurrences.

Wildlife and fish species were evaluated for potential groundwater dependence based on determinations from the Critical Species Lookbook (Rohde et al., 2019) and by evaluating known habitat preferences, life histories, and diets. Species GDE associations were assigned one of three categories:

- **Direct.** Species directly dependent on groundwater for some or all water needs (e.g., juvenile steelhead in dry season).
- **Indirect.** Species dependent upon other species that rely on groundwater for some or all water needs (e.g., riparian birds).
- **No known reliance on groundwater.**

-

Special Status Species Within the Regional Vicinity of Mound Basin

Scientific Name Common Name	Status	Potential to Occur within Mound Basin	Habitat Requirements and Documented Occurrences within Mound Basin	GDE Association	Potential to Occur within Area 11 of Mound Basin
Plants					
Aphanisma blitoides aphanisma	None/None G3G4/S2 1B.2	Likely to Occur	Coastal bluff scrub, Coastal dunes, Coastal scrub. On bluffs and slopes near the ocean in sandy or clay soils. 1-305m. Blooms Feb-Jun. There is one documented occurrence of the species approximately 2.5 miles northwest of Mound Basin, near Conoco Oil Road (Calflora 2021). Some suitable habitat for the species occurs within Mound Basin and Area 11.	Unlikely	Likely to Occur
Astragalus didymocarpus var. milesianus Miles' milk-vetch	None/None 1B.2	Not Expected	Annual herb. 50-385 m elevation. Occurs in coastal scrub with clay soils. Blooms Mar-Jun. There is one historic occurrence (from 1945) of the species documented approximately 5.5 miles northwest of Mound Basin along Casitas Road, near Casitas Lake (Calflora 2021). Some coastal scrub habitat occurs within the northwestern portion of Mound Basin, but no suitable habitat for the species occurs within Area 11.	Unlikely	Not Expected
Astragalus pycnostachyus var. *lanosissimus* Ventura Marsh milk-vetch	FE/SE 1B.1	Present	Perennial herb. 1-35 m elevation. Occurs in marshes and swamps, coastal dunes, coastal scrub. Within reach of high tide or protected by barrier beaches, more rarely near seeps on sandy bluffs. Blooms Jul-Oct. There are two documented occurrences in Mound Basin, within the SCRE (Calflora 2021). Critical habitat for the species occurs approximately 0.7 mile south of the basin.	Likely	Present

Scientific Name Common Name	Status	Potential to Occur within Mound Basin	Habitat Requirements and Documented Occurrences within Mound Basin	GDE Association	Potential to Occur within Area 11 of Mound Basin
Atriplex coulteri Coulter's saltbush	None/None G3/S1S2 1B.2	Likely to Occur	Coastal bluff scrub, Coastal dunes, Coastal scrub, valley and foothill grassland. Ocean bluffs, ridgetops, as well as alkaline low places. Alkaline or clay soils. 3-460m. Blooms Mar-Oct. There is one documented occurrence of the species approximately 1.5 miles southwest of the basin (Calflora 2021). Suitable habitat for the species occurs throughout undisturbed portions of the basin and within dune habitat near Area 11.	Unlikely	May Occur
Atriplex pacifica south coast saltscale	None/None G4/S2 1B.2	May Occur	Coastal bluff scrub, Coastal dunes, Coastal scrub, Playas. Alkali soils. 0-140m. Blooms Mar-Oct. Some suitable habitat for the species occurs within the basin, but there is only one historical occurrence (from 1963) documented within ten miles (Calflora 2021). Potentially suitable habitat exists within Area 11 in the foredunes and on the fringes of the estuary.	Unlikely	May Occur
Atriplex serenana var. *davidsonii* Davidson's saltscale	None/None G5T1/S1 1B.2	Unlikely to Occur	Annual herb. Blooms April to October. Coastal bluff scrub, coastal scrub. Alkaline soil. 3-250m (10-820ft). One occurrence of the species was documented in 2001 within the Oxnard USGS quad, southeast of the basin (Calflora 2021). Suitable habitat for the species occurs within the basin, but not within Area 11.	Unlikely	Not Expected
Calochortus fimbriatus Late-flowered mariposa lily	None/None 1B.3	May Occur	Perennial bulbiferous herb. 270-1435 m. Occurs chaparral, cismontane woodland, and riparian woodland in dry, open areas on serpentine soils. Blooms Jun-Aug. Some potentially suitable habitat for the species occurs in the northern portion of the basin, but does not exist within Area 11. The species is documented within the Ventura USGS quad. (Calflora 2021).	Unlikely	Not Expected

Scientific Name Common Name	Status	Potential to Occur within Mound Basin	Habitat Requirements and Documented Occurrences within Mound Basin	GDE Association	Potential to Occur within Area 11 of Mound Basin
Chaenactis glabriuscula var. *orcuttiana* Orcutt's pincushion	None/None G5T1T2/S1 1B.1	Likely to Occur	Coastal bluff scrub, Coastal dunes. Sandy sites. 0-100m. Blooms Jan-Aug. The species is documented within the Ventura USGS quadrangle and within McGrath State Beach (Calflora 2021). Suitable habitat for the species occurs within Mound Basin and Area 11.	Unlikely	Likely to Occur
Chloropyron maritimum ssp. *maritimum* salt marsh bird's-beak	FE/SE G4?T1/S1 1B.2	May Occur	Occurs in coastal dunes and coastal salt marshes and swamps. This species blooms between May and October, and typically occurs at elevations ranging from 0-30 meters. Suitable habitat for the species occurs within Mound Basin and Area 11. One occurrence of the species was documented within McGrath State Beach in 2005 (Calflora 2021).	Likely	May Occur
Lasthenia glabrata ssp. *coulteri* Coulter's goldfields	None/None G4T2/S2 1B.1	May Occur	Annual herb. Blooms February to June. Coastal salt marshes, playas, valley and foothill grassland, vernal pools. Usually found on alkaline soils in playas, sinks, and grasslands. 1-1400m (3-4595ft).The species is documented within the Ventura USGS quadrangle (Calflora 2021).	Likely	May Occur
Malacothrix similis Mexican malacothrix	None/None G2G3/SH 2A	Not Expected	Coastal dunes. 0-40m. Blooms Apr-May. One historic occurrence of the species was documented near Port Hueneme in 1925 (Calflora 2021). Some suitable habitat for the species occurs within Mound Basin and Area 11, though the species is considered possibly extirpated in the region (CDFW 2021a).	Unlikely	Not Expected
Monardella hypoleuca ssp. *hypoleuca* White-veined monardella	None/None 1B.3	Unlikely to Occur	Perennial herb. 50-1280 m. Occurs in chaparral and cismontane woodland on dry slopes. 50-1280 m. Blooms Apr-Nov. Potentially suitable habitat occurs within the northern portion of the basin, but no chaparral or cismontane woodland occurs within Area 11.	Unlikely	Not Expected

Scientific Name Common Name	Status	Potential to Occur within Mound Basin	Habitat Requirements and Documented Occurrences within Mound Basin	GDE Association	Potential to Occur within Area 11 of Mound Basin
Navarretia ojaiensis Ojai navarretia	None/None 1B.1	Unlikely to Occur	Annual herb. 275-620 m. elevation. Occurs in openings in chaparral and coastal scrub, and in valley and foothill grasslands. Blooms May-Jul. Suitable habitat for the species is present in the northern portion of the basin, but Area 11 is lower than the elevation range of the species.	Unlikely	Not Expected
Pseudognaphalium leucocephalum white rabbit-tobacco	None/None G4/S2 2B.2	Likely to Occur	Chaparral, Cismontane woodland, Coastal scrub, Riparian woodland. Sandy, gravelly sites. 0-2100m. Blooms (Jul) AuH-Nov (Dec). Multiple occurrences of the species are documented within one mile of Mound Basin, within both coastal and upland habitat (Calflora 2021).	Unlikely	May Occur
Invertebrates					
Bombus crotchii Crotch bumble bee	None/SCE	Not Expected	Occurs in coastal California east to the Sierra-Cascade crest and south into Mexico. Food plant genera include: *Antirrhinum, Phacelia, Clarkia, Dendromecon, Eschscholzia,* and *Eriogonum.* Suitable plant food genera are not abundant within Mound Basin.	No known dependence on groundwater	Not Expected
Danaus plexippus pop. 1 monarch - California overwintering population	FC/None G4T2T3/S2S3	Present	Winter roost sites extend along the coast from northern Mendocino to Baja California, Mexico. Roosts located in wind-protected tree groves (eucalyptus, Monterey pine, cypress), with nectar and water sources nearby. Multiple roosting sites are documented within the boundaries of Mound Basin (Xerces Society 2021), though none occur within Area 11. While individual monarchs may pass through Area 11, suitable roosting habitat for the species does not occur within the estuary area.	Indirect	May Occur (non-roosting)

Scientific Name Common Name	Status	Potential to Occur within Mound Basin	Habitat Requirements and Documented Occurrences within Mound Basin	GDE Association	Potential to Occur within Area 11 of Mound Basin
Fish					
Catostomus santaanae Santa Ana sucker	FT/None G1/S1	May Occur	The Santa Ana sucker is found in the Los Angeles, San Gabriel, and Santa Ana watersheds of Southern California, where it is considered native. The species is also found in the Santa Clara River Watershed, though during the recovery planning process there was uncertainty as to whether the species was native to the Santa Clara River. The Santa Clara River population is therefore not currently protected by the USFWS (USFWS 2014). Genetic research conducted by Richmond et al. (2017) later verified the species is most likely native to the Santa Clara River. However, the species remains unprotected by the USFWS in the Santa Clara River. These fish are habitat generalists, but prefer sand-rubble-boulder bottoms, cool, clear water, and algae. Santa Ana suckers are known to occur within the Santa Clara River (CDFW 2021a, Richmond et al. 2017). The species is unlikely to inhabit brackish water within the estuary but may occur within the eastern portions of Area 11, upstream of the saltwater interface.	Direct	May Occur
Eucyclogobius newberryi tidewater goby	FE/None G3/S3	Present	Tidewater gobies occur within brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego County to the mouth of the Smith River in Del Norte County. Found in shallow lagoons and lower stream reaches, they need fairly still but not stagnant water and high oxygen levels and salinities typically between 12 and 28 ppt. Tidewater goby are present within the SCRE (USFWS 2005). Critical habitat for tidewater goby exists within the SCRE and falls within the basin and Area 11.	Direct	Present

Scientific Name Common Name	Status	Potential to Occur within Mound Basin	Habitat Requirements and Documented Occurrences within Mound Basin	GDE Association	Potential to Occur within Area 11 of Mound Basin
Entosphenus tridentatus Pacific lamprey	None/None SSC	Present	Occurs in freshwater systems and requires adequate flows for migration, suitable substrate (i.e., gravels) for spawning, and adequate cover for pre-spawning holding. Juveniles (called ammocoetes) spend an extended period of time (between four and ten years) rearing while burrowed in sediments filter feeding on organic material and require suitable cover, flow, foraging conditions, and cool temperatures. Juvenile migrant (called macropthalmia) emigration (i.e., outmigration to the ocean) requires water conditions suitable for migration (i.e., water velocity and water depth, dissolved oxygen levels within the surface water, and water temperature suitable for passage). The lower Santa Clara River serves primarily as a migration corridor for Pacific lamprey (Puckett and Villa 1985). Adults, as well as macropthalmia and ammocoetes, have been captured at the Vern Freeman Diversion, which is located approximately 10 miles upstream of the SCRE. However, only a few ammocoetes have been observed within the river basin in recent years (Swift and Howard 2009). Pacific lamprey could be present within Mound Basin and Area 11, especially when the estuary is open to the ocean and immigration and emigration can occur.	Direct	Present
Gasterosteus aculeatus williamsoni unarmored threespine stickleback	FE/SE G5T1/S1 FP	Not Expected	Weedy pools, backwaters, and among emergent vegetation at the stream edge in small Southern California streams. Cool (<24 C), clear water with abundant vegetation. The species range is now restricted to a 14 km stretch of the Soledad Canyon portion of the Upper Santa Clara River and upper San Francisquito Canyon (USFWS 1985, Buth et al. 1984). The species is therefore present upstream of Mound Basin but is not expected to occur within the basin.	Direct	Not Expected

Scientific Name Common Name	Status	Potential to Occur within Mound Basin	Habitat Requirements and Documented Occurrences within Mound Basin	GDE Association	Potential to Occur within Area 11 of Mound Basin
Gila orcuttii arroyo chub	None/None SSC (Non-Native to Santa Clara River)	May Occur	Native to streams from Malibu Creek to San Luis Rey River basin. Introduced into streams in Santa Clara, Ventura, Santa Ynez, Mojave & San Diego river basins. Inhabits slow water stream sections with mud or sand bottoms. Feeds heavily on aquatic vegetation and associated invertebrates. Known to be common and widely distributed in some of the streams in which it was introduced, including the Santa Clara River (CDFW 2015, Nautilus 2005). While this fish is a SSC, the Santa Clara River is not currently considered part of its native range. The species is unlikely to inhabit brackish water within the estuary but may occur within the eastern portions of Area 11, upstream of the saltwater interface.	Direct	May Occur
Oncorhynchus mykiss irideus pop. 10 Southern California DPS steelhead	FE/None	Present	Occurs in freshwater systems and requires adequate water conditions suitable for migration (i.e., flow, dissolved oxygen levels within the surface water, and water temperature suitable for passage) and suitable substrate (i.e., gravels) for spawning. Juvenile *O. mykiss* require suitable cover, flow, foraging conditions, and cool temperatures for rearing. Juvenile emigration (i.e., outmigration to the ocean) requires water conditions suitable for migration. Steelhead are known to occur within the Santa Clara River (NMFS 2012, Dagit et al. 2019). The lower Santa Clara River serves primarily as a migration corridor for steelhead (Puckett and Villa 1985). The entire Santa Clara River, from the ocean upstream to impassible barriers, is designated critical habitat for steelhead.	Direct	Present

Scientific Name Common Name	Status	Potential to Occur within Mound Basin	Habitat Requirements and Documented Occurrences within Mound Basin	GDE Association	Potential to Occur within Area 11 of Mound Basin
Amphibians					
Rana boylii foothill yellow-legged frog	None/SE G3/S3 SSC	Not Expected	Prefers partly shaded, shallow streams and riffles with a rocky substrate in a variety of habitats. Needs at least some cobble-sized substrate for egH-laying and sunny streamside banks. Needs at least 15 weeks to attain metamorphosis. There is one historic occurrence of the species (from 1940) documented in the CNDDB within the Ventura USGS quadrangle, but the species is now considered extirpated in the Santa Clara River (CDFW 2021a).	Direct	Not Expected
Rana draytonii California red-legged frog	FT/None SSC	May Occur	Occurs in lowlands and foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation. Requires 11-20 weeks of permanent water for larval development. Must have access to estivation habitat. There are no documented occurrences of CRLF within the SCRE area in the CNDDB (CDFW 2021a). The species was not documented during amphibian surveys conducted on the Santa Clara River and is thought to only occur within the watershed within several upland tributaries (Santa Clara River Trustee Council 2008). However, suitable riparian habitat for the species occurs within Mound Basin and Area 11.	Direct	May Occur
Reptiles					
Anniella ssp. California legless lizard	None/None G3G4/S3S4 SSC	Likely to Occur	Contra Costa County south to San Diego, within a variety of open habitats. This element represents California records of *Anniella* not yet assigned to new species within the *Anniella pulchra* complex. *Anniella pulchra* are considered present within the vicinity of the SCRE (Stillwater 2011, WRA 2014) and may occur within foredune habitat within Mound Basin and Area 11.	Indirect	Likely to Occur

Scientific Name Common Name	Status	Potential to Occur within Mound Basin	Habitat Requirements and Documented Occurrences within Mound Basin	GDE Association	Potential to Occur within Area 11 of Mound Basin
Anniella stebbinsi Southern California legless lizard	None/None G3/S3 SSC	Likely to Occur	Generally south of the Transverse Range, extending to northwestern Baja California. Occurs in sandy or loose loamy soils under sparse vegetation. Disjunct populations in the Tehachapi and Piute Mountains in Kern County. Variety of habitats; generally in moist, loose soil. They prefer soils with a high moisture content. Six occurrences of the species are documented in the CNDDB along the shore just south of Mound Basin and Area 11 (CDFW 2021a).	Indirect	Likely to Occur
Aspidoscelis tigris stejnegeri coastal whiptail	None/None G5T5/S3 SSC	May Occur	Found in deserts and semi-arid areas with sparse vegetation and open areas. Also found in woodland & riparian areas. Ground may be firm soil, sandy, or rocky. One occurrence of the species is documented within the CNDDB approximately 1.2 miles north of Mound Basin (CDFW 2021a). Potentially suitable habitat for the species occurs within Mound Basin and Area 11.	Indirect	May Occur
Actinemys pallida (Emys marmorata) Southwestern pond turtle	None/None SSC	May Occur	Occurs in ponds, lakes, rivers, streams, creeks, marshes, and irrigation ditches with basking sites. Feeds on aquatic plants, invertebrates, worms, frog and salamander eggs and larvae, crayfish, and occasionally frogs and fish. Relies on surface water that may be supported by groundwater (Rhode et al. 2019). There are no readily available data on occurrences within Mound Basin. However, suitable habitat does occur upstream of the estuary and the species could be present upstream of the salt wedge.	Direct	May Occur

Scientific Name Common Name	Status	Potential to Occur within Mound Basin	Habitat Requirements and Documented Occurrences within Mound Basin	GDE Association	Potential to Occur within Area 11 of Mound Basin
Phrynosoma blainvillii coast horned lizard	None/None G3G4/S3S4 SSC	May Occur	Frequents a wide variety of habitats, most common in lowlands along sandy washes with scattered low bushes. Open areas for sunning, bushes for cover, patches of loose soil for burial, and abundant supply of ants and other insects. There are multiple occurrences of the species documented in the CNDDB within the vicinity of Mound Basin, several within the Santa Clara River bed, upstream of Area 11 (CDFW 2021a). Some suitable habitat for the species occurs throughout undisturbed portions of Mound Basin. Potentially suitable habitat for the species occurs within foredunes in Area 11.	No known dependance on groundwater	May Occur
Thamnophis hammondii Two-striped gartersnake	None/None SSC	Likely to Occur	Highly aquatic snake species. Found in or near permanent fresh water, often along streams with rocky beds and riparian vegetation. Prey includes fish, fish eggs, tadpoles, newt larvae, small frogs and toads, leeches, and earthworms. There are five occurrences of the species documented in the CNDDB northwest of Mound Basin, within the Ventura River watershed (CDFW 2021a). Suitable riparian habitat for the species occurs within Mound Basin and Area 11.	Direct	Likely to Occur
Birds					
Agelaius tricolor tricolored blackbird	None/ST G1G2/S1S2 SSC	Present	Highly colonial species, most numerous in Central Valley & vicinity. Largely endemic to California. Requires open water, protected nesting substrate, and foraging area with insect prey within a few kilometers of the colony. Cattail (*Typha* spp.) stands are present within the Santa Clara Estuary (Stillwater 2011), which could provide suitable foraging and nesting habitat for the species. Multiple occurrences of the species are documented within the basin and within Area 11 (Cornell Lab of Ornithology 2021a).	Indirect	Likely to Occur

Scientific Name Common Name	Status	Potential to Occur within Mound Basin	Habitat Requirements and Documented Occurrences within Mound Basin	GDE Association	Potential to Occur within Area 11 of Mound Basin
Athene cunicularia burrowing owl	None/None G4/S3 SSC	Present	Open, dry annual or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel. Suitable habitat for the species exists within the basin and there are multiple occurrences documented within the basin and near Area 11 (Cornell Lab of Ornithology 2021a).	No known dependence on groundwater	Likely to Occur
Charadrius nivosus western snowy plover	FT/None G3T3/S2 SSC	Present	Sandy beaches, salt pond levees & shores of large alkali lakes. Needs sandy, gravelly or friable soils for nesting. Numerous occurrences of the species are documented along the coastline within Mound Basin and known nesting habitat for the species exists in and around the SCRE (Cornell Lab of Ornithology 2021a). Critical habitat for the species is designated within Area 11.	No known dependence on groundwater	Present
Circus hudsonius northern harrier	None/None G5/S3 SSC	Present	Occurs in coastal salt & freshwater marsh. Nest and forage in grasslands, from salt grass in desert sink to mountain cienagas. Nests on ground in shrubby vegetation, usually at marsh edge; nest built of a large mound of sticks in wet areas. The species was observed within the SCRE during biological surveys conducted in 2014 (WRA 2014). Numerous occurrences of the species are also documented within Mound Basin and Area 11 in eBird (Cornell Lab of Ornithology 2021a). Suitable nesting and foraging habitat for the species occurs within Area 11.	Indirect	Present

Scientific Name Common Name	Status	Potential to Occur within Mound Basin	Habitat Requirements and Documented Occurrences within Mound Basin	GDE Association	Potential to Occur within Area 11 of Mound Basin
Coccyzus americanus occidentalis western yellow-billed cuckoo	FT/SE G5T2T3/S1	May Occur	Riparian forest nester, along the broad, lower flood-bottoms of larger river systems. Nests in riparian jungles of willow, often mixed with cottonwoods, with lower story of blackberry, nettles, or wild grape. There is one documented occurrence of the species (from 2020) within the Ventura Settling Ponds in the western portion of the basin, just north of Area 11 (Cornell Lab of Ornithology 2021a). Some potential breeding habitat for the species occurs within Area 11, though no individuals were detected within the basin during surveys conducted in 2018 and 2019 (Hall et al. 2020).	Indirect	May Occur
Elanus leucurus white-tailed kite	None/None G5/S3S4 FP	Present	Often found in rolling foothills and valley margins with scattered oaks & river bottomlands or marshes next to deciduous woodland. Also occurs in open grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching. The species was observed within SCRE during biological surveys conducted in 2014 (WRA 2014). Numerous occurrences of the species are also documented within Mound Basin and Area 11 in eBird (Cornell Lab of Ornithology 2021a). Suitable foraging habitat and potentially suitable nesting habitat for the species occurs within Area 11.	Indirect	Present

Scientific Name Common Name	Status	Potential to Occur within Mound Basin	Habitat Requirements and Documented Occurrences within Mound Basin	GDE Association	Potential to Occur within Area 11 of Mound Basin
Empidonax traillii extimus Southwestern willow flycatcher	FE/SE	May Occur	Occurs in dense brushy thickets within riparian woodland often dominated by willows and/or alder, near permanent standing water. Reliant on groundwater-dependent riparian vegetation, including for nest sites that are typically located near slow-moving streams, or side channels and marshes with standing water and/or wet soils (Rohde et al. 2019). Feeds on insects, fruits, and berries. There are no occurrences of the species documented within the CNDDB or eBird within the basin (CDFW 2021a, Cornell Lab of Ornithology 2021a). The species was documented within the Santa Clara River channel, upstream of the basin, during avian population surveys in 2005 and 2006 (Labinger et al. 2011). Some potential nesting habitat for the species exists within Area 11, though no individuals were detected within the basin during surveys conducted in 2018 and 2019 (Hall et al. 2020). The Santa Clara River channel and estuary are designated critical habitat for the southwestern willow flycatcher.	Indirect	May Occur
Falco peregrinus anatum American peregrine falcon	FD/SD G4T4/S3S4 FP	Present	Near wetlands, lakes, rivers, or other water; on cliffs, banks, dunes, mounds; also, human-made structures. Nests consist of a scrape or a depression or ledge in an open site. One known nest site exists within the Oxnard USGS quadrangle (CDFW 2021a). Numerous occurrences of the species are documented within the basin and Area 11 (Cornell Lab of Ornithology 2021a, WRA 2014). The Santa Clara estuary and surrounding beach provide high quality foraging habitat for the species, though suitable nesting habitat is not present within Area 11.	Indirect	Present (foraging)

Scientific Name Common Name	Status	Potential to Occur within Mound Basin	Habitat Requirements and Documented Occurrences within Mound Basin	GDE Association	Potential to Occur within Area 11 of Mound Basin
Laterallus jamaicensis coturniculus California black rail	None/ST G3G4T1/S1 FP	Not Expected	Inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. Needs water depths of about 1 inch that do not fluctuate during the year and dense vegetation for nesting habitat. Suitable habitat for the species occurs within the basin and Area 11, but there are no documented occurrences within Ventura County since 1936 (CDFW 2021a, Cornell Lab of Ornithology 2021a).	Direct	Not Expected
Passerculus sandwichensis beldingi Belding's savannah sparrow	None/SE G5T3/S3	Present	Inhabits coastal salt marshes, from Santa Barbara south through San Diego County. Nests in Salicornia on and about margins of tidal flats. Multiple occurrences of the species are documented within Mound Basin and Area 11 (Cornell Lab of Ornithology 2021a).	Indirect	Present
Polioptila californica coastal California gnatcatcher	FT/None G4G5T3Q/S2 SSC	Unlikely to Occur	Obligate, permanent resident of coastal sage scrub below 2500 ft in Southern California. Low, coastal sage scrub in arid washes, on mesas and slopes. Not all areas classified as coastal sage scrub are occupied. There is one occurrence of the species documented in eBird within Area 11 in 2018 (Cornell Lab of Ornithology 2021a). Two historical occurrences (in 1872 and 1906) of the species are documented within the basin in the CNDDB (CDFW 2021a).	Indirect	Unlikely to Occur
Riparia bank swallow	None/ST G5/S2	Present	Colonial nester; nests primarily in riparian and other lowland habitats west of the desert. Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole. Multiple occurrences of the species are documented within the basin and near Area 11 (WRA 2014, Cornell Lab of Ornithology 2021a). One historic occurrence (1976) is documented in McGrath State Beach in the CNDDB (CDFW 2021a).	Indirect	Present

Scientific Name Common Name	Status	Potential to Occur within Mound Basin	Habitat Requirements and Documented Occurrences within Mound Basin	GDE Association	Potential to Occur within Area 11 of Mound Basin
Setophaga petechia Yellow warbler	None/None SSC	Present	Inhabits riparian plant associations in close proximity to water. Also nests in montane shrubbery in open conifer forests in Cascades and Sierra Nevada. Frequently found nesting and foraging in willow shrubs and thickets, and in other riparian plants including cottonwoods, sycamores, ash, and alders. There are multiple observations of the species documented within the basin and Area 11 in eBird (Cornell Lab of Ornithology 2021a). There are two recent occurrences (2016 and 2017) of the species documented within the vicinity of the basin in the CNDDB (CDFW 2021a). The species was also detected within the lower reaches of the Santa Clara River during avian population surveys conducted in 2005 and 2006 (Labinger et al. 2011).	Indirect	Present
Sternula antillarum browni California least tern	FE/SE G4T2T3Q/S2 FP	Present	Nests along the coast from San Francisco Bay south to northern Baja California. Colonial breeder on bare or sparsely vegetated, flat substrates: sand beaches, alkali flats, landfills, or paved areas. There are multiple observations of the species documented within the basin and Area 11 in eBird (Cornell Lab of Ornithology 2021a). Suitable nesting habitat for the species occurs within Area 11.	Indirect	Present

Scientific Name Common Name	Status	Potential to Occur within Mound Basin	Habitat Requirements and Documented Occurrences within Mound Basin	GDE Association	Potential to Occur within Area 11 of Mound Basin
Vireo bellii pusillus Least Bell's vireo	FE/SE G5T2/S2	Present	Nests in dense vegetative cover of riparian areas; often nests in willow or mulefat; forages in dense, stratified canopy. This species relies on groundwater-dependent vegetation in riparian areas, particularly during breeding periods (Rohde et al. 2019). Eats insects, fruits, and berries. Multiple occurrences of the species are documented within the basin and near Area 11 (Cornell Lab of Ornithology 2021a). Multiple occurrences of the species were also documented upstream of the estuary during avian population surveys conducted in 2005 and 2006 (Labinger et al 2011). Suitable nesting habitat for the species occurs within Area 11.	Indirect	Present
Mammals					
Antrozous pallidus pallid bat	None/None G4/S3 SSC	Unlikely to Occur	Found in a variety of habitats including deserts, grasslands, shrublands, woodlands, and forests. Most common in open, dry habitats with rocky areas for roosting. Roosts in crevices of rock outcrops, caves, mine tunnels, buildings, bridges, and hollows of live and dead trees which must protect bats from high temperatures. Very sensitive to disturbance of roosting sites. Only one historic occurrence of the species (from 1906) is documented in the CNDDB within the vicinity of mound Basin (CDFW 2021a).	No known dependence on groundwater	Unlikely to Occur

Scientific Name Common Name	Status	Potential to Occur within Mound Basin	Habitat Requirements and Documented Occurrences within Mound Basin	GDE Association	Potential to Occur within Area 11 of Mound Basin
Chaetodipus californicus femoralis Dulzura pocket mouse	None/None SSC	Not Expected	Inhabit a variety of habitats including coastal scrub, chaparral & grassland (primarily in San Diego County). Attracted to grass-chaparral edges. Specimens were collected northeast of Mound Basin at unknown dates, but presumably not within recent decades. One male and one female were collected within near Meiner's Oaks at an unknown date. Another female was collected near Weldon Canyon at an unknown date (CDFW 2021a). There are no other documented occurrences of the species within Mound Basin.	No known dependence on groundwater	Not Expected
Choeronycteris mexicana Mexican lonH-tongued bat	None/None G3G4/S1 SSC	Not Expected	Common throughout Mexico, this species is occasionally found in San Diego and Imperial Counties. Feeds on nectar and pollen of night-blooming succulents. Roosts in desert canyons, caves, and rock crevices. Also uses abandoned buildings. canyons, deep caves, mines, or rock crevices. There is one historic occurrence of the species (in 1994) documented just north of Mound Basin in the CNDDB (CDFW 2021a). Suitable habitat for the species is not present within Area 11.	No known dependence on groundwater	Not Expected
Eumops perotis californicus Western mastiff bat	None/None SSC	Not Expected	Occurs in open, semi-arid to arid habitats, including coniferous and deciduous woodlands, coastal scrub, grasslands, and chaparral. Roosts in crevices in cliff faces and caves, and buildings. Roosts typically occur high above ground. One occurrence of the species was documented in 1907 near Weldon (CDFW 2021a).	No known dependence on groundwater	Not Expected

Scientific Name Common Name	Status	Potential to Occur within Mound Basin	Habitat Requirements and Documented Occurrences within Mound Basin	GDE Association	Potential to Occur within Area 11 of Mound Basin
Taxidea taxus American badger	None/None G5/S3 SSC	Unlikely to Occur	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils for digging burrows. Needs sufficient food, friable soils and open, uncultivated ground. Preys on burrowing rodents. There is some potentially suitable habitat for the species within hills in the northwestern portion of Mound Basin, though the species is more likely to occur in open habitat inland of the basin. No suitable habitat for the species occurs within Area 11.	No known dependence on groundwater	Not Expected

Regional Vicinity refers to the three USGS quadrangles surrounding Mound Basin (Ventura, Oxnard, and Saticoy)

FE = Federally Endangered

FT = Federally Threatened

SSC= CDFW Species of Special Concern

SE = State Endangered

ST = State Threatened

SCE = State Candidate Endangered

FP = State Fully Protected

CRPR (California Rare Plant Rank)

1A=Presumed Extinct in California

1B=Rare, Threatened, or Endangered in California and elsewhere

2A=Plants presumed extirpated in California, but more common elsewhere

2B=Plants Rare, Threatened, or Endangered in California, but more common elsewhere

CRPR Threat Code Extension

.1=Seriously endangered in California (over 80% of occurrences threatened/high degree and immediacy of threat)

.2=Fairly endangered in California (20-80% occurrences threatened)

.3=Not very endangered in California (<20% of occurrences threatened)

CDFW Rare

G1 or S1 = Critically Imperiled Globally or Subnationally (state)

G2 or S2 = Imperiled Globally or Subnationally (state)

G3 or S3 = Vulnerable to extirpation or extinction Globally or Subnationally (state)

G4/5 or S4/5 = Apparently secure, common and abundant

GNR/SNR= Globally or Subnationally (state) not ranked

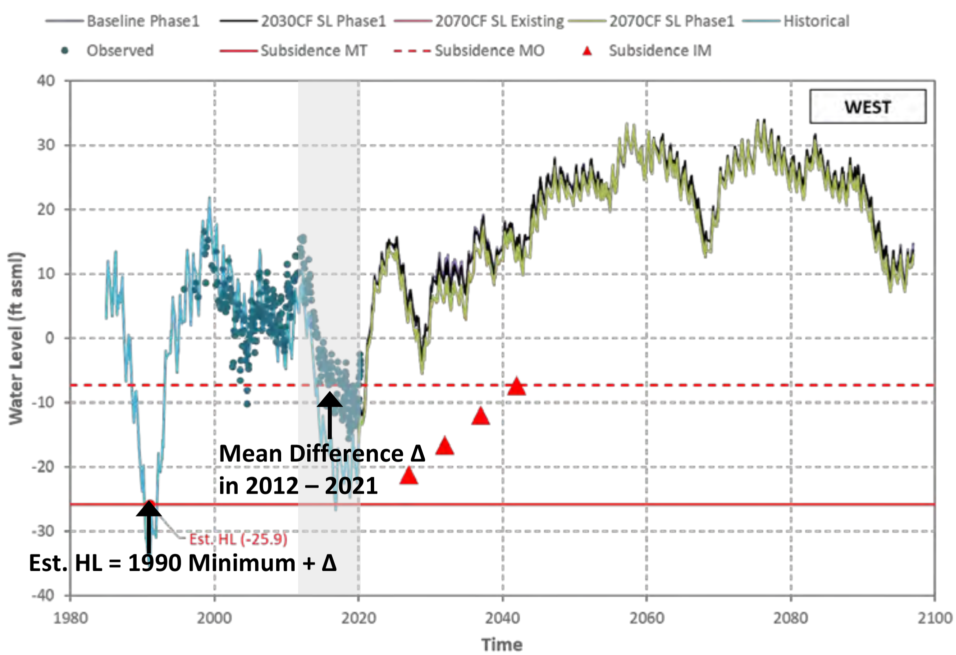
Appendix I

Time Series Plots of Measured Groundwater Level Data with Model Calibration and Predictive Simulations with Minimum Thresholds and Measurable Objectives

APPENDIX I

Method for Establishing Groundwater Level Historical Lows (HL)

Measured and modeled groundwater level data was analyzed for the Mound Basin monitoring network (Figures I-1 and I-2). The observed groundwater level (GWL) data contained two notable periods of historical lows (HL), one near the year 1990 and one near the year 2020. When a well had low GWL measurements near 1990, the lowest of those measurements was selected as HL for that well (e.g., Hueneme Well 02N22W09K04S; Figure I-3). When a well did not have an observed GWL measurement near 1990, the HL was estimated using the modeled GWL because the modeled HL was typically lower at 1990 than near 2020 (with the exception of two wells in the Mugu aquifer). This estimation method first calculated the mean difference between the observed and simulated data in the 2012 – 2021 period (this period was used because the last peak GWL before 2021 occurred near 2012), and then the mean difference was added to the lowest simulated GWL near 1990 (e.g., see annotated figure for Hueneme Well 02N23W15J01S below).



There were two exceptions to this HL estimation method, the Mugu wells 02N22W08G01S and 02N22W19M04S (Figures I-16 and I-20, respectively). For these wells, the estimated HL using modeled GWL ended up being higher than the observed HL measurement near 2020, so the HL near 2020 was used instead.

Minimum Thresholds (MT)

Chronic Lowering of Groundwater Levels MT:
Initially, the Groundwater Supply Depletion Water Level Threshold was estimated (Table I-1): for each Mugu well, a fixed height of 40 ft was added and the estimated drawdown (estimated pumping rate divided by specific capacity; 2000/60 ≈ 33 ft) to the top elevation of the aquifer at that well location. Similarly, for each Hueneme well, a fixed height of 40 ft was added and the estimated drawdown (2000/83 ≈ 24 ft) to the top elevation of the aquifer at that well location. The drawdown estimates are based on the historical data and the 2000 gpm pumping assumption.

Table I-1. Groundwater Supply Depletion Water Level Thresholds

Well ID	Aquifer	Aquifer Top Elevation (ft amsl) [Z]	Specific Capacity (gpm/ft) [Q/s]	Pumping Rate (gpm) [Q]	Drawdown (ft) [s]	GW Supply Depletion Water Level Threshold (ft amsl) [Z + s + 40 ft]
02N22W09K04S	Hueneme	-103.53	83	2000	24.10	-39.43
02N22W09L03S	Hueneme	-206.94	83	2000	24.10	-142.85
02N22W09L04S	Hueneme	-206.94	83	2000	24.10	-142.85
02N22W10N03S	Hueneme	-45.02	83	2000	24.10	19.08
02N22W16K01S	Hueneme	-162.35	83	2000	24.10	-98.25
02N22W17Q05S	Hueneme	-269.52	83	2000	24.10	-205.42
02N22W07M01S	Hueneme	-1041.36	83	2000	24.10	-977.27
02N22W17M02S	Hueneme	-345.08	83	2000	24.10	-280.99
02N22W20E01S	Hueneme	-273.97	83	2000	24.10	-209.87
02N23W13K03S	Hueneme	-711.48	83	2000	24.10	-647.39
02N23W13K04S	Hueneme	-703.22	83	2000	24.10	-639.12
02N23W15J01S	Hueneme	-824.31	83	2000	24.10	-760.21
02N23W24G01S	Hueneme	-552.57	83	2000	24.10	-488.48
02N22W08G01S	Mugu	-107.88	60	2000	33.33	-34.55
02N22W08P01S	Mugu	-57.21	60	2000	33.33	16.12
02N22W07M02S	Mugu	-414.68	60	2000	33.33	-341.34
02N22W07P01S	Mugu	-262.96	60	2000	33.33	-189.62
02N22W19M04S	Mugu	-212.99	60	2000	33.33	-139.66
02N23W15J02S	Mugu	-454.22	60	2000	33.33	-380.88

Although this water level threshold calculation was considered for the minimum threshold for the chronic lowering of groundwater levels sustainability indicator, it was noted that some calculated levels are several hundred feet lower in elevation than the measured historical low groundwater elevation (especially for the Hueneme aquifer), while others are similar into the historical low elevations; this is due to the significant folding of the principal aquifers that create a variable depth to the top of aquifer throughout the Basin. Other considerations include the prevention of land subsidence, avoiding potentially unrecoverable reduction of groundwater storage, and impacting underflows to/from the adjacent Oxnard Basin. After considering these factors, therefore, the minimum thresholds for the chronic lowering of groundwater levels are conservatively set at the historical low groundwater elevations in the monitoring wells. This approach will protect the wells near anticlines (upward folds), prevent land subsidence, prevent the Basin groundwater levels from falling beyond a point from which groundwater storage may not fully recover, and ensure that underflow to/from the Oxnard Basin is not unduly impacted to ensure the protection of the overall groundwater supply for the Basin (i.e., groundwater levels going significantly below historical lows could lead to long-term storage depletions). However, as discussed in Section 4.4.2.1.1 of the GSP, some of the minimum thresholds that fall below the historical low groundwater levels are superseded by the proxy groundwater level minimum thresholds for the land subsidence sustainability indicator. The resulting minimum thresholds are depicted on the time-series plots (hydrographs) below.

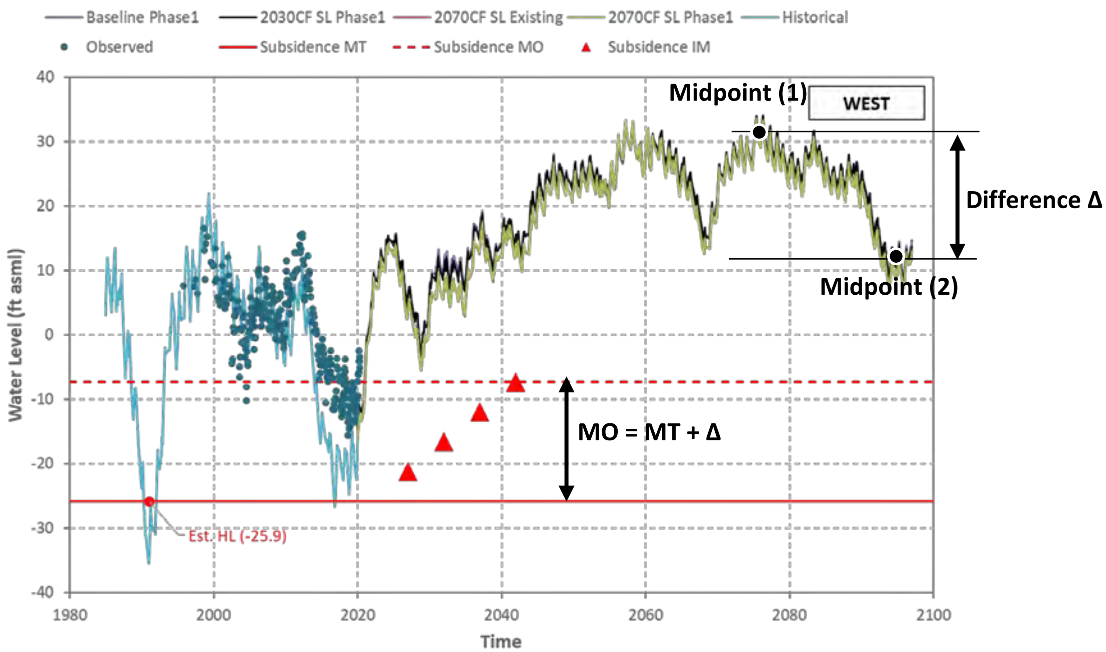
Land Subsidence MT:
For the wells in the eastern half of the Basin, a subsidence rate of ≥ 0.1 ft/year (based on corrected measurements calculated from InSAR data) was used as the MT for when the GWL is at or below the HL. For the wells in the western half of the Basin, the HL was used as the MT.

Measurable Objectives (MO) and Interim Milestones (IM)

The MO was estimated as follows:

(1) The upper limit of the GWL range in the baseline projected model results was extracted by locating the midpoint between the highest and lowest simulated in the 2074 – 2076 period (the highest modeled GWLs).
(2) The lower limit of the GWL range in the baseline projected model results was extracted by locating the midpoint between the highest and lowest simulated GWL in the 2093 – 2095 period (the lowest modeled GWLs following the highest modeled GWLs).
(3) The difference between the two midpoints from (1) and (2) was added to the MT. This difference represents the maximum modeled decline in GWL at the well location.

The IM was estimated by calculating the difference between MT and MO and dividing that range into four sections. Starting from year 2022, IM was set for 2027, 2032, 2037, and 2042 (20 years).


Baseline Phase1
2030CF SL Phase1
2070CF SL Existing
2070CF SL Phase1
Historical
Observed
Subsidence MT
Subsidence MO
Subsidence IM
WEST
Midpoint (1)
Midpoint (2)
Difference Δ
MO = MT + Δ
Est. HL (-25.9)
Water Level (ft asml)
Time
40
30
20
10
0
-10
-20
-30
-40
1980
2000
2020
2040
2060
2080
2100

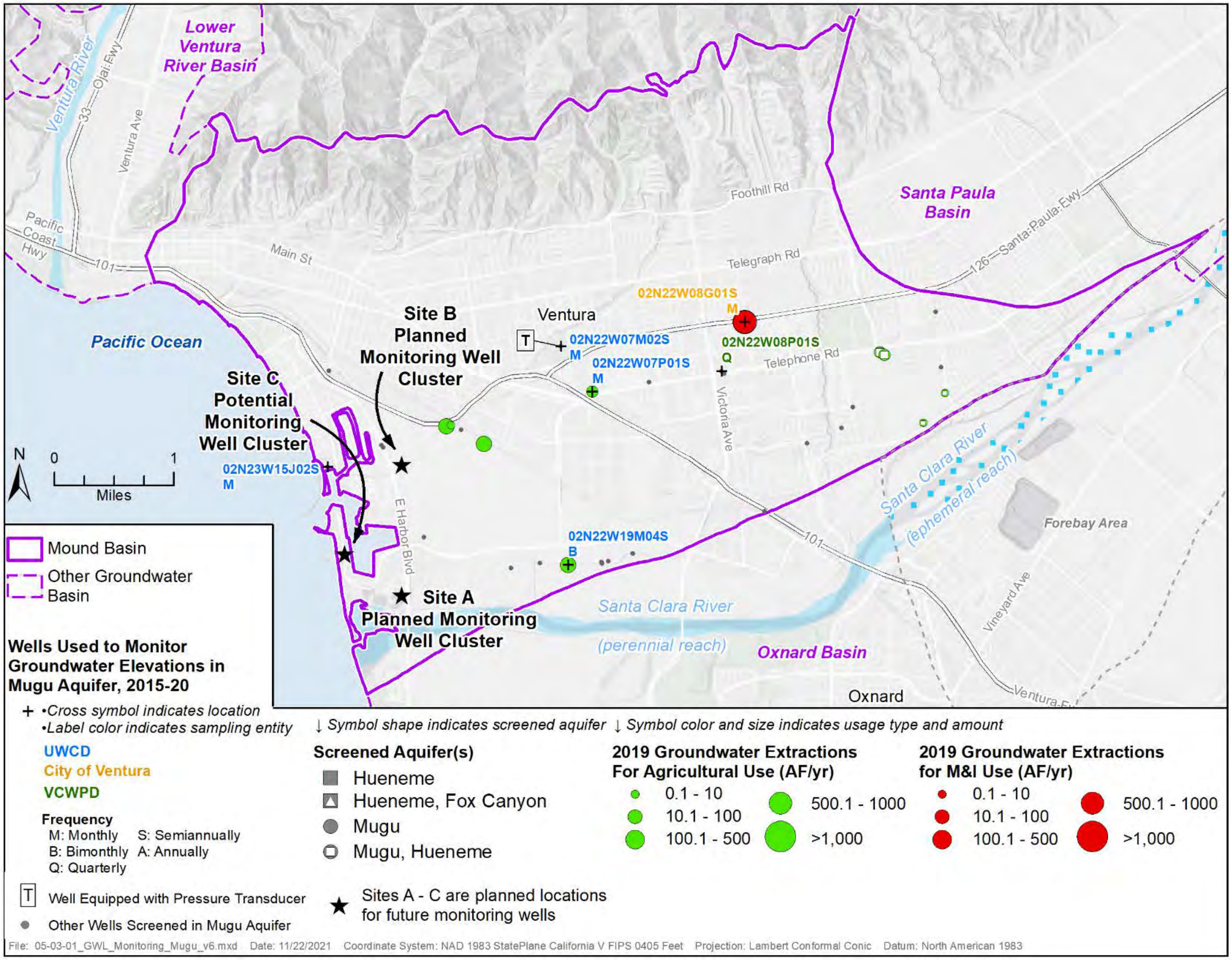


Figure I-1 Map Showing the Groundwater Elevation Monitoring Network in the Mugu Aquifer of Mound Basin.

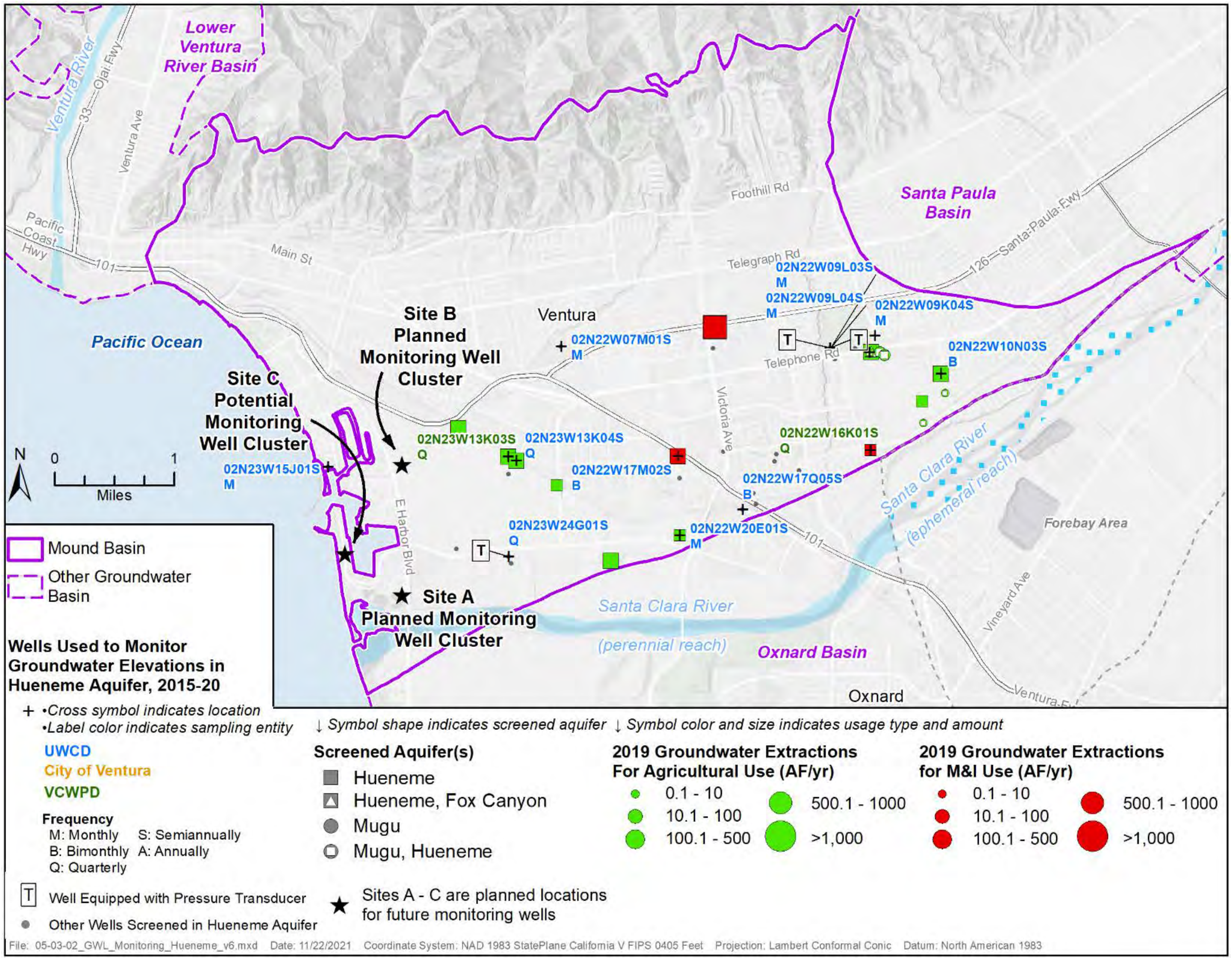


Figure I-2 Map Showing the Groundwater Elevation Monitoring Network in the Hueneme Aquifer of Mound Basin Aquifer of Mound Basin.

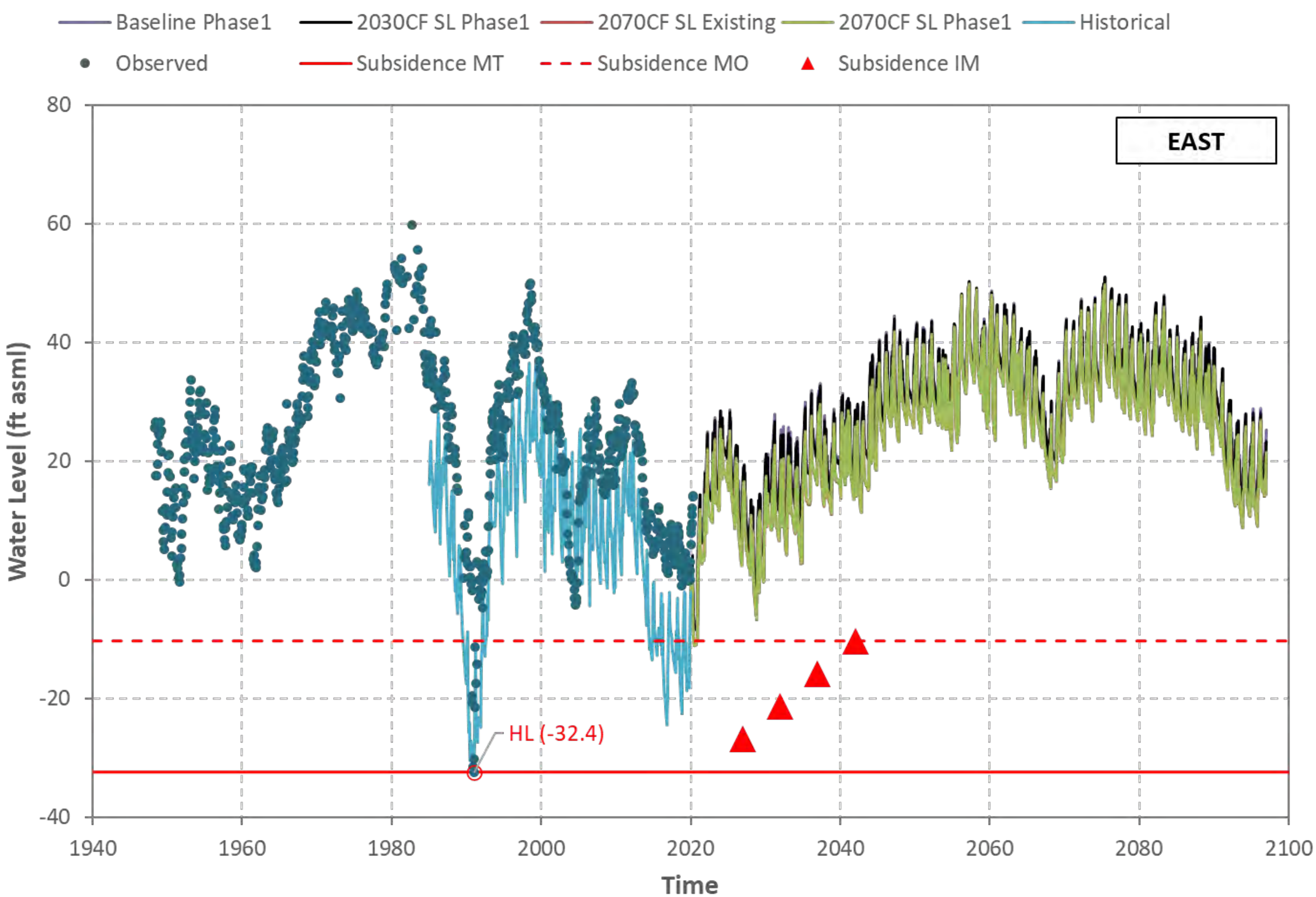


Figure I-3 Hueneme Aquifer - Simulated/Observed Water Level (Well 02N22W09K04S).

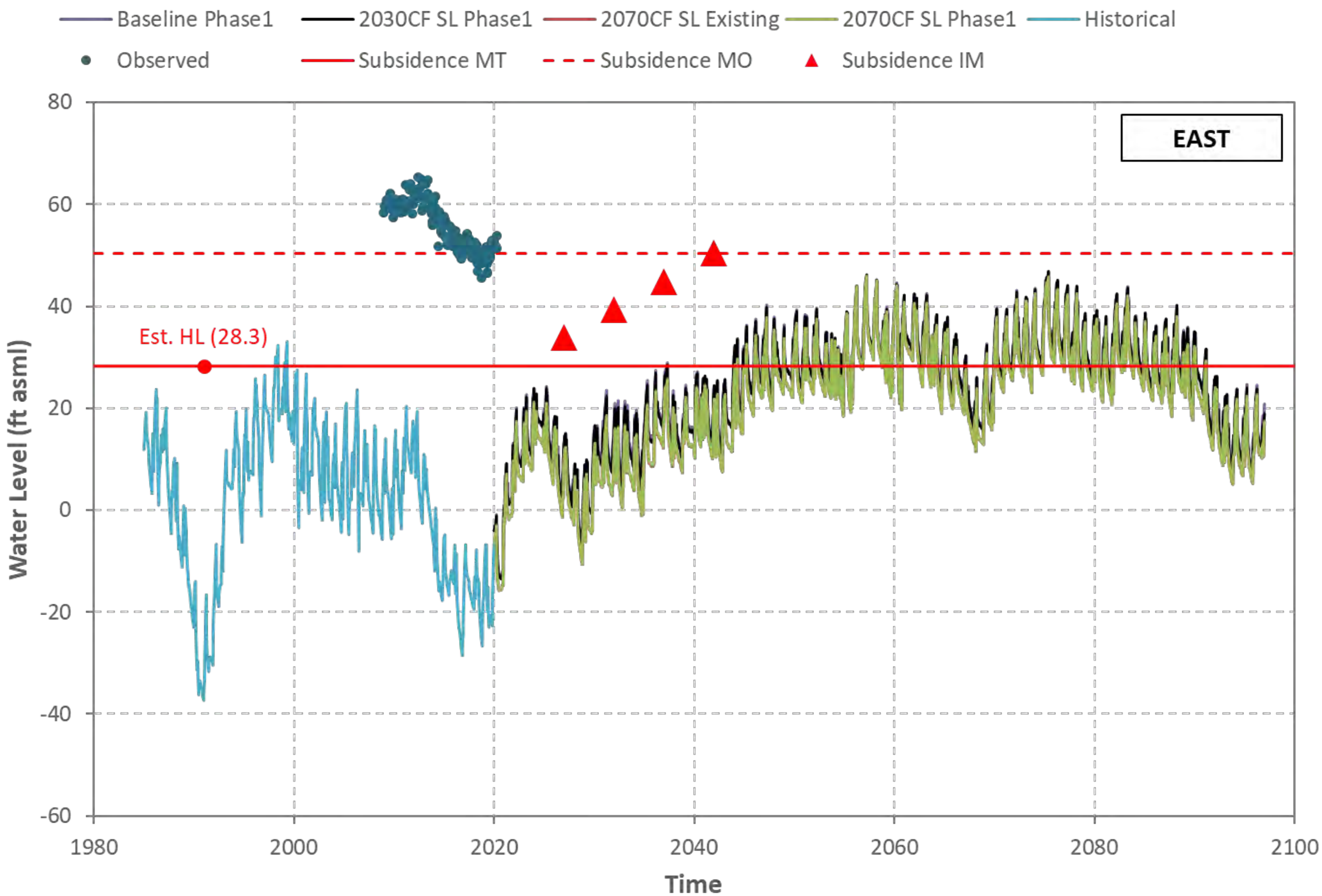


Figure I-4 Hueneme Aquifer - Simulated/Observed Water Level (Well 02N22W09L03S).

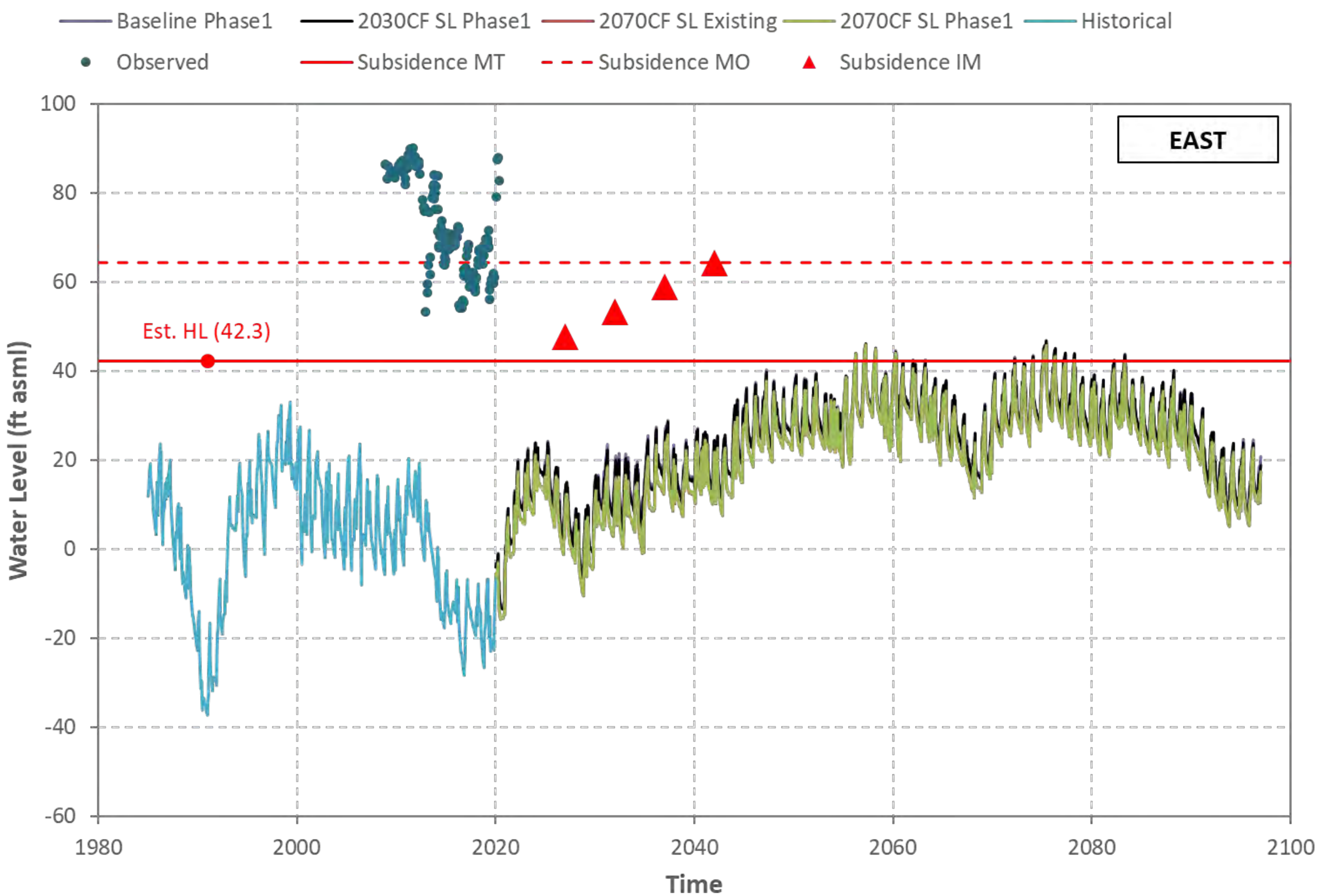


Figure I-5 Hueneme Aquifer - Simulated/Observed Water Level (Well 02N22W09L04S).

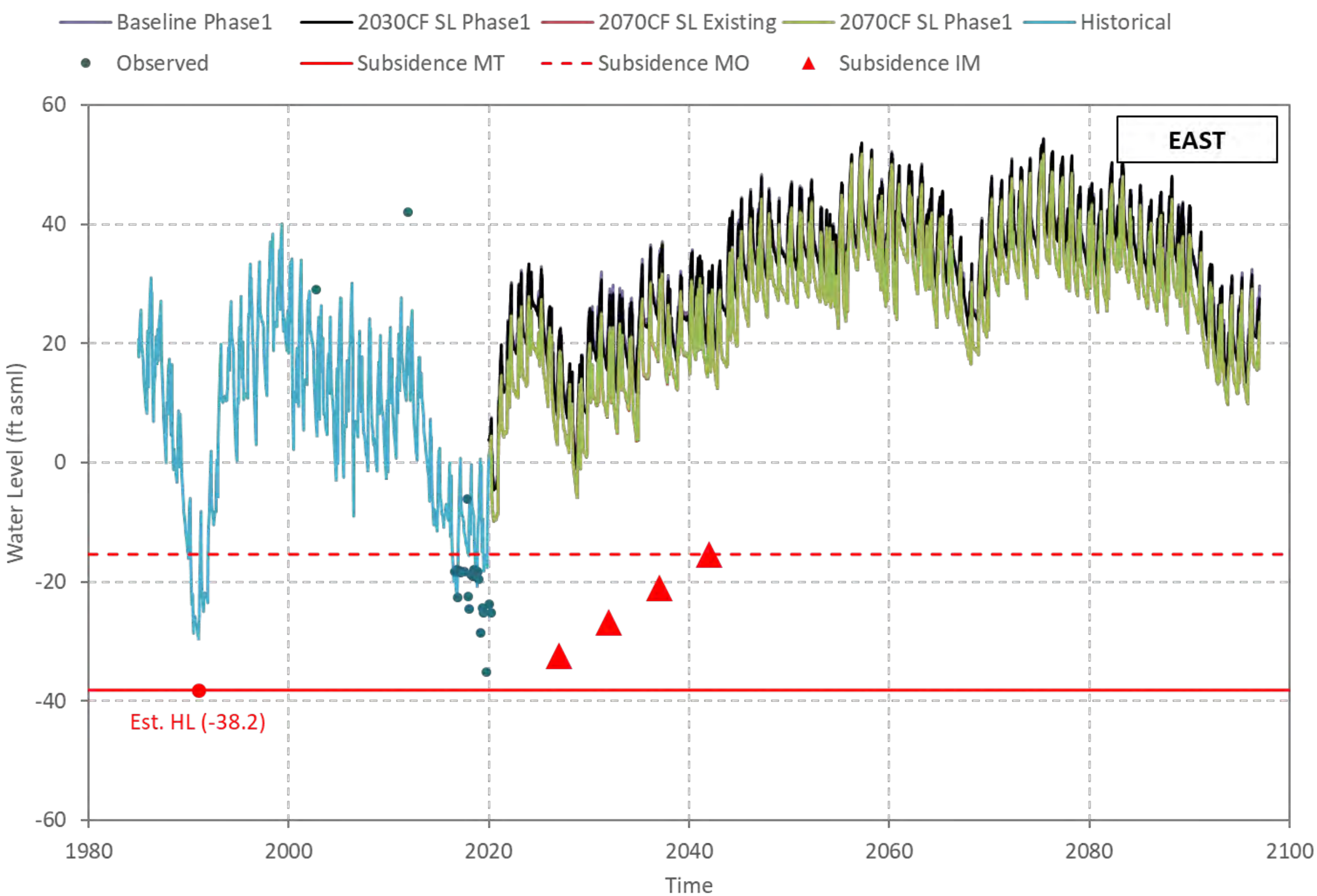


Figure I-6 Hueneme Aquifer - Simulated/Observed Water Level (Well 02N22W10N03S).

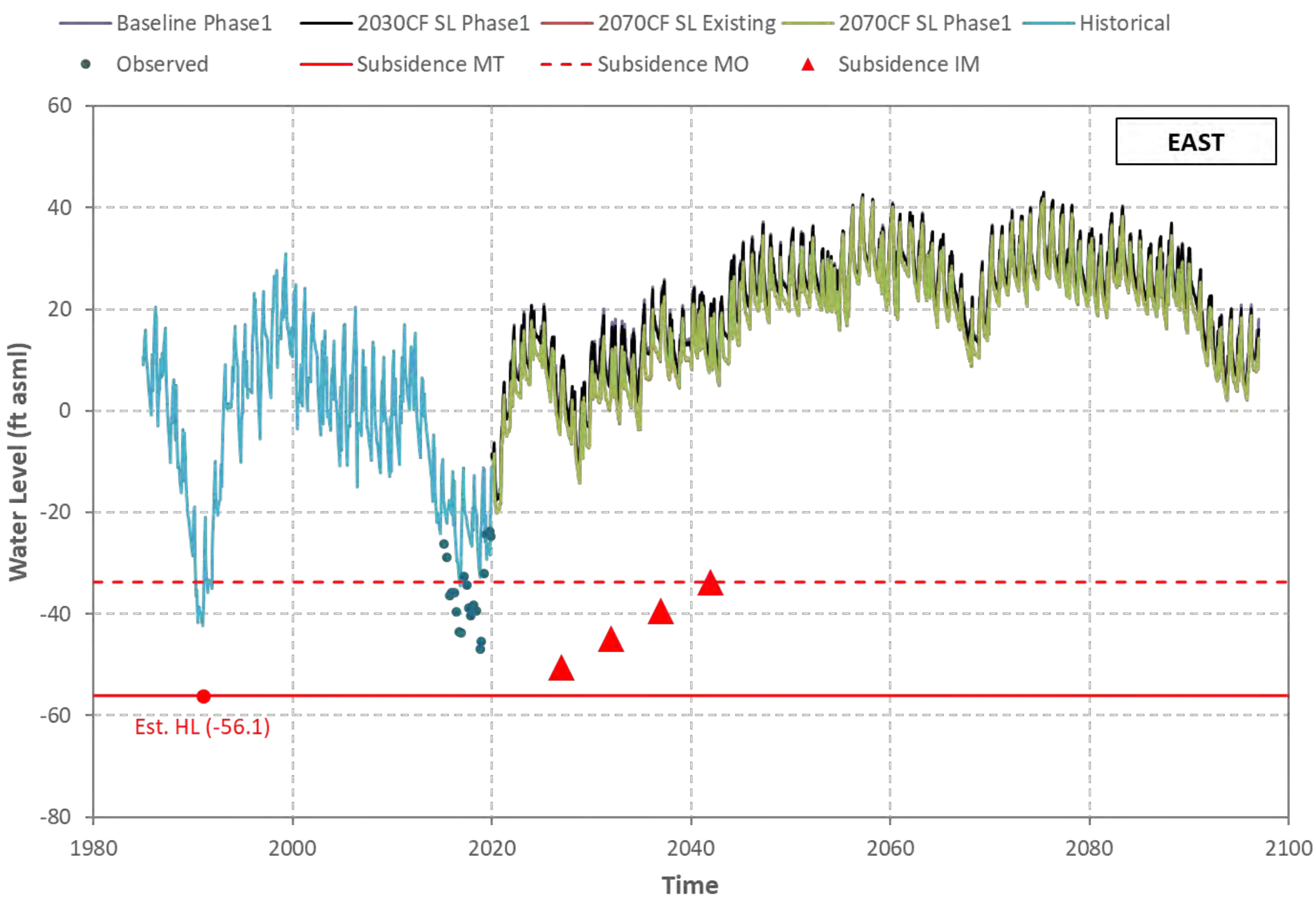


Figure I-7 Hueneme Aquifer - Simulated/Observed Water Level (Well 02N22W16K01S).

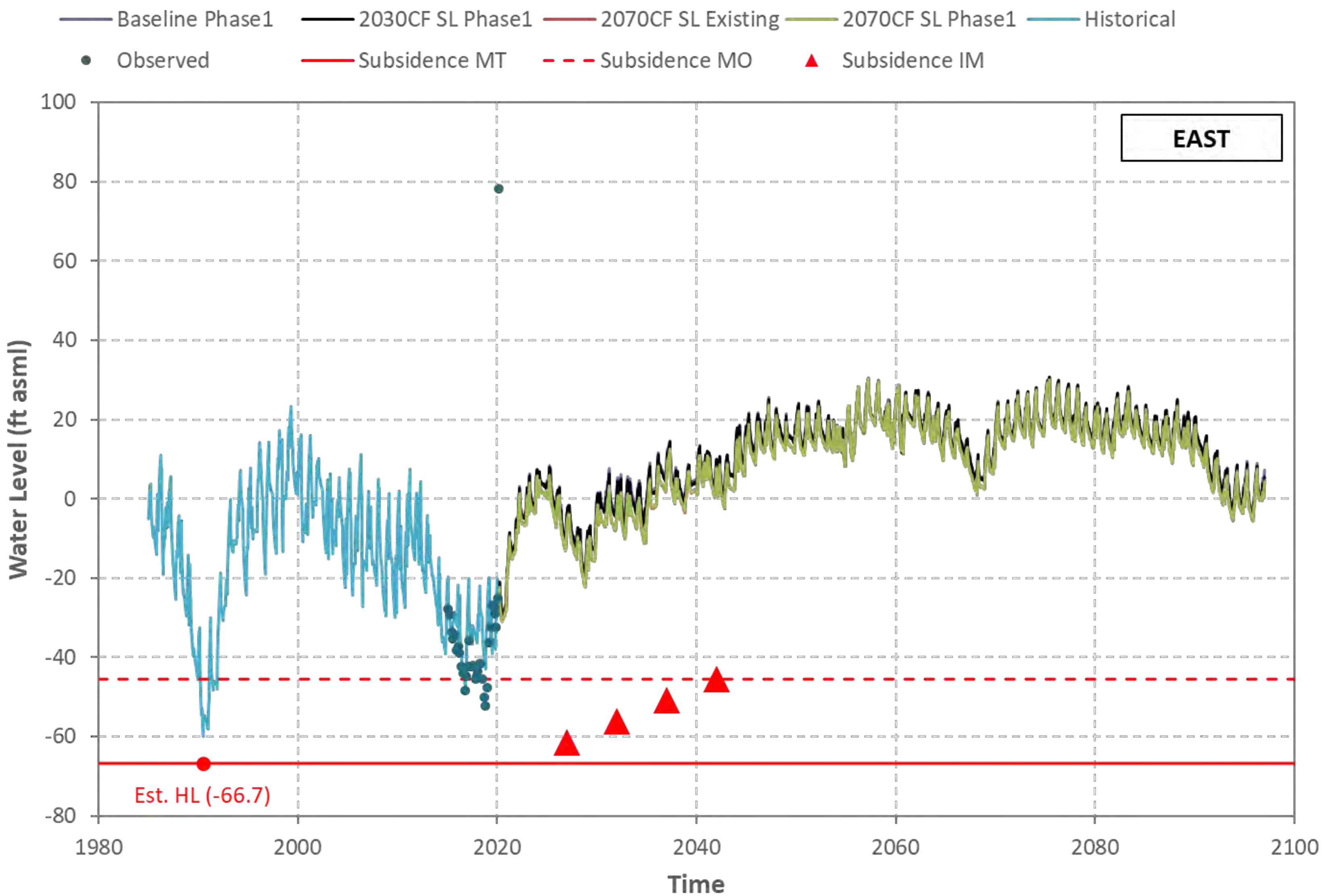


Figure I-8 Hueneme Aquifer - Simulated/Observed Water Level (Well 02N22W17Q05S).

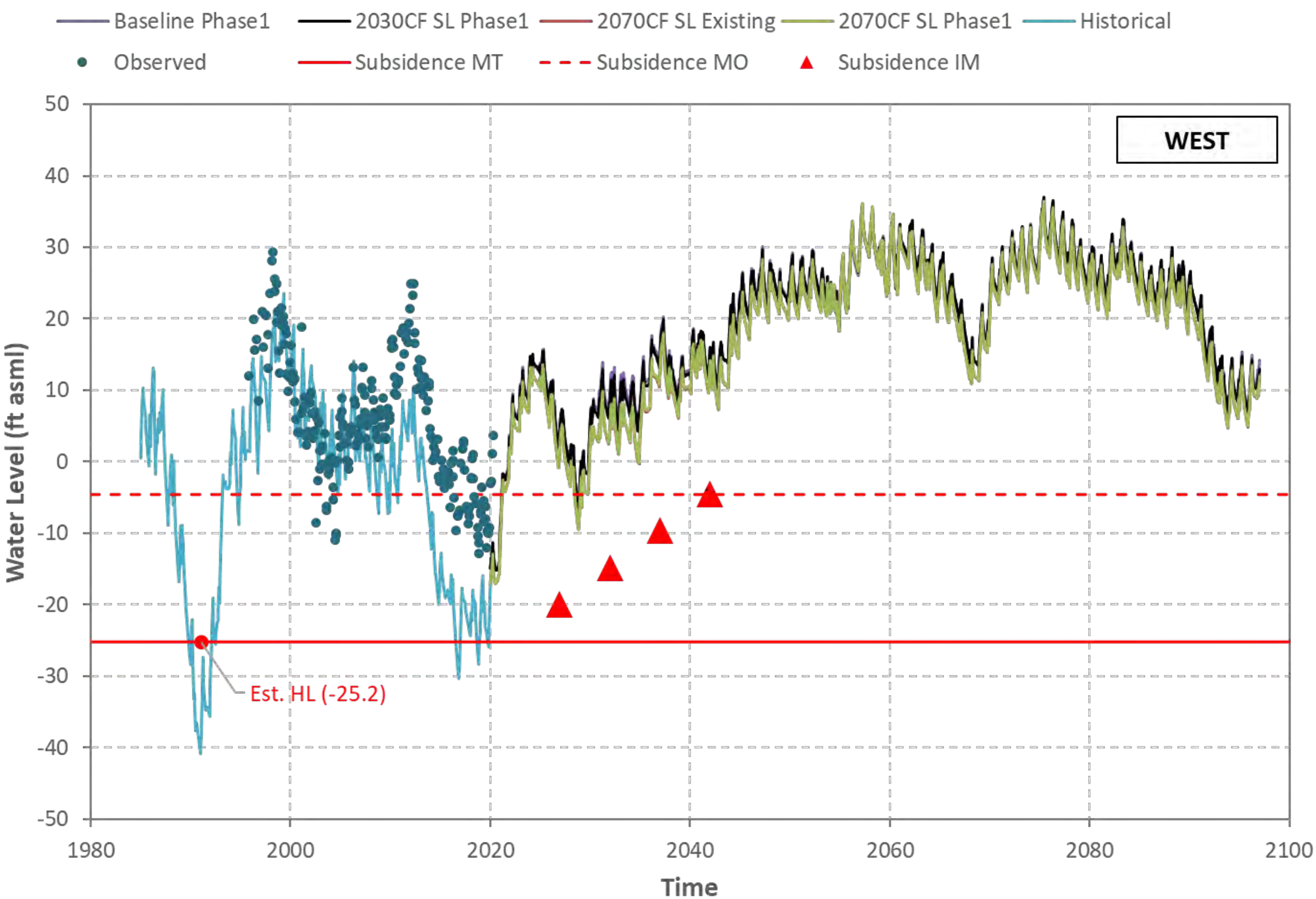


Figure I-9 Hueneme Aquifer - Simulated/Observed Water Level (Well 02N22W07M01S).

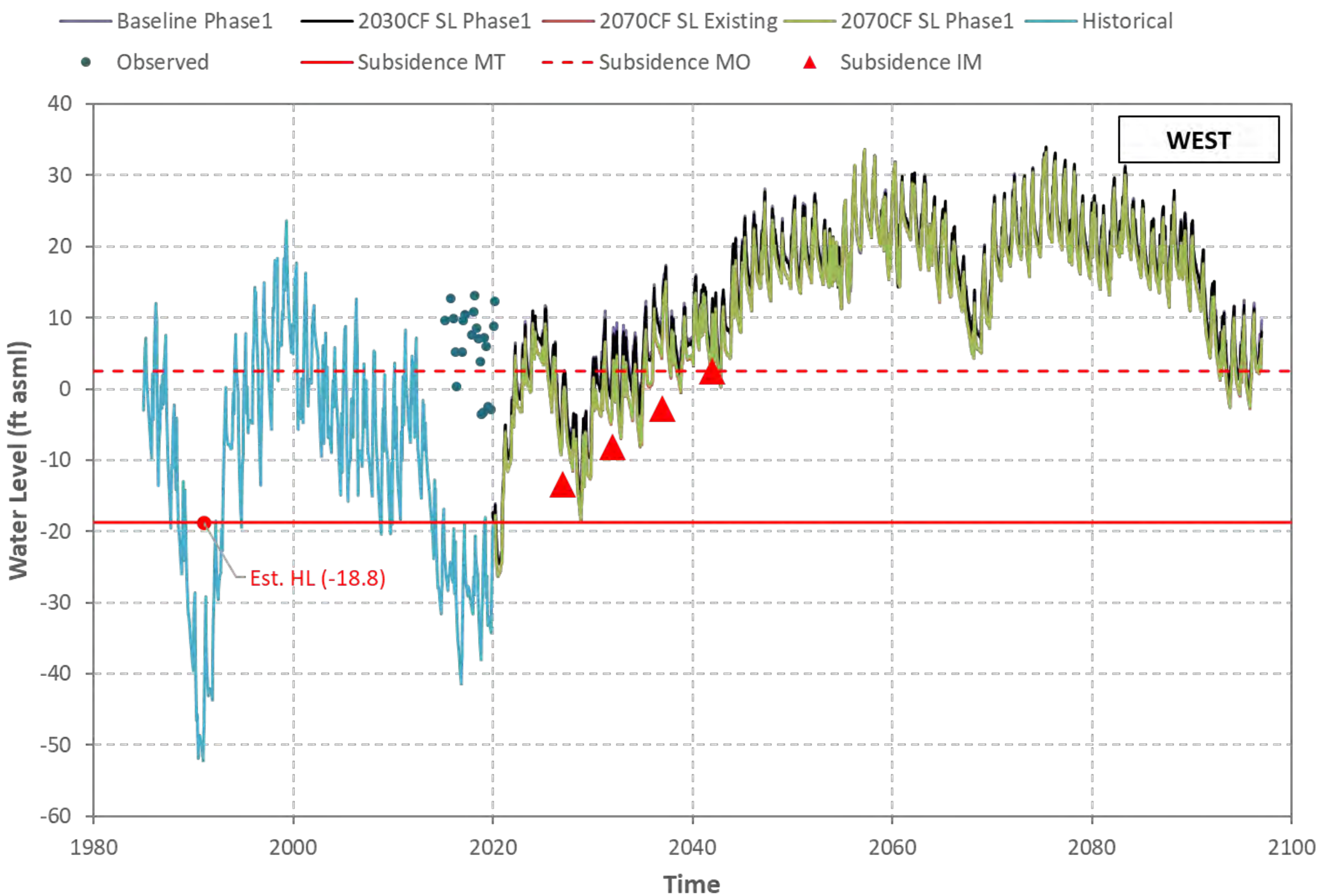


Figure I-10 Hueneme Aquifer - Simulated/Observed Water Level (Well 02N22W17M02S).

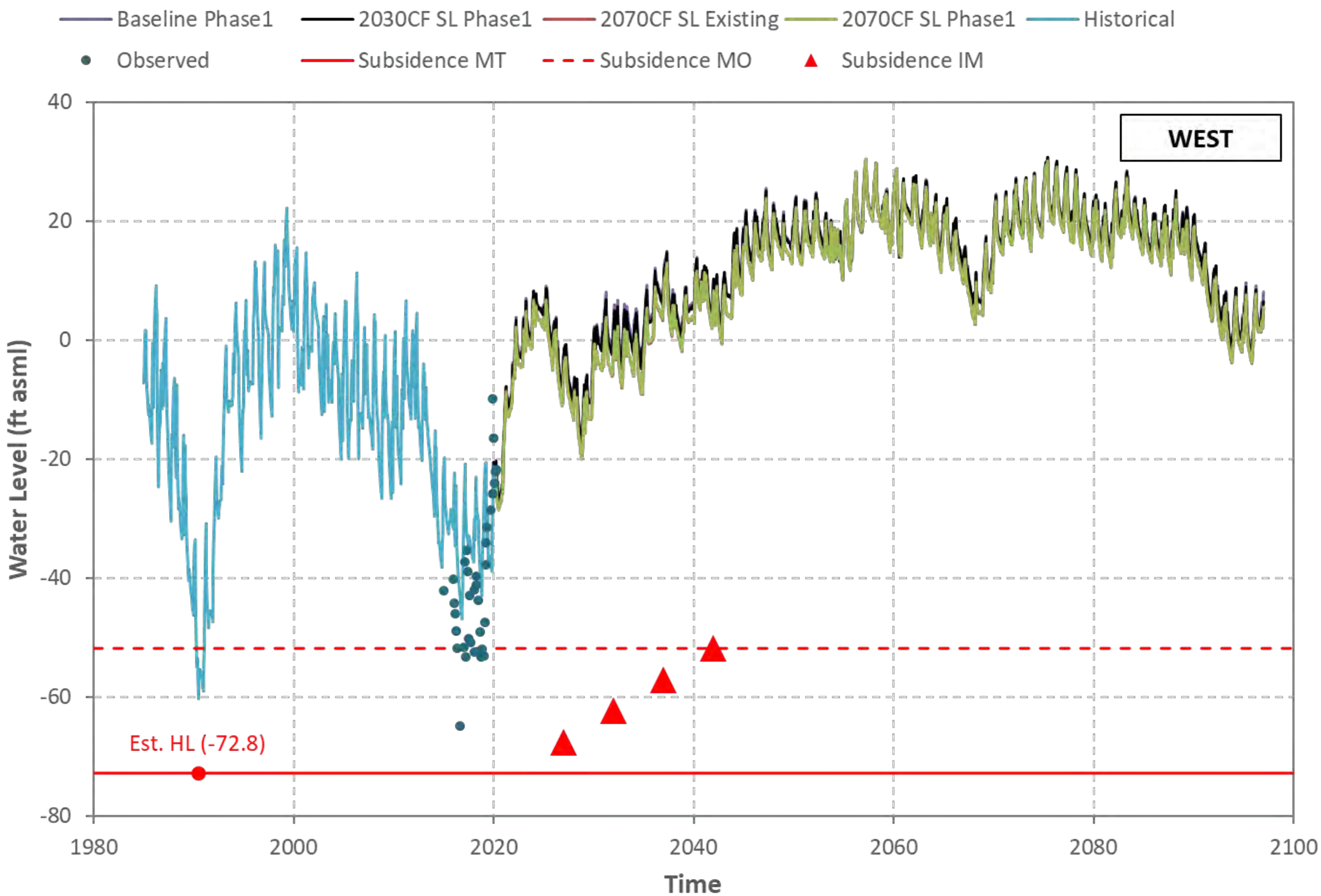


Figure I-11 Hueneme Aquifer - Simulated/Observed Water Level (Well 02N22W20E01S).

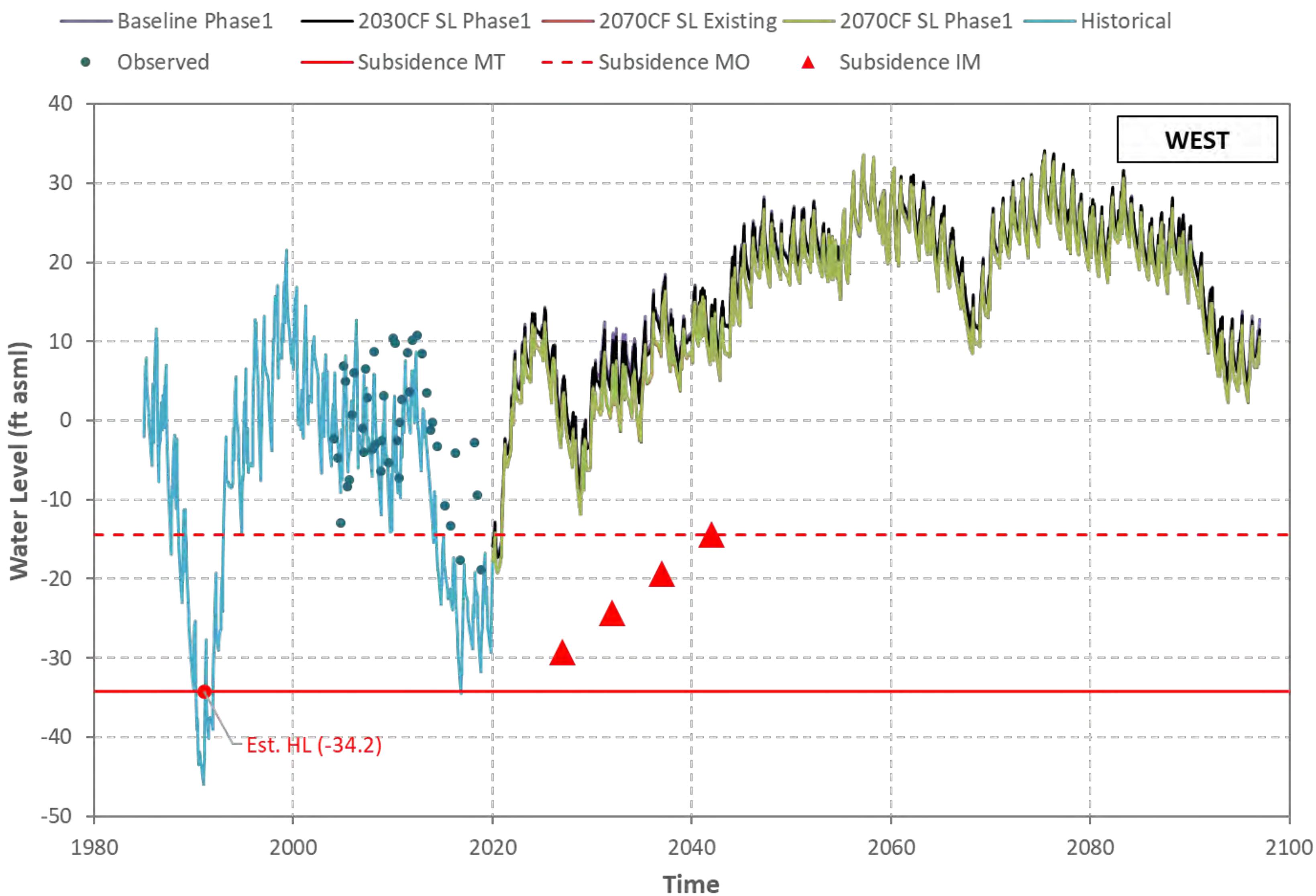


Figure I-12 Hueneme Aquifer - Simulated/Observed Water Level (Well 02N23W13K03S).

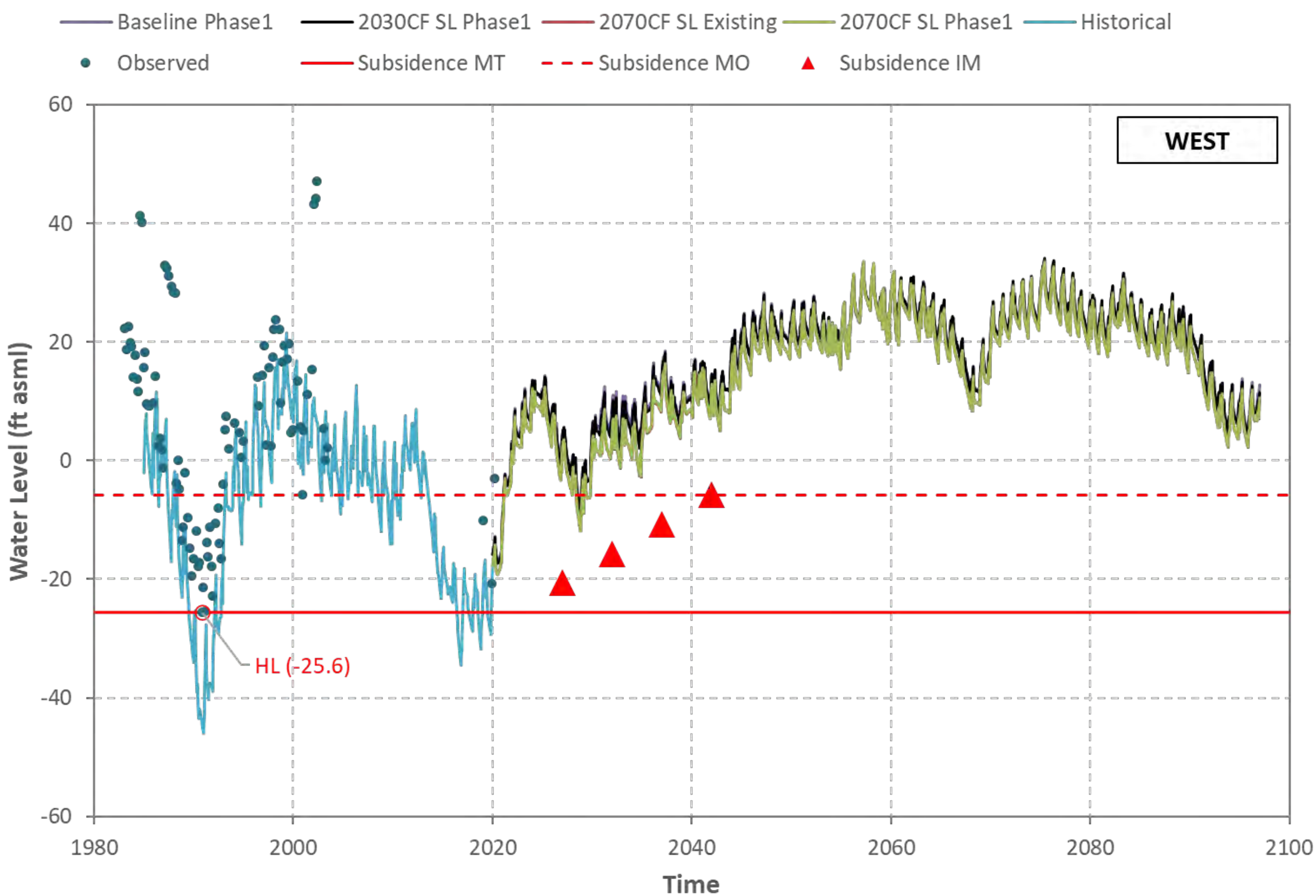


Figure I-13 Hueneme Aquifer - Simulated/Observed Water Level (Well 02N23W13K04S).

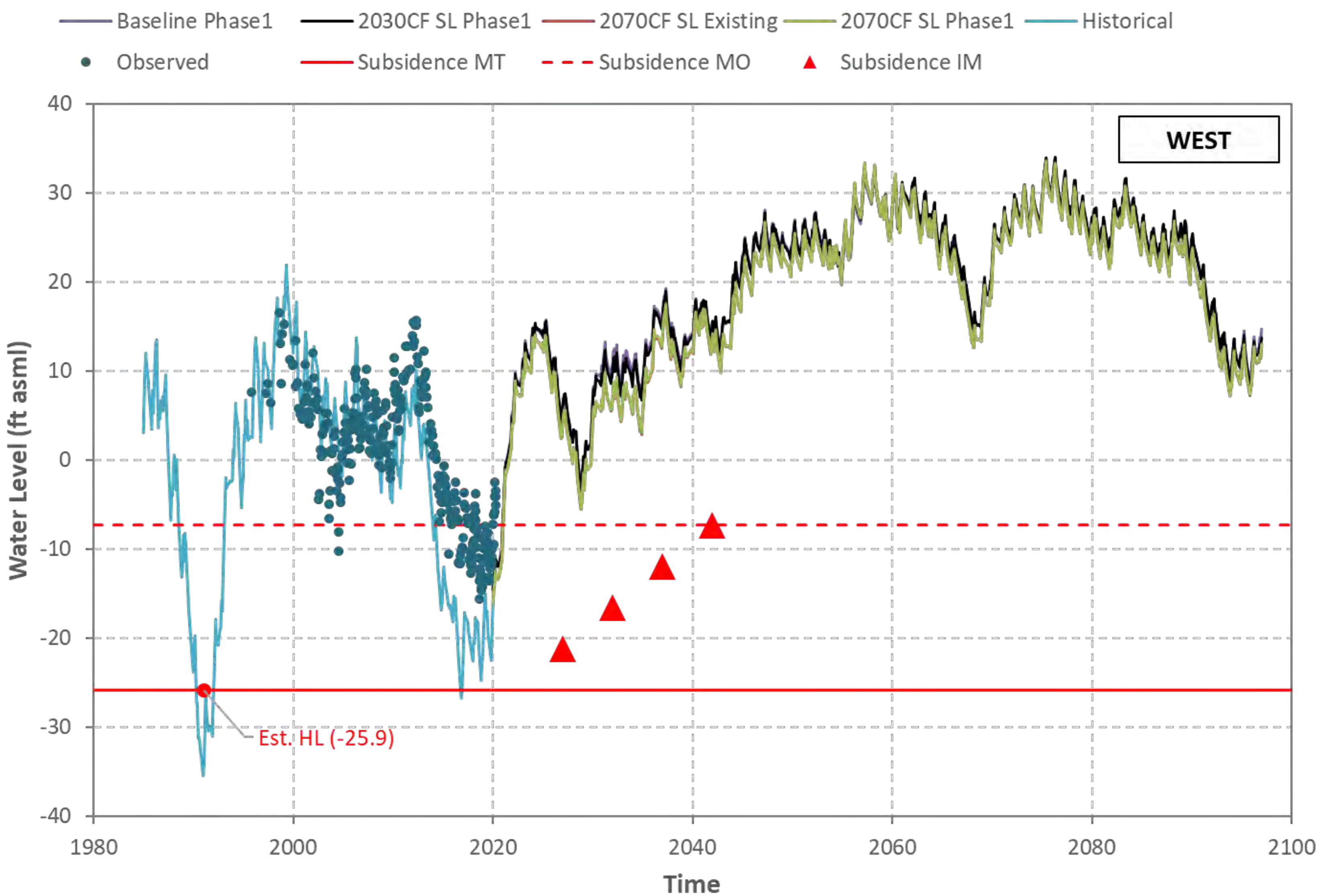


Figure I-14 Hueneme Aquifer - Simulated/Observed Water Level (Well 02N23W15J01S).

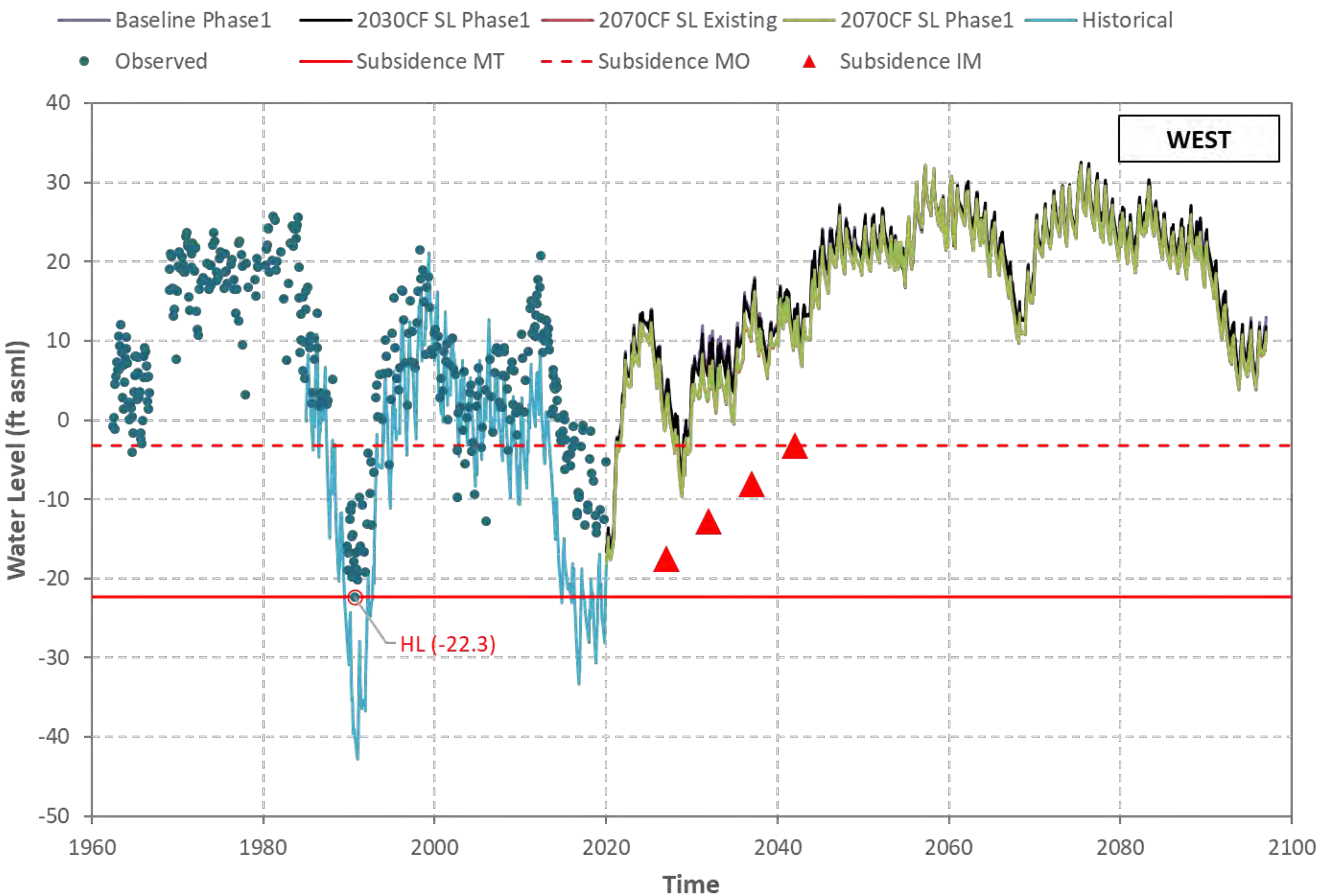


Figure I-15 Hueneme Aquifer - Simulated/Observed Water Level (Well 02N23W24G01S).

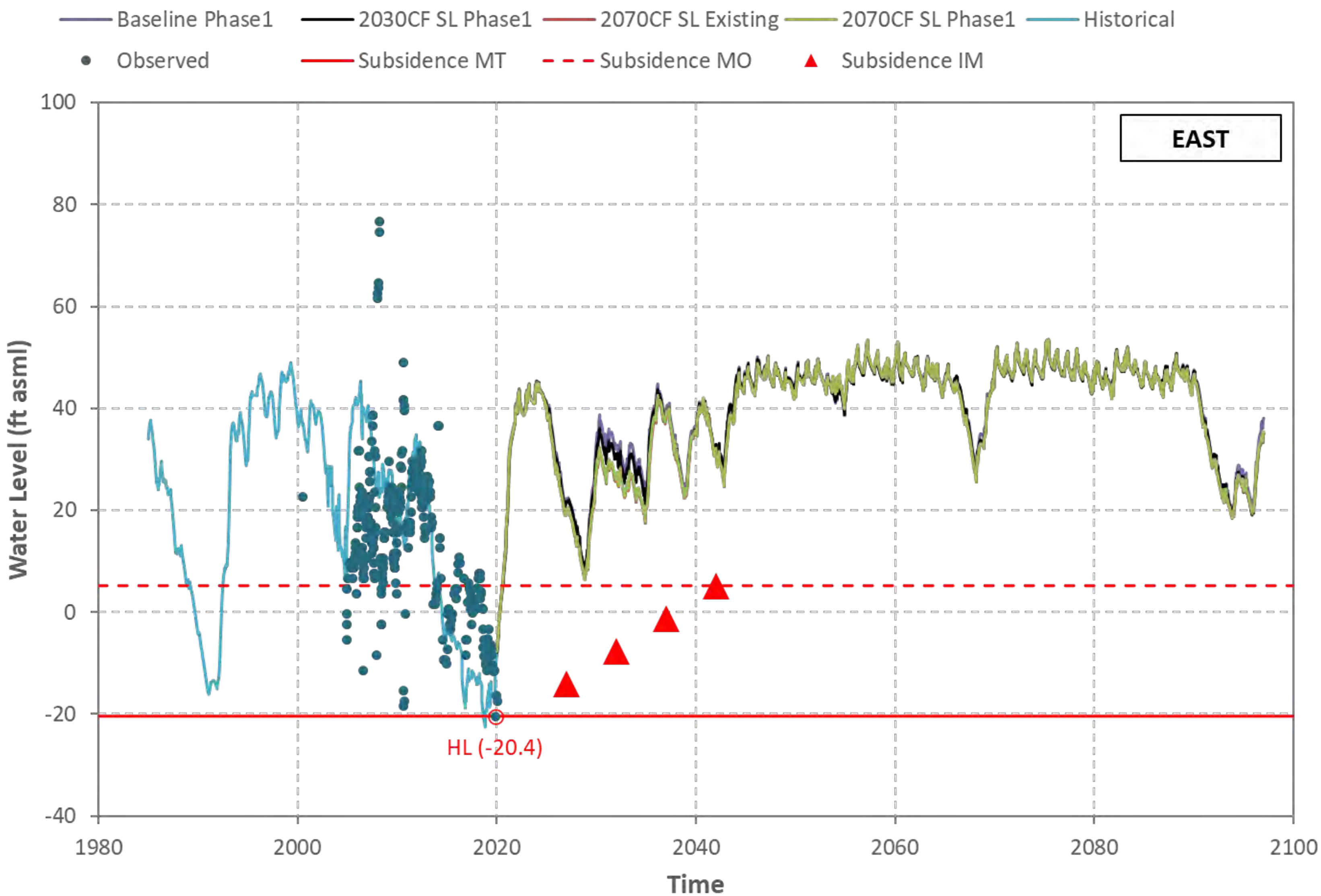


Figure I-16 Mugu Aquifer - Simulated/Observed Water Level (Well 02N22W08G01S).

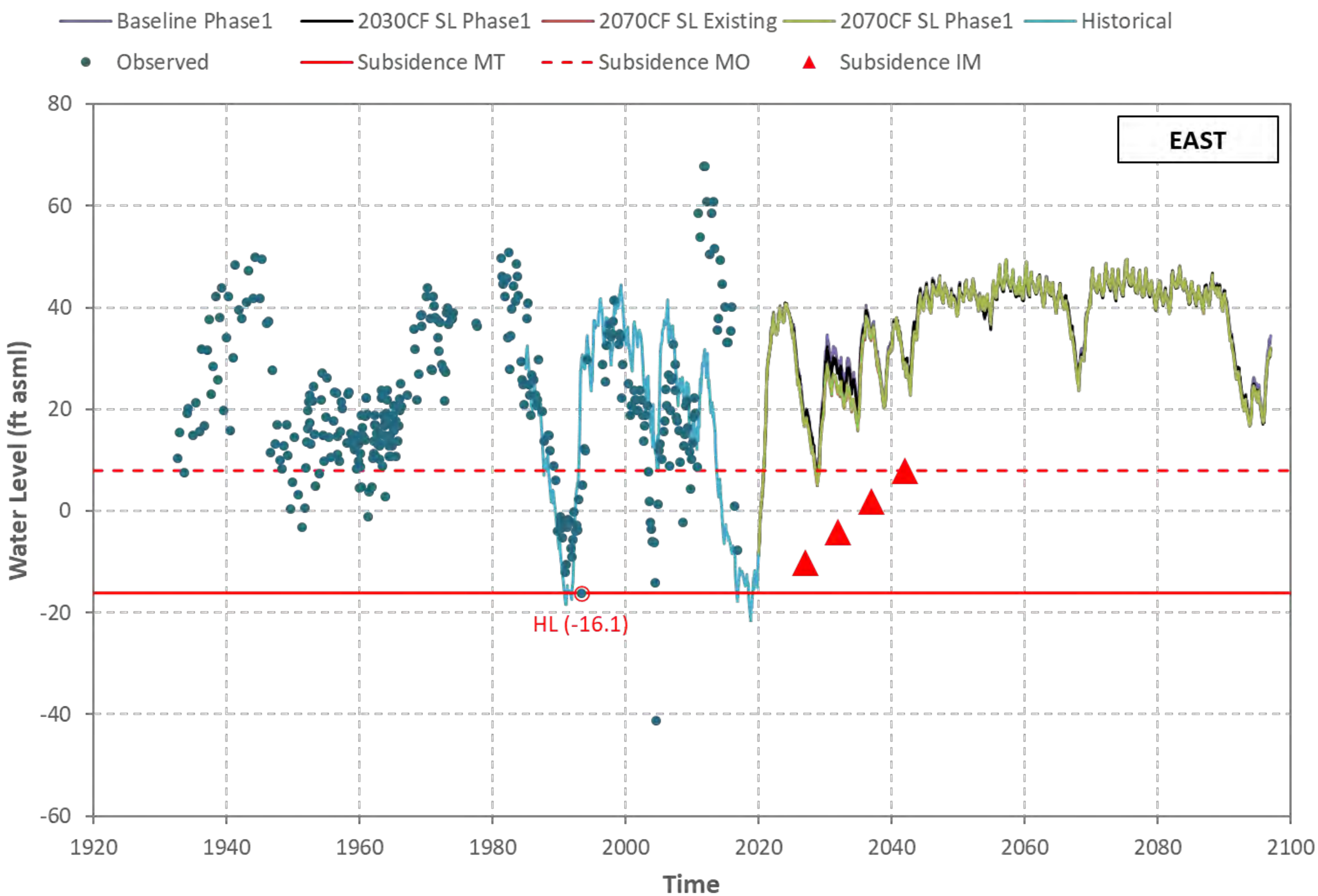


Figure I-17 Mugu Aquifer - Simulated/Observed Water Level (Well 02N22W08P01S).

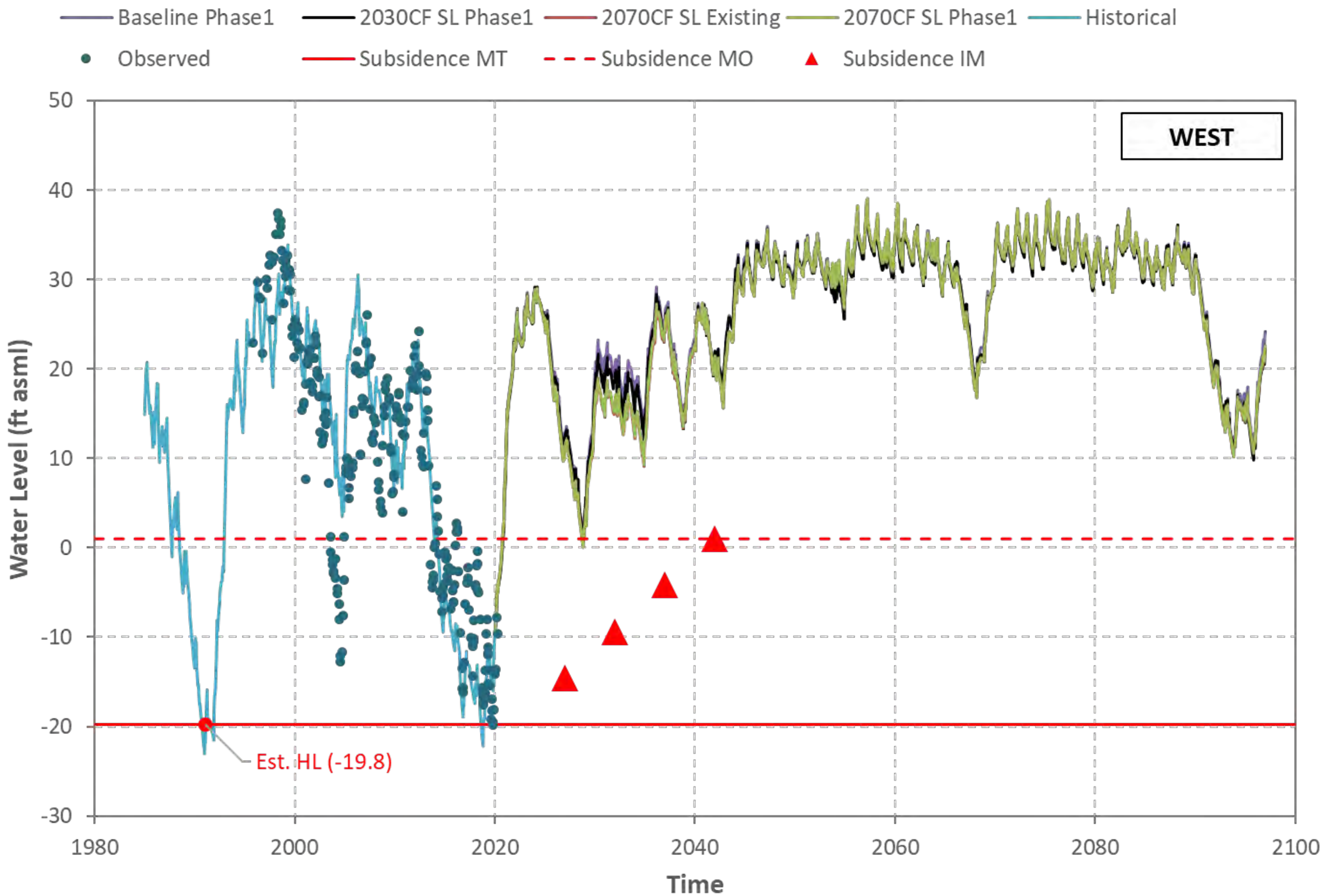


Figure I-18 Mugu Aquifer - Simulated/Observed Water Level (Well 02N22W07M02S).

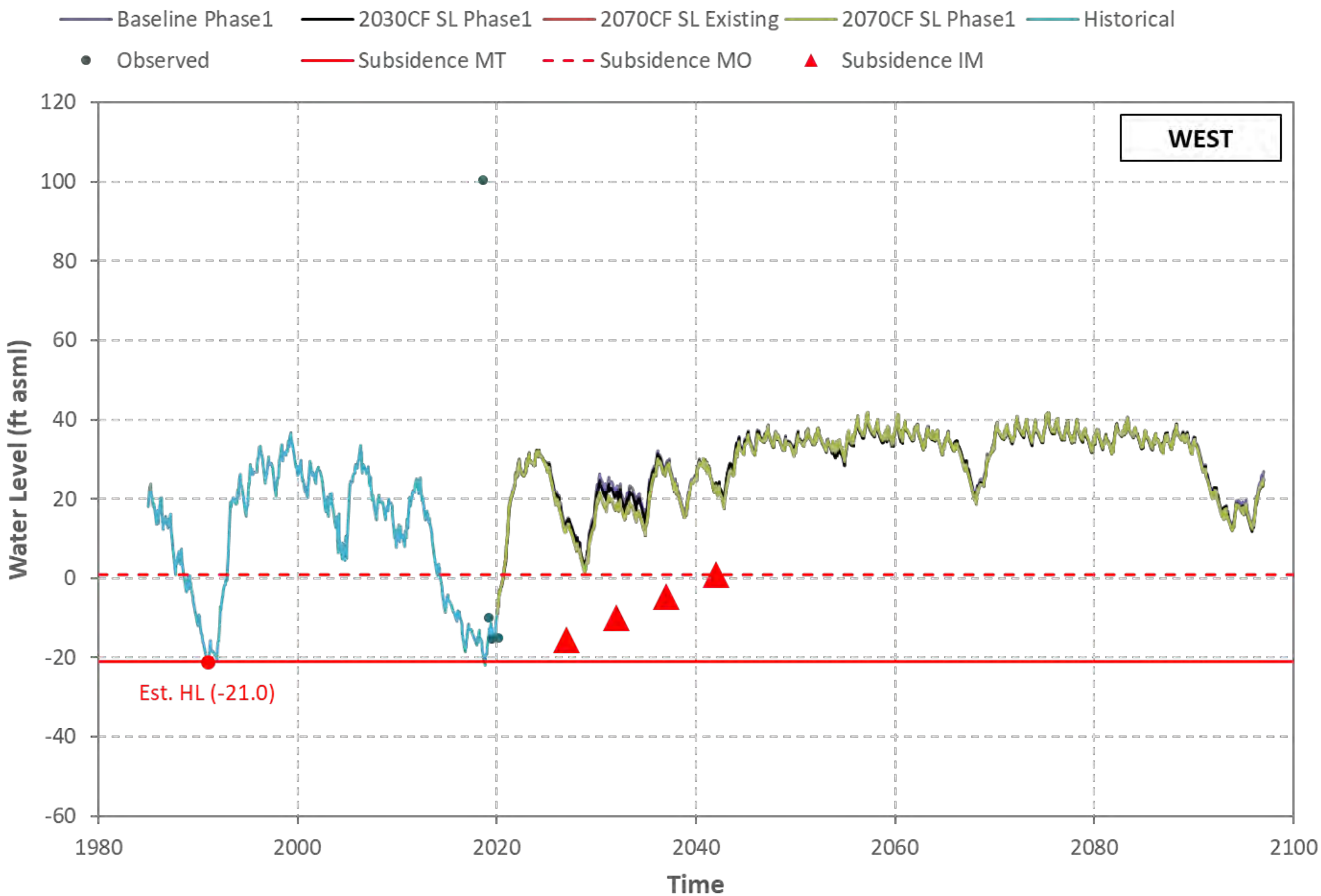


Figure I-19 Mugu Aquifer - Simulated/Observed Water Level (Well 02N22W07P01S).

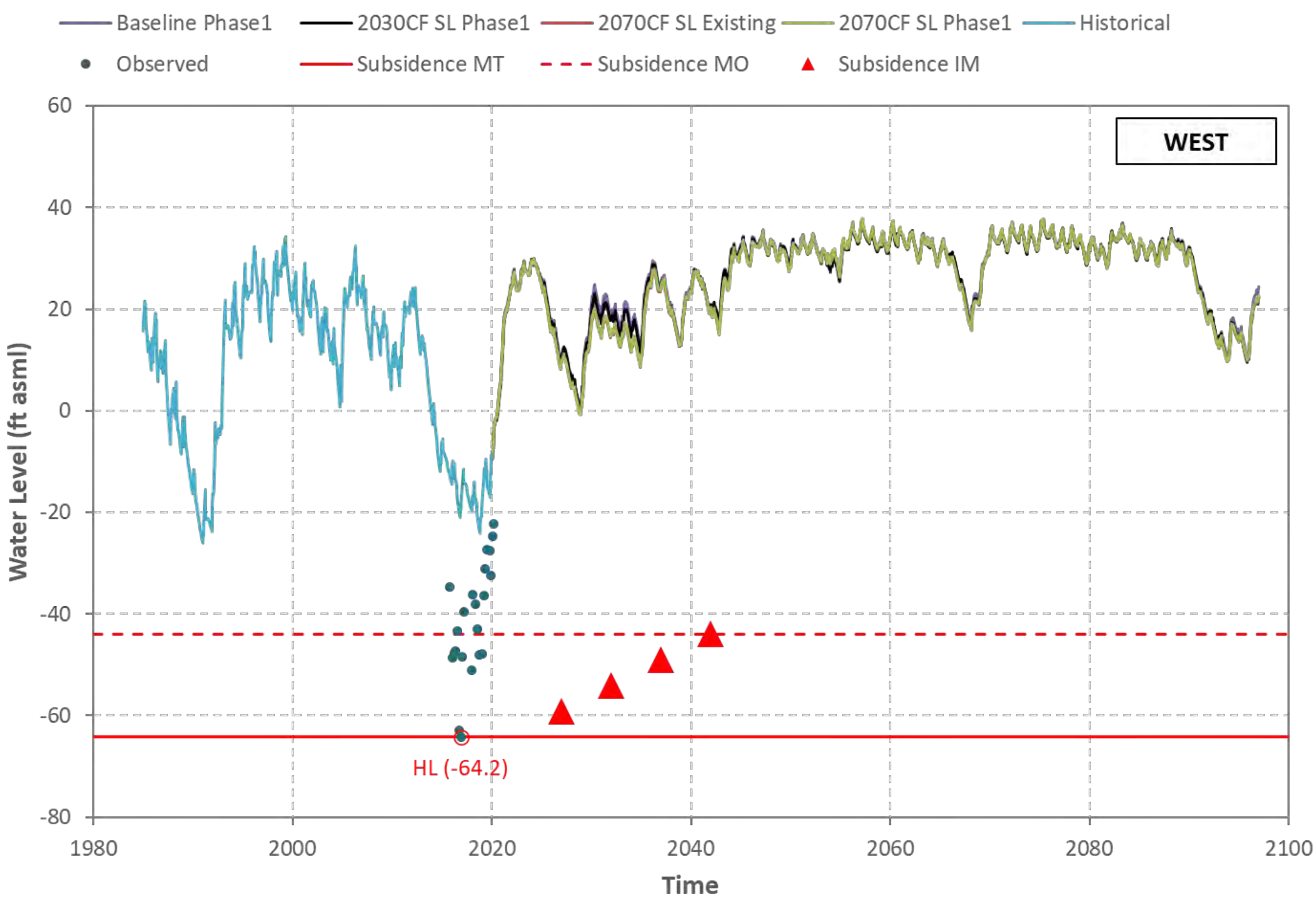


Figure I-20 Mugu Aquifer - Simulated/Observed Water Level (Well 02N22W19M04S).

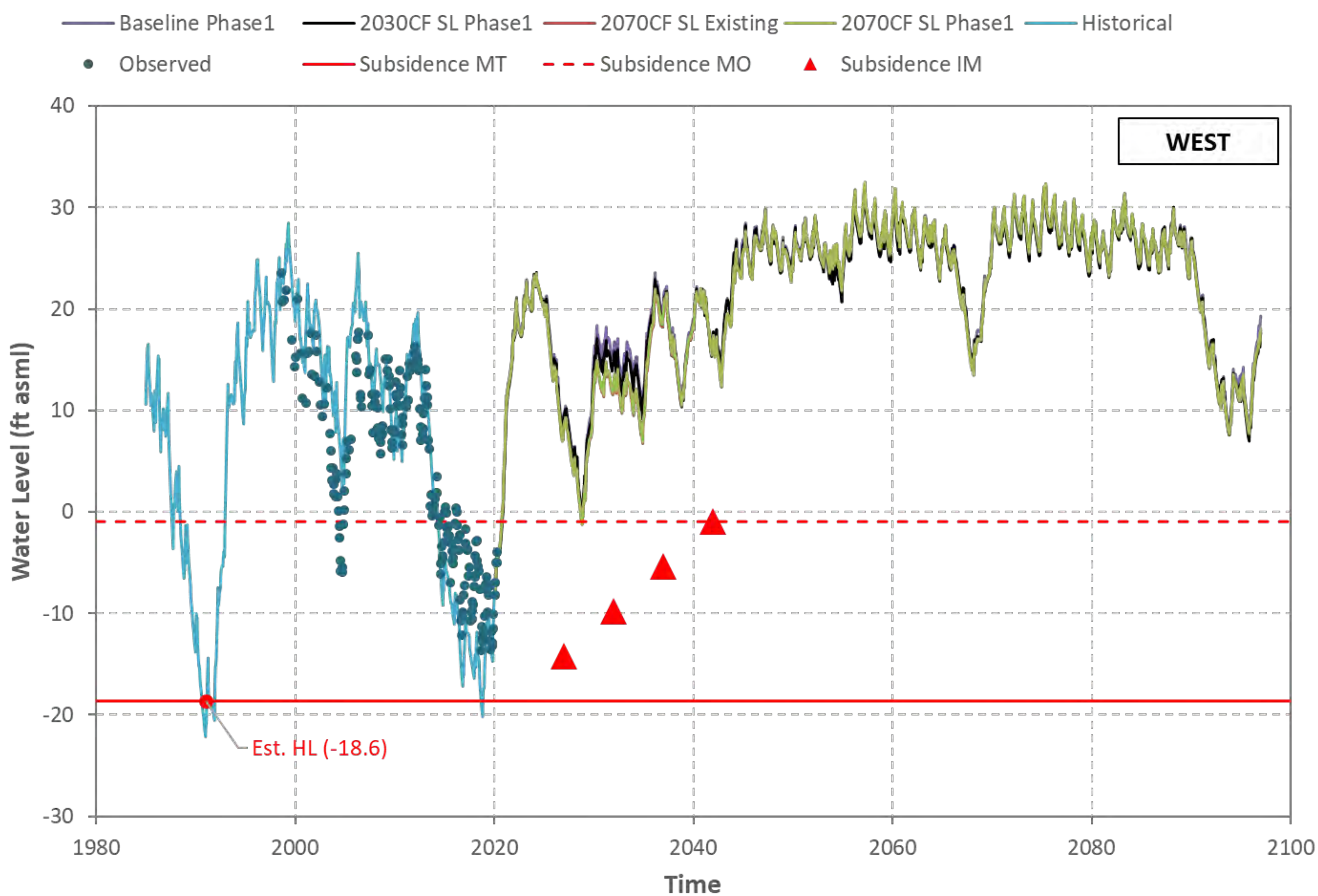


Figure I-21 Mugu Aquifer - Simulated/Observed Water Level (Well 02N23W15J02S).

Appendix J

Time Series Plots of Groundwater Quality with Minimum Thresholds and Measurable Objectives

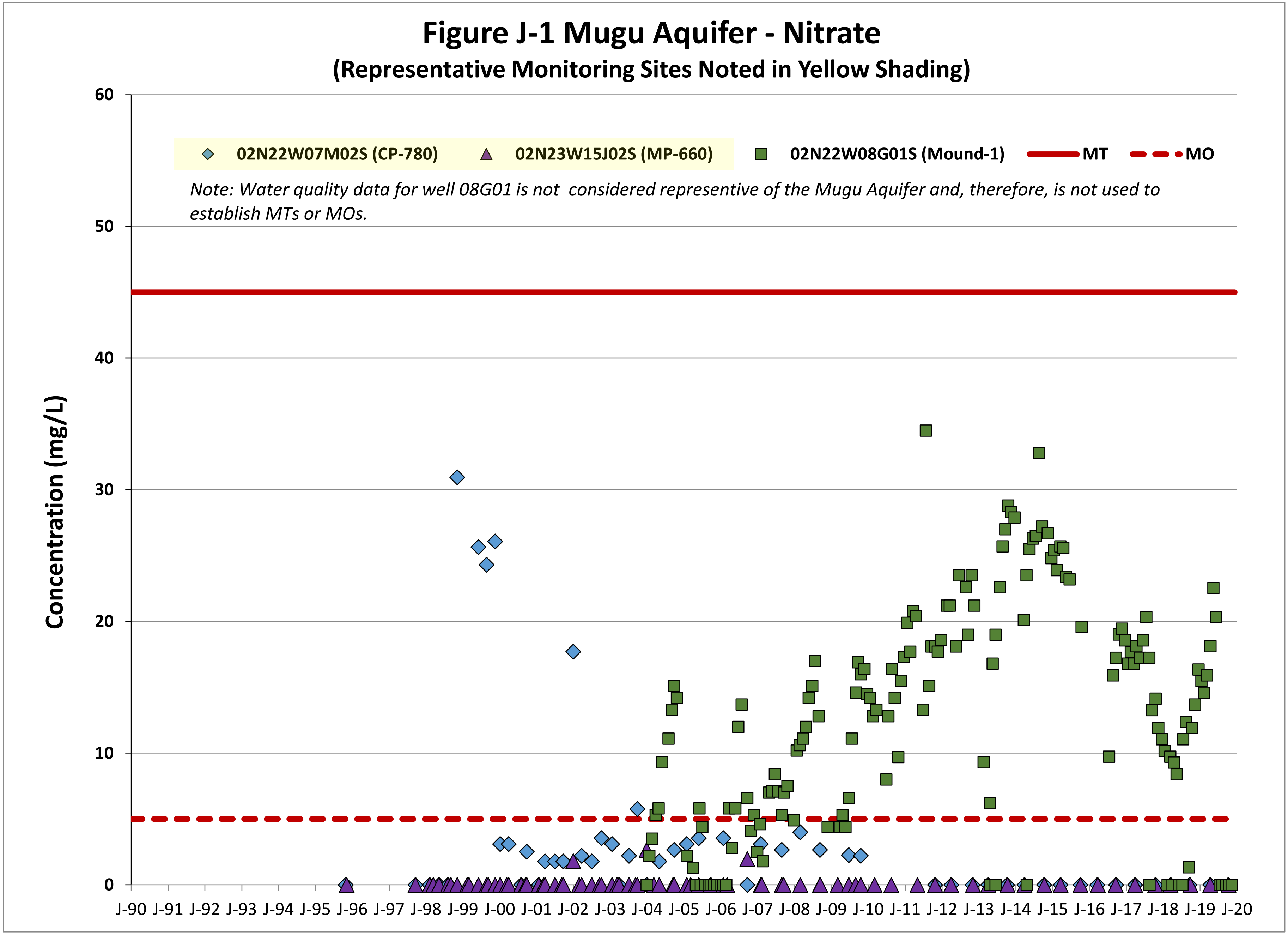


Figure J-1 Mugu Aquifer - Nitrate
(Representative Monitoring Sites Noted in Yellow Shading)
02N22W07M02S (CP-780)
02N23W15J02S (MP-660)
02N22W08G01S (Mound-1)
MT
MO
Note: Water quality data for well 08G01 is not considered representative of the Mugu Aquifer and, therefore, is not used to establish MTs or MOs.
Concentration (mg/L)
60
50
40
30
20
10
0
J-90
J-91
J-92
J-93
J-94
J-95
J-96
J-97
J-98
J-99
J-00
J-01
J-02
J-03
J-04
J-05
J-06
J-07
J-08
J-09
J-10
J-11
J-12
J-13
J-14
J-15
J-16
J-17
J-18
J-19
J-20

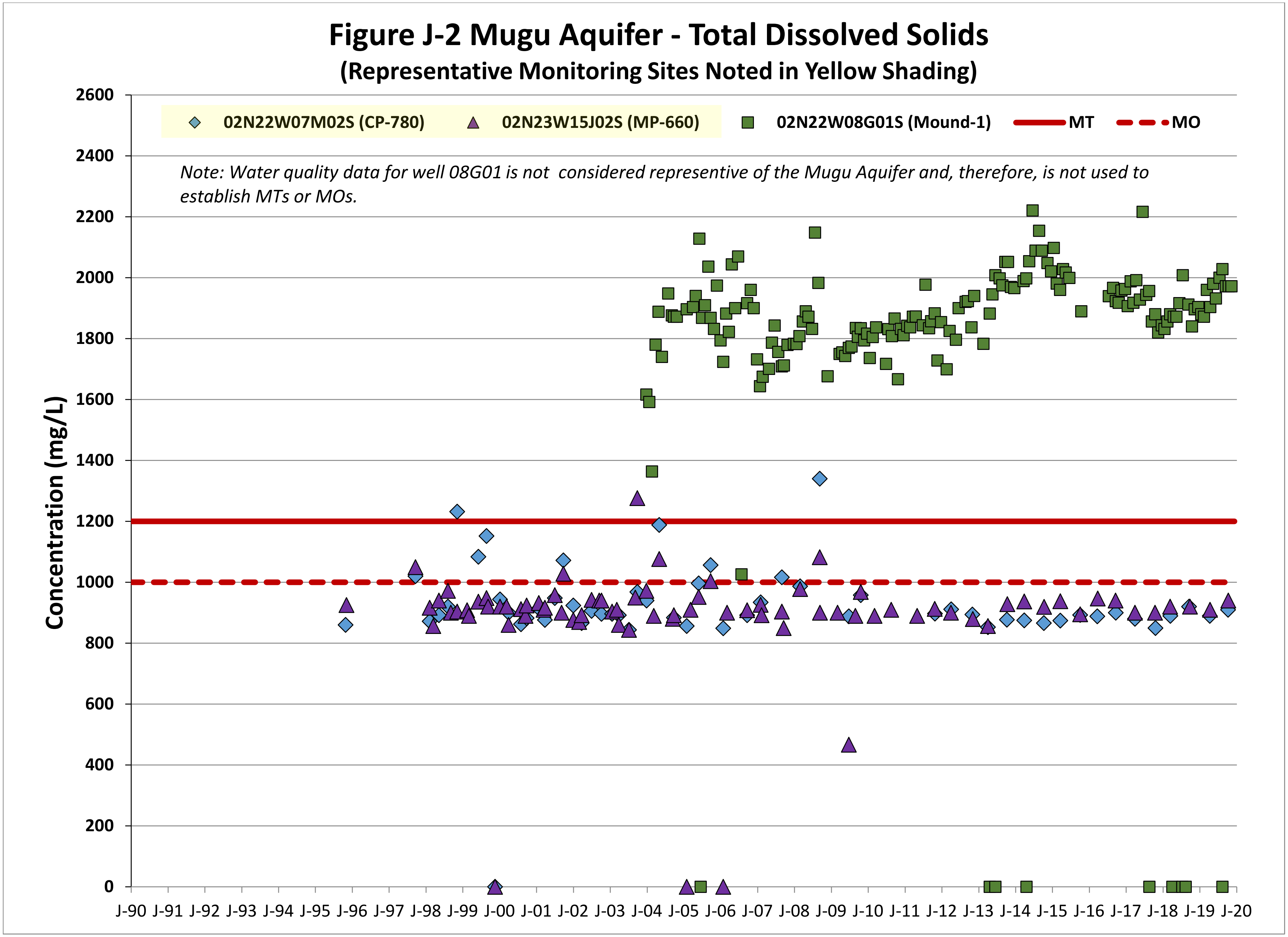


Figure J-2 Mugu Aquifer - Total Dissolved Solids
(Representative Monitoring Sites Noted in Yellow Shading)
02N22W07M02S (CP-780)
02N23W15J02S (MP-660)
02N22W08G01S (Mound-1)
MT
MO
Note: Water quality data for well 08G01 is not considered representative of the Mugu Aquifer and, therefore, is not used to establish MTs or MOs.
Concentration (mg/L)
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
J-90 J-91 J-92 J-93 J-94 J-95 J-96 J-97 J-98 J-99 J-00 J-01 J-02 J-03 J-04 J-05 J-06 J-07 J-08 J-09 J-10 J-11 J-12 J-13 J-14 J-15 J-16 J-17 J-18 J-19 J-20

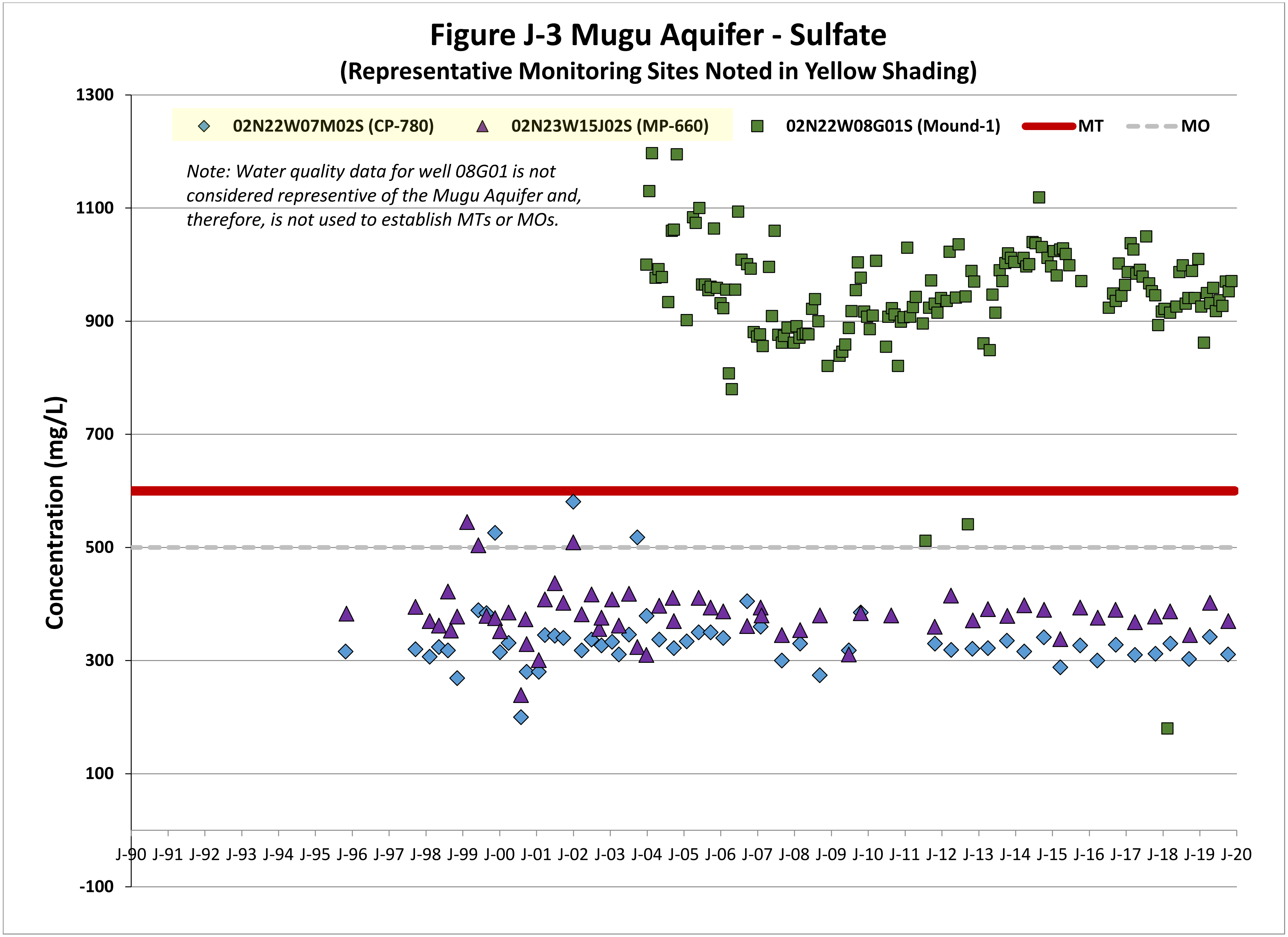


Figure J-3 Mugu Aquifer - Sulfate
(Representative Monitoring Sites Noted in Yellow Shading)
02N22W07M02S (CP-780)
02N23W15J02S (MP-660)
02N22W08G01S (Mound-1)
MT
MO
Note: Water quality data for well 08G01 is not considered representive of the Mugu Aquifer and, therefore, is not used to establish MTs or MOs.
Concentration (mg/L)
1300
1100
900
700
500
300
100
-100
J-90
J-91
J-92
J-93
J-94
J-95
J-96
J-97
J-98
J-99
J-00
J-01
J-02
J-03
J-04
J-05
J-06
J-07
J-08
J-09
J-10
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J-12
J-13
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J-16
J-17
J-18
J-19
J-20

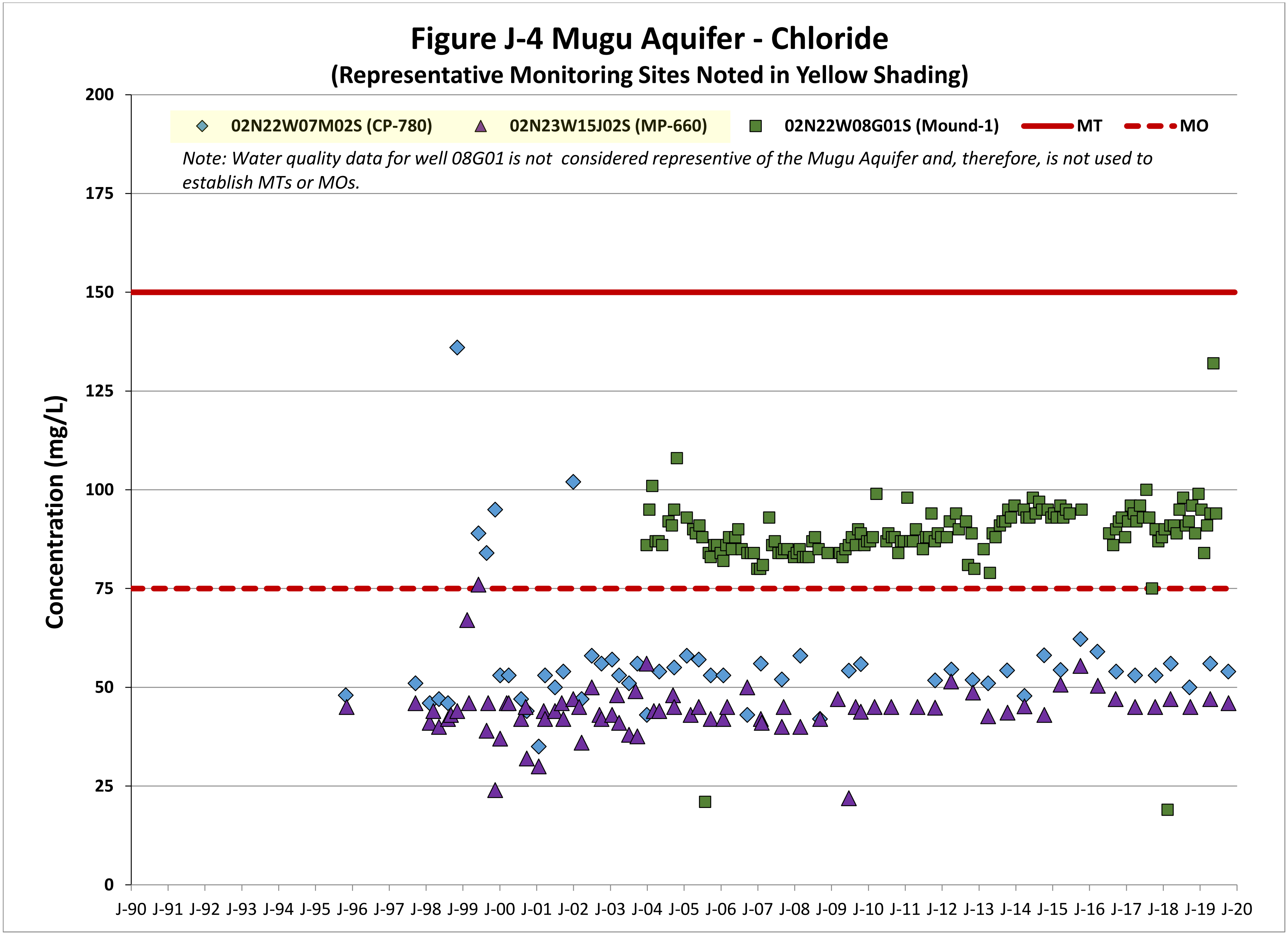

Figure J-4 Mugu Aquifer - Chloride
(Representative Monitoring Sites Noted in Yellow Shading)
02N22W07M02S (CP-780)
02N23W15J02S (MP-660)
02N22W08G01S (Mound-1)
MT
MO
Note: Water quality data for well 08G01 is not considered representative of the Mugu Aquifer and, therefore, is not used to establish MTs or MOs.
Concentration (mg/L)
0
25
50
75
100
125
150
175
200
J-90
J-91
J-92
J-93
J-94
J-95
J-96
J-97
J-98
J-99
J-00
J-01
J-02
J-03
J-04
J-05
J-06
J-07
J-08
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J-12
J-13
J-14
J-15
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J-17
J-18
J-19
J-20

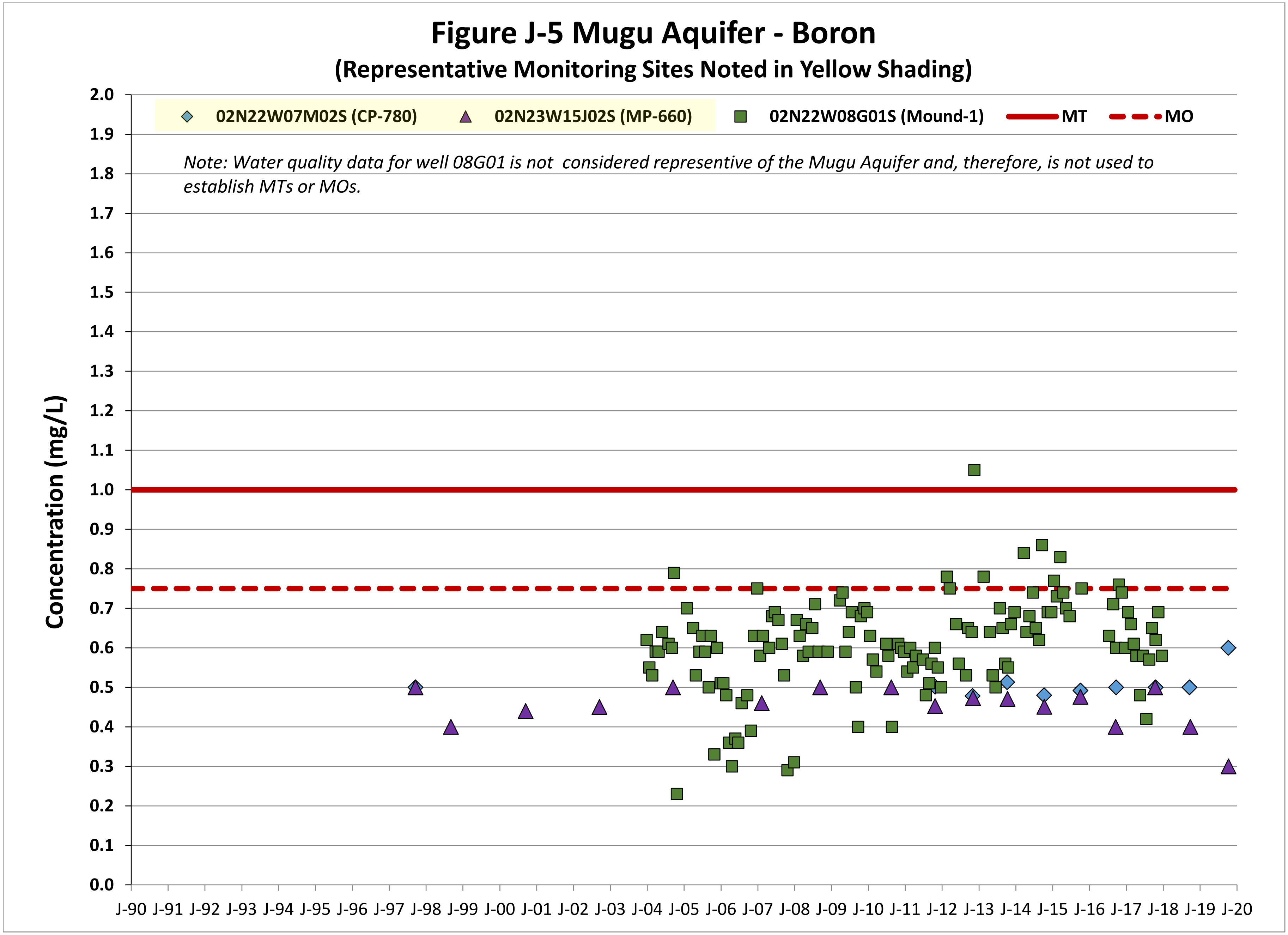


Figure J-5 Mugu Aquifer - Boron
(Representative Monitoring Sites Noted in Yellow Shading)
02N22W07M02S (CP-780)
02N23W15J02S (MP-660)
02N22W08G01S (Mound-1)
MT
MO
Note: Water quality data for well 08G01 is not considered representative of the Mugu Aquifer and, therefore, is not used to establish MTs or MOs.
Concentration (mg/L)
2.0
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
J-90 J-91 J-92 J-93 J-94 J-95 J-96 J-97 J-98 J-99 J-00 J-01 J-02 J-03 J-04 J-05 J-06 J-07 J-08 J-09 J-10 J-11 J-12 J-13 J-14 J-15 J-16 J-17 J-18 J-19 J-20

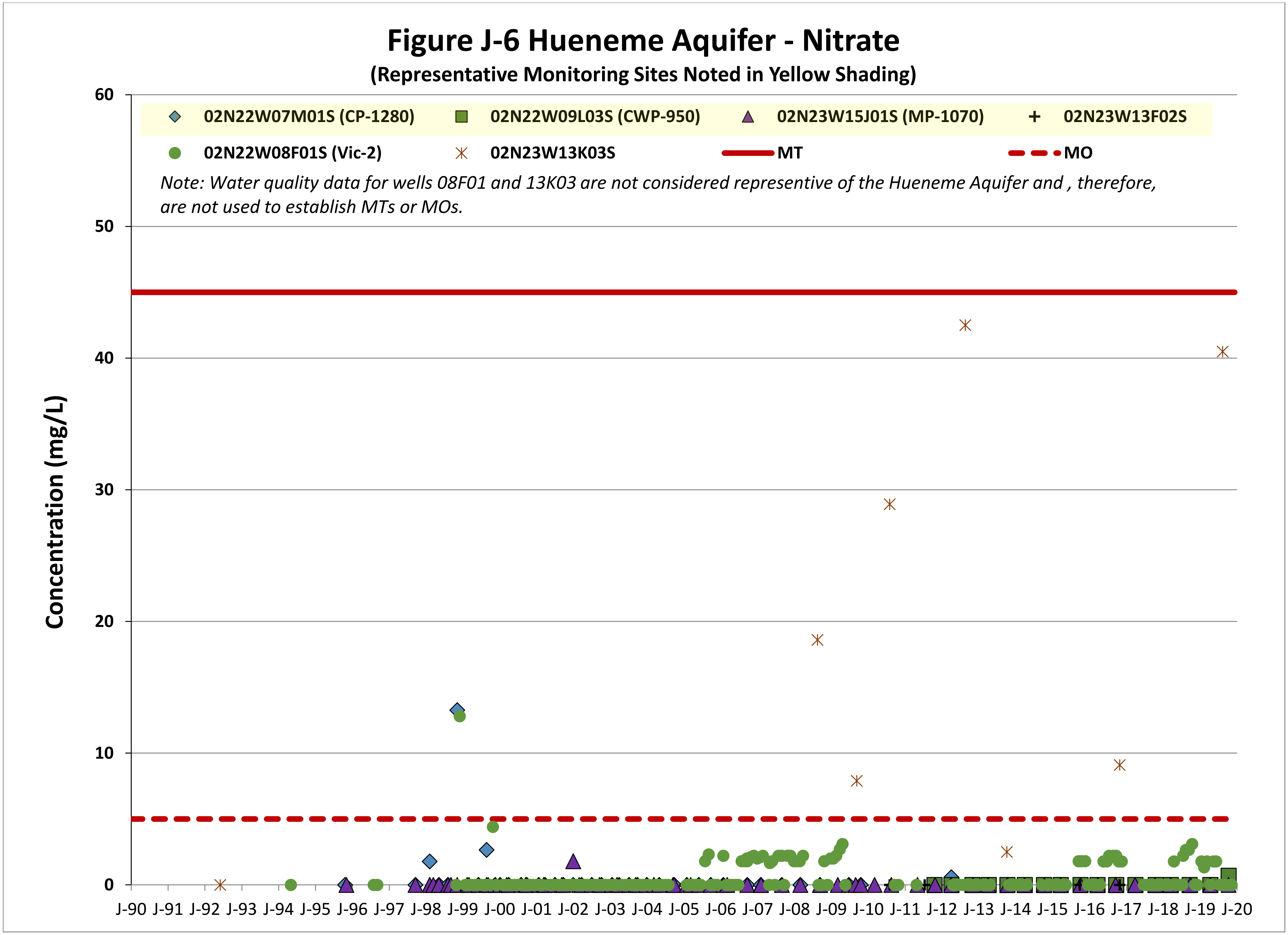


Figure J-6 Hueneme Aquifer - Nitrate
(Representative Monitoring Sites Noted in Yellow Shading)
02N22W07M01S (CP-1280)
02N22W09L03S (CWP-950)
02N23W15J01S (MP-1070)
02N23W13F02S
02N22W08F01S (Vic-2)
02N23W13K03S
MT
MO
Note: Water quality data for wells 08F01 and 13K03 are not considered representative of the Hueneme Aquifer and , therefore, are not used to establish MTs or MOs.
Concentration (mg/L)
0
10
20
30
40
50
60
J-90 J-91 J-92 J-93 J-94 J-95 J-96 J-97 J-98 J-99 J-00 J-01 J-02 J-03 J-04 J-05 J-06 J-07 J-08 J-09 J-10 J-11 J-12 J-13 J-14 J-15 J-16 J-17 J-18 J-19 J-20

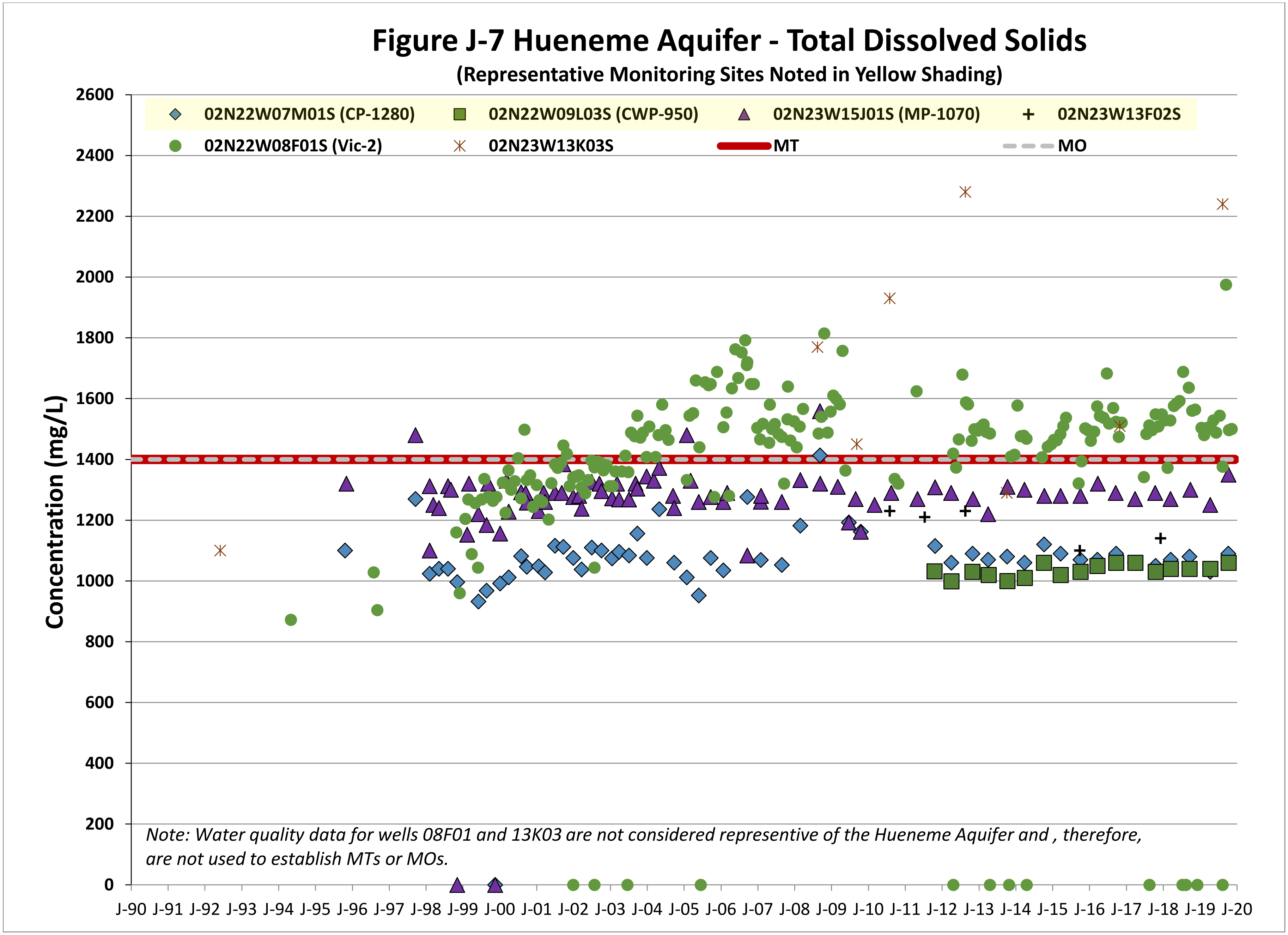


Figure J-7 Hueneme Aquifer - Total Dissolved Solids
(Representative Monitoring Sites Noted in Yellow Shading)
02N22W07M01S (CP-1280)
02N22W09L03S (CWP-950)
02N23W15J01S (MP-1070)
02N23W13F02S
02N22W08F01S (Vic-2)
02N23W13K03S
MT
MO
Concentration (mg/L)
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
J-90 J-91 J-92 J-93 J-94 J-95 J-96 J-97 J-98 J-99 J-00 J-01 J-02 J-03 J-04 J-05 J-06 J-07 J-08 J-09 J-10 J-11 J-12 J-13 J-14 J-15 J-16 J-17 J-18 J-19 J-20
Note: Water quality data for wells 08F01 and 13K03 are not considered representative of the Hueneme Aquifer and , therefore, are not used to establish MTs or MOs.

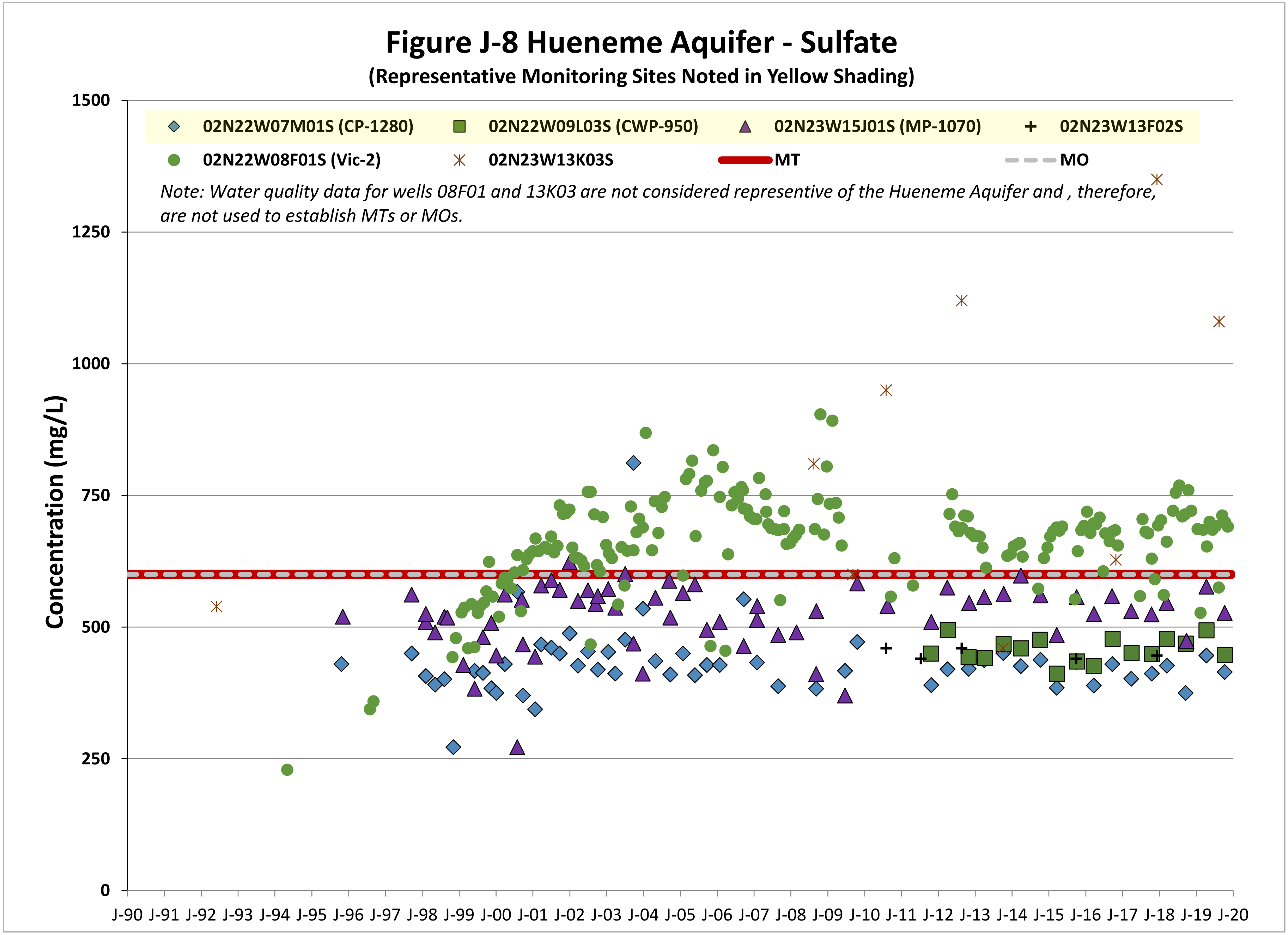
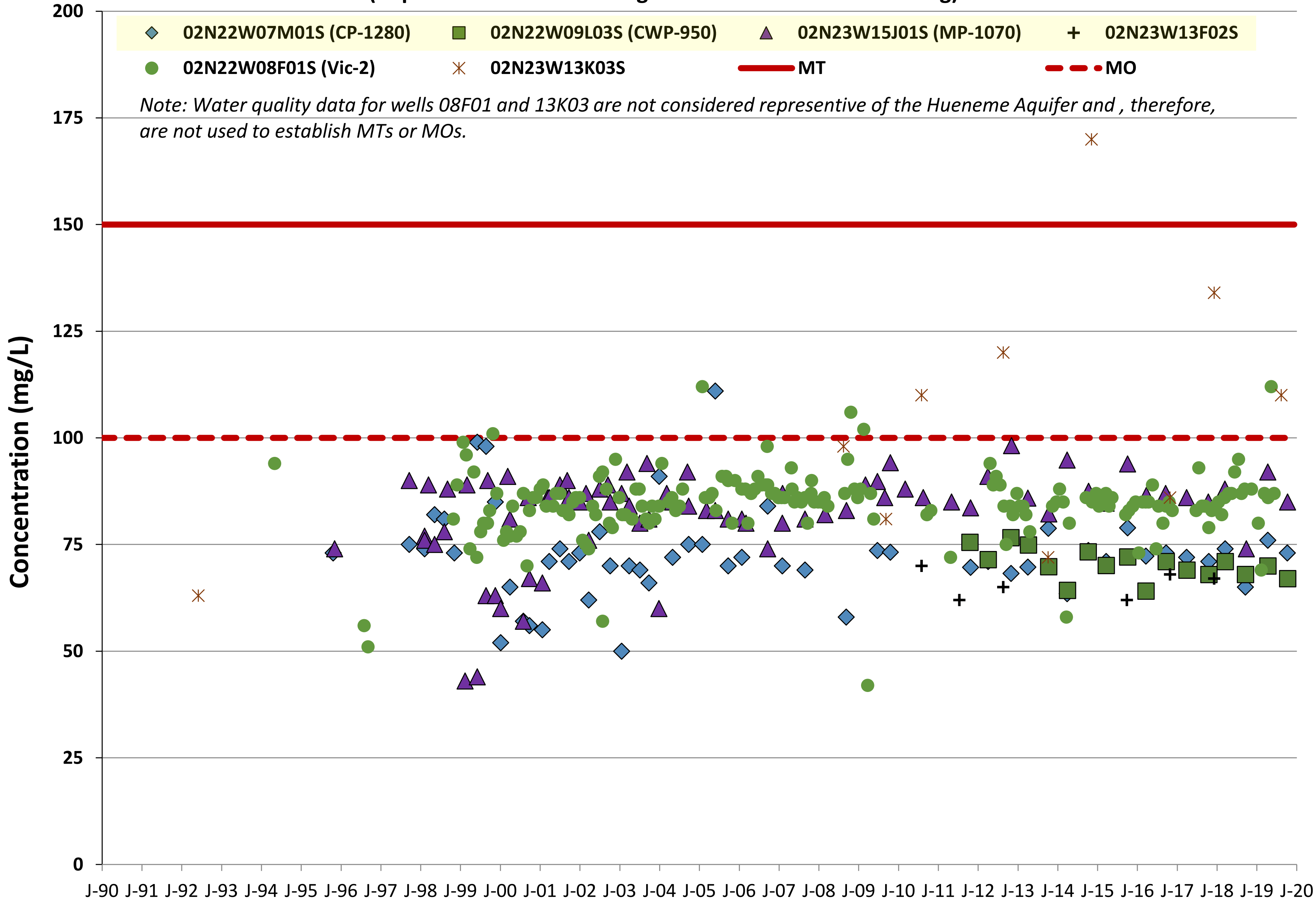


Figure J-8 Hueneme Aquifer - Sulfate
(Representative Monitoring Sites Noted in Yellow Shading)
02N22W07M01S (CP-1280)
02N22W09L03S (CWP-950)
02N23W15J01S (MP-1070)
02N23W13F02S
02N22W08F01S (Vic-2)
02N23W13K03S
MT
MO
Note: Water quality data for wells 08F01 and 13K03 are not considered representive of the Hueneme Aquifer and , therefore, are not used to establish MTs or MOs.
Concentration (mg/L)
1500
1250
1000
750
500
250
0
J-90 J-91 J-92 J-93 J-94 J-95 J-96 J-97 J-98 J-99 J-00 J-01 J-02 J-03 J-04 J-05 J-06 J-07 J-08 J-09 J-10 J-11 J-12 J-13 J-14 J-15 J-16 J-17 J-18 J-19 J-20

Figure J-9 Hueneme Aquifer - Chloride

(Representative Monitoring Sites Noted in Yellow Shading)



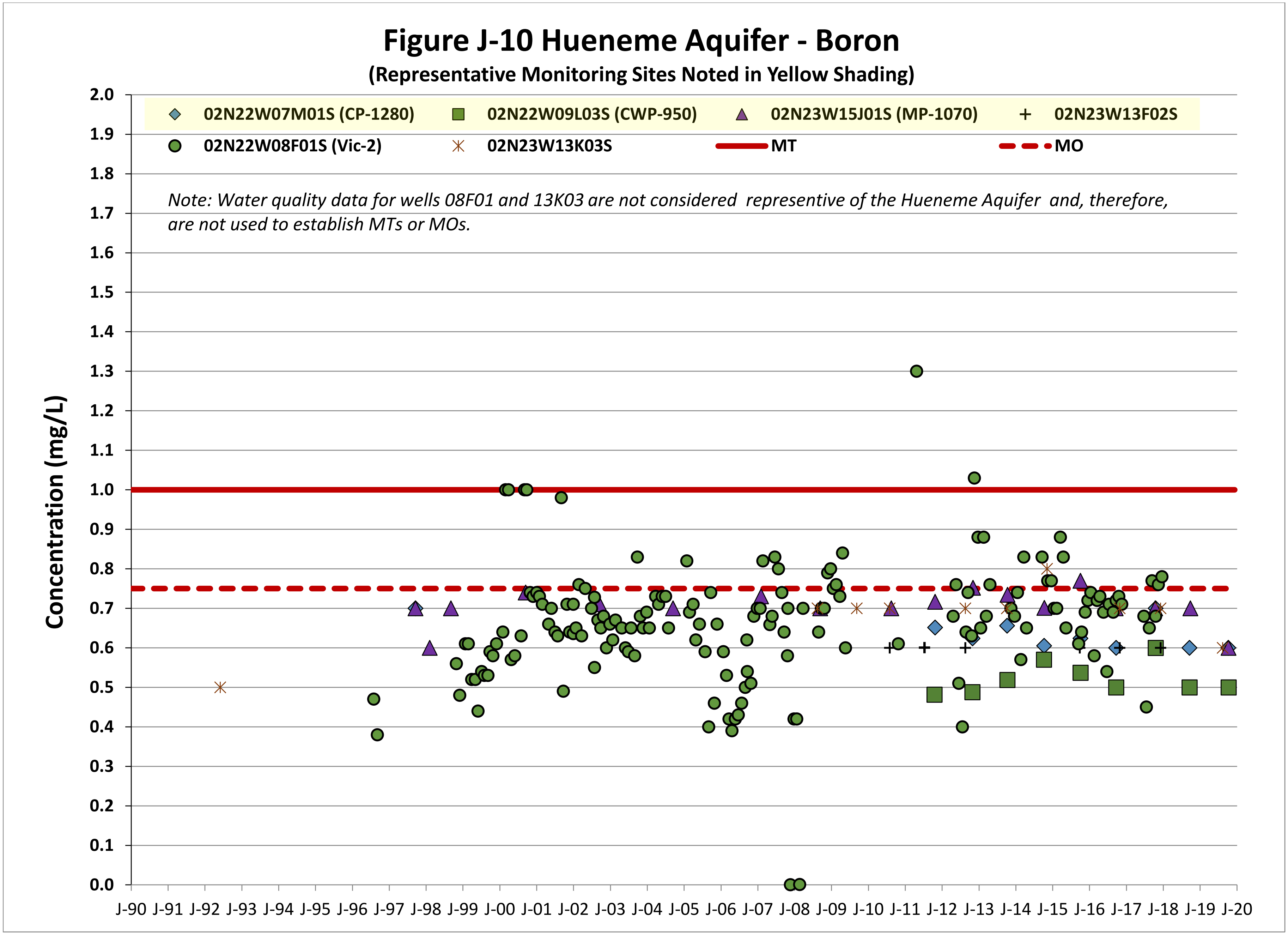


Figure J-10 Hueneme Aquifer - Boron
(Representative Monitoring Sites Noted in Yellow Shading)
02N22W07M01S (CP-1280)
02N22W09L03S (CWP-950)
02N23W15J01S (MP-1070)
02N23W13F02S
02N22W08F01S (Vic-2)
02N23W13K03S
MT
MO
Note: Water quality data for wells 08F01 and 13K03 are not considered representative of the Hueneme Aquifer and, therefore, are not used to establish MTs or MOs.
Concentration (mg/L)
2.0
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
J-90 J-91 J-92 J-93 J-94 J-95 J-96 J-97 J-98 J-99 J-00 J-01 J-02 J-03 J-04 J-05 J-06 J-07 J-08 J-09 J-10 J-11 J-12 J-13 J-14 J-15 J-16 J-17 J-18 J-19 J-20

Appendix K

Storage Curve Approach to Estimating Annual Change in Storage

Appendix K

Development of a "Storage Curve" to Estimate Annual Change in Groundwater in Storage In Mound Basin Using Groundwater Level Data

Introduction/Background

This appendix provides data and methodology used to develop a relationship between the historical changes in groundwater levels measured in the principal aquifers of Mound Basin and corresponding modeled changes in groundwater storage. This relationship will be used to calculate the annual storage changes in Mound Basin for the purpose of annual reporting required under the Sustainable Groundwater Management Act (SGMA) during years between future model updates by United (currently anticipated to occur approximately every 5 years).

SGMA Section 354.18(b)(4) states that "the water budget shall quantify the following, either through direct measurements or estimates based on data… the change in annual volume of groundwater in storage between seasonal high conditions." In Mound Basin, data presented in the Mound Basin Groundwater Sustainability Plan (GSP) indicate that spring is typically the season when aquifers in the region are in a positive water-balance condition (inflows exceed outflows) and groundwater levels (including potentiometric surfaces in confined aquifers) are at their highest. Changes in volume of groundwater in storage from one spring-high to the next can provide an indication of whether the aquifers have received sufficient recharge to recover from discharges during the preceding dry season (summer and fall), or whether a declining trend in storage is developing. Fall-low groundwater levels in Mound and adjacent basins can be strongly influenced by short-term, local factors such as timing of the first winter rainfall event and the presence or absence of Santa Ana winds in fall (which can result in a significant increase in demand for irrigation). Therefore, fall groundwater elevations provide a less reliable indicator of year-over-year changes in groundwater in storage compared to spring groundwater elevations.

Data Sources and Review

Groundwater elevation data available in the Mound Basin data management system were reviewed and selected for this analysis based on the following characteristics:

- Wells with a lengthy period of record (at least 20 years) of spring-high groundwater elevation measurements.
- The preferred timeframe for selection of spring-high groundwater elevations was the week of March 31 of each year. However, if no data were available that week, or if higher groundwater elevations occurred earlier or later in spring of that year, groundwater elevation data from other dates (up to several weeks earlier or later than the week of March 31) were selected to represent spring-high water levels.
- Only groundwater elevations from wells screened in principal aquifers in Mound Basin (Mugu and Hueneme Aquifers) were selected.
- Well locations had to be representative of areas of the basin where annual groundwater-level (and storage) changes were most significant, specifically along the central axis and southern portions of Mound Basin.

The clustered monitoring wells in Marina Park (02N23W15J01S and -J02S, screened in the Hueneme and Mugu aquifers, respectively) and Camino Real Park (02N22W07M01S and –M02S, also screened in the Hueneme and Mugu aquifers, respectively), together with agricultural supply well 02N22W20E01S (screened in the Hueneme Aquifer) met these criteria best. Locations of these wells are shown on Figure K-1. Spring-high groundwater elevations measured at these wells are summarized on Table K-1. The arithmetic mean (average) of the spring groundwater elevations at the five selected wells was calculated, and the change in average groundwater elevations from year to year was calculated (Table K-1). Note that years when data were not available for one or more of the selected wells, an average was not calculated. Furthermore, changes in groundwater elevation from the previous year could not be (and were not) calculated when no average was available for the prior year.

Past annual changes in groundwater in storage in Mound Basin were estimated by United's groundwater flow model, as described in Section 3.3 (water-budget analysis) of the Mound Basin GSP. However, rather than using model output to calculate water-year (October through September) changes in groundwater in storage in Mound Basin, as was conducted for the water-budget analysis presented in the GSP, model output for the end of March of each year was used to calculate changes in spring-high groundwater in storage.

Correlation Results and Development of Storage Curve

A scatterplot of annual spring-high changes in groundwater elevation versus annual changes in groundwater in storage in Mound Basin (from spring of the previous year to spring of the selected year) is shown on Figure K-2. The best-fit linear regression calculated for this relationship is:

Annual change in storage (acre-feet) = 706 (acre-feet/foot) x Annual change in average groundwater elevation (feet)

The coefficient of determination (R^2) for this relationship is 0.51.

The y-intercept in this regression was forced through the origin (the point on the graph representing zero change in groundwater elevation and zero change in storage). If this y-intercept had not been forced, the best-fit would have changed slightly to:

Annual change in storage (acre-feet) = 777 (acre-feet/foot) x Annual change in average groundwater elevation (feet) + 818 (acre-feet)

The coefficient of determination for this relationship is 0.53.

Although the equations and coefficients of determination are similar, conceptually it is logical to assume that in a year with no change in groundwater elevations in Mound Basin, the volume of groundwater in storage in the basin would not change. Therefore, the first linear regression above (with the y-intercept forced through the origin) is selected as representative of the relationship between changes in groundwater elevation and storage in the basin. In the near future, annual changes in spring-high storage in Mound Basin can be approximated using this relationship and groundwater elevation data collected from wells 02N23W15J01S, 02N23W15J02S, 02N22W07M01S, 02N22W07M02S, and 02N22W20E01S. As noted previously, changes in storage in the basin for the previous 5 years are expected to be computed via groundwater flow modeling at approximately 5-year intervals. When these model estimates are completed, the storage-curve can be modified if needed, and the modeled estimates of change in storage can be used to improve the storage-curve-based estimates of the previous 5 years.

MoundBasin

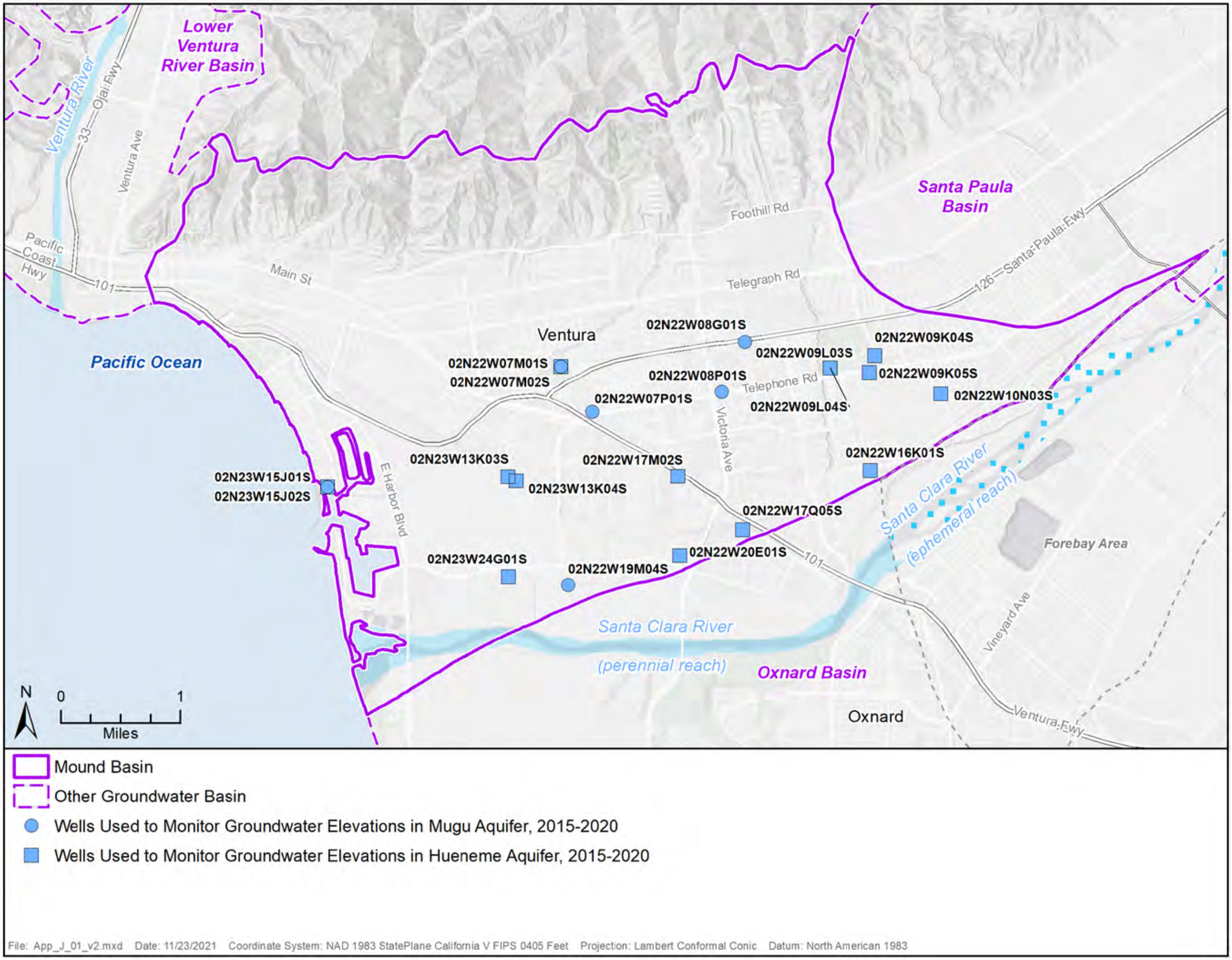


Figure K-01 Locations of Wells.

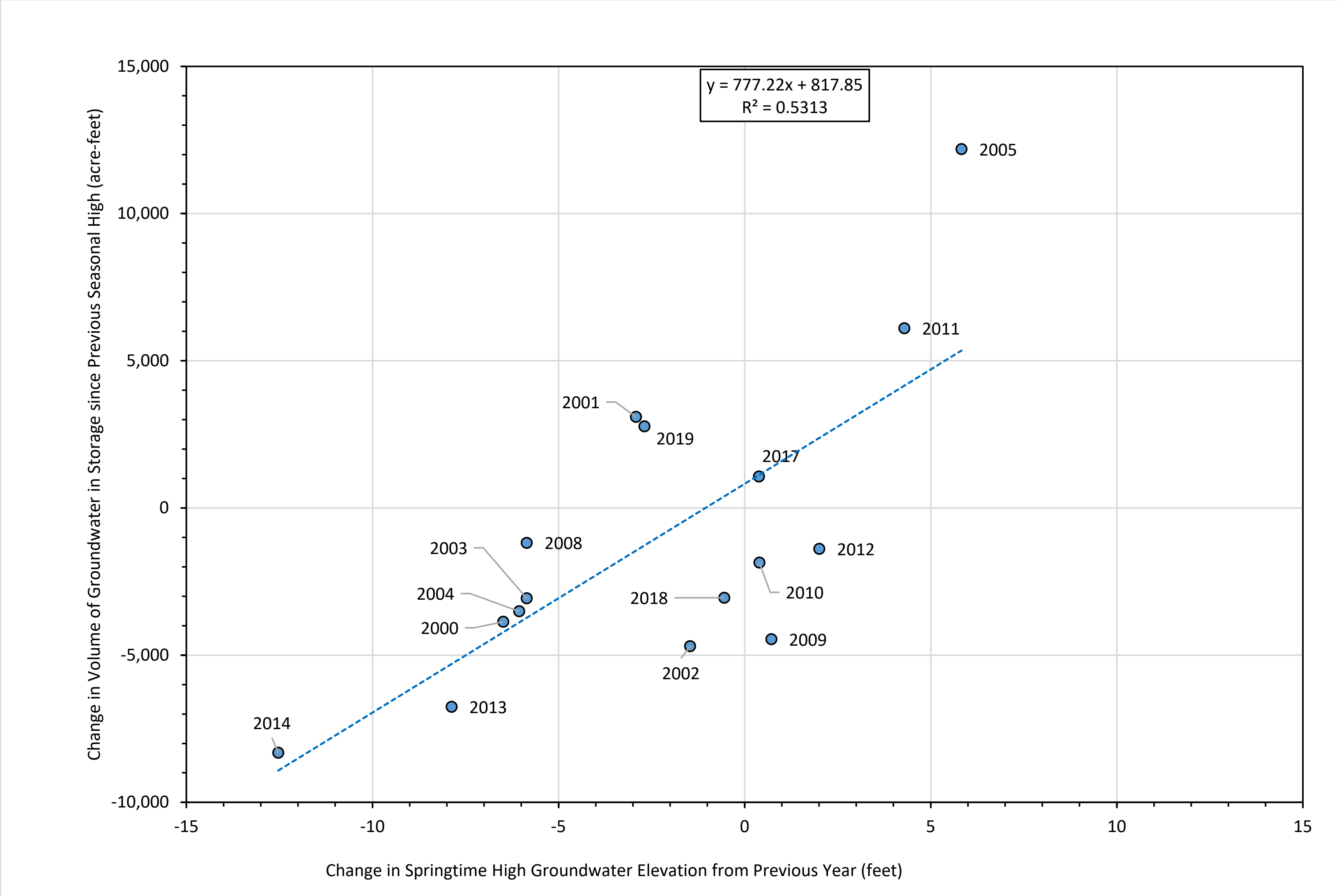


Figure K-02 Annual Spring-High Changes in Groundwater Elevation Versus Annual Changes In Groundwater In Storage In Mound Basin.

Table K-01 Groundwater Level Elevations Measured at Selected Wells and Modeled Changes in Groundwater in Storage in Mound Basin

Water Year	Average of Spring-High Groundwater Elevations Measured in Mugu and Hueneme Aquifers at Marina Park and Camino Real Park Clustered Monitoring Wells, and Supply Well 02N22W20E01S (feet, msl)	Change in Average of Spring-High Groundwater Elevations Measured in Mugu and Hueneme Aquifers at Marina Park and Camino Real Park Clustered Monitoring Wells, and Supply Well 02N22W20E01S (feet)	Change in Volume of Groundwater in Storage since Previous Seasonal High (acre-feet)	Well Identifier	Date Ground-water Level Measured	Ground-water Level (feet, msl)	Well Identifier	Date Ground-water Level Measured	Ground-water Level (feet, msl)	Well Identifier	Date Ground-water Level Measured	Ground-water Level (feet, msl)	Well Identifier	Date Ground-water Level Measured	Ground-water Level (feet, msl)	Well Identifier	Date Ground-water Level Measured	Ground-water Level (feet, msl)
1996			641	02N22W07M01S	4/15/1996	19.96	02N22W07M02S	4/15/1996	29.66	02N23W15J01S	4/15/1996	11.73	02N23W15J02S	4/15/1996	15.93			
1997			-96	02N22W07M01S	2/14/1997	21.06	02N22W07M02S	2/14/1997	30.06	02N23W15J01S	4/10/1997	7.53						
1998			8,253	02N22W07M01S	4/9/1998	29.36	02N22W07M02S	4/9/1998	37.46	02N23W15J01S	3/19/1998	13.95	02N23W15J02S	3/19/1998	23.19			
1999	27.05		-1,834	02N22W07M01S	3/31/1999	20.36	02N22W07M02S	3/31/1999	32.76	02N23W15J01S	3/30/1999	18.07	02N23W15J02S	3/30/1999	22.54	02N22W20E01S	3/18/1999	41.55
2000	20.57	-6.48	-3,869	02N22W07M01S	4/7/2000	12.46	02N22W07M02S	4/7/2000	24.86	02N23W15J01S	3/16/2000	13.41	02N23W15J02S	3/16/2000	21.03	02N22W20E01S	3/2/2000	31.09
2001	17.65	-2.92	3,094	02N22W07M01S	3/28/2001	7.06	02N22W07M02S	3/28/2001	20.76	02N23W15J01S	3/19/2001	10.76	02N23W15J02S	3/19/2001	15.60	02N22W20E01S	3/28/2001	34.07
2002	16.19	-1.46	-4,697	02N22W07M01S	3/29/2002	3.21	02N22W07M02S	3/29/2002	19.38	02N23W15J01S	3/7/2002	6.38	02N23W15J02S	3/7/2002	15.82	02N22W20E01S	2/25/2002	36.15
2003	10.33	-5.85	-3,071	02N22W07M01S	4/4/2003	2.26	02N22W07M02S	4/4/2003	16.86	02N23W15J01S	3/17/2003	5.26	02N23W15J02S	3/17/2003	12.24	02N22W20E01S	2/27/2003	15.05
2004	4.28	-6.05	-3,514	02N22W07M01S	2/4/2004	0.54	02N22W07M02S	2/6/2004	-1.24	02N23W15J01S	3/18/2004	3.17	02N23W15J02S	3/18/2004	3.78	02N22W20E01S	4/20/2004	15.15
2005	10.11	5.83	12,191	02N22W07M01S	2/7/2005	8.96	02N22W07M02S	4/7/2005	10.06	02N23W15J01S	3/1/2005	5.85	02N23W15J02S	3/18/2005	6.92	02N22W20E01S	3/9/2005	18.75
2006			-1,345	02N22W07M01S	4/13/2006	13.26	02N22W07M02S	4/13/2006	21.96	02N23W15J01S	3/15/2006	9.73	02N23W15J02S	3/15/2006	14.93			
2007	17.12		-4,908	02N22W07M01S	4/4/2007	13.16	02N22W07M02S	4/4/2007	26.06	02N23W15J01S	3/6/2007	8.65	02N23W15J02S	4/4/2007	12.63	02N22W20E01S	4/4/2007	25.11
2008	11.27	-5.85	-1,184	02N22W07M01S	2/6/2008	11.30	02N22W07M02S	4/2/2008	9.56	02N23W15J01S	3/31/2008	6.65	02N23W15J02S	3/31/2008	10.29	02N22W20E01S	4/8/2008	18.55
2009	11.99	0.72	-4,463	02N22W07M01S	3/31/2009	8.86	02N22W07M02S	3/31/2009	18.96	02N23W15J01S	3/17/2009	6.39	02N23W15J02S	3/17/2009	13.93	02N22W20E01S	2/26/2009	11.80
2010	12.39	0.40	-1,858	02N22W07M01S	4/6/2010	17.06	02N22W07M02S	2/8/2010	15.86	02N23W15J01S	3/1/2010	11.50	02N23W15J02S	3/1/2010	12.77	02N22W20E01S	4/12/2010	4.75
2011	16.68	4.29	6,103	02N22W07M01S	4/8/2011	18.68	02N22W07M02S	4/8/2011	15.77	02N23W15J01S	4/5/2011	12.77	02N23W15J02S	4/5/2011	13.35	02N22W20E01S	4/14/2011	22.84
2012	18.69	2.01	-1,389	02N22W07M01S	4/18/2012	24.88	02N22W07M02S	4/4/2012	17.68	02N23W15J01S	3/30/2012	15.20	02N23W15J02S	3/30/2012	15.43	02N22W20E01S	4/4/2012	20.25
2013	10.82	-7.87	-6,760	02N22W07M01S	3/28/2013	10.34	02N22W07M02S	3/16/2013	19.14	02N23W15J01S	3/28/2013	9.89	02N23W15J02S	3/28/2013	11.27	02N22W20E01S	3/27/2013	3.45
2014	-1.71	-12.53	-8,316	02N22W07M01S	3/24/2014	3.14	02N22W07M02S	3/10/2014	6.88	02N23W15J01S	3/26/2014	0.67	02N23W15J02S	3/26/2014	1.85	02N22W20E01S	3/21/2014	-21.11
2015			-6,837	02N22W07M01S	3/18/2015	-2.63	02N22W07M02S	3/1/2015	-0.99	02N23W15J01S	3/2/2015	-2.07	02N23W15J02S	3/2/2015	-0.09			
2016	-9.37		-3,459	02N22W07M01S	3/24/2016	1.55	02N22W07M02S	3/14/2016	2.70	02N23W15J01S	4/4/2016	-2.46	02N23W15J02S	2/26/2016	0.33	02N22W20E01S	3/23/2016	-48.97
2017	-8.99	0.38	1,064	02N22W07M01S	3/21/2017	1.73	02N22W07M02S	3/21/2017	-3.98	02N23W15J01S	2/27/2017	-3.70	02N23W15J02S	2/27/2017	-1.73	02N22W20E01S	2/28/2017	-37.26
2018	-9.54	-0.55	-3,051	02N22W07M01S	3/15/2018	0.50	02N22W07M02S	3/27/2018	-0.34	02N23W15J01S	3/29/2018	-3.75	02N23W15J02S	3/15/2018	-2.92	02N22W20E01S	3/27/2018	-41.17
2019	-12.23	-2.69	2,775	02N22W07M01S	3/6/2019	-3.57	02N22W07M02S	3/25/2019	-8.05	02N23W15J01S	3/28/2019	-8.27	02N23W15J02S	3/6/2019	-7.18	02N22W20E01S	4/8/2019	-34.08
2020	-7.26	4.97		02N22W07M01S	3/12/2020	1.10	02N22W07M02SX	3/12/2020	-7.85	02N23W15J01S	3/26/2020	-2.49	02N23W15J02S	3/12/2020	-4.99	02N22W20E01S	3/11/2020	-22.07
2021	-6.19	1.07		02N22W07M01S	1/21/2021	3.96	02N22W07M02S	3/17/2021	-7.46	02N23W15J01S	3/17/2021	-2.83	02N23W15J02S	3/17/2021	-3.58	02N22W20E01S	3/16/2021	-21.06

Notes: Blank entries represent years when no data are available or average groundwater elevations could not be calculated
feet, msl = feet above (or below, if negative) mean sea level

Appendix L

Data Management System Information

Overview

This data management system (DMS) was developed for the purpose of "storing and reporting information relevant to the development or implementation of the Plan and monitoring of the basin", per section 352.6 of the GSP regulations. The DMS was developed for use by the Mound Basin Groundwater Sustainability Agency (MBGSA).

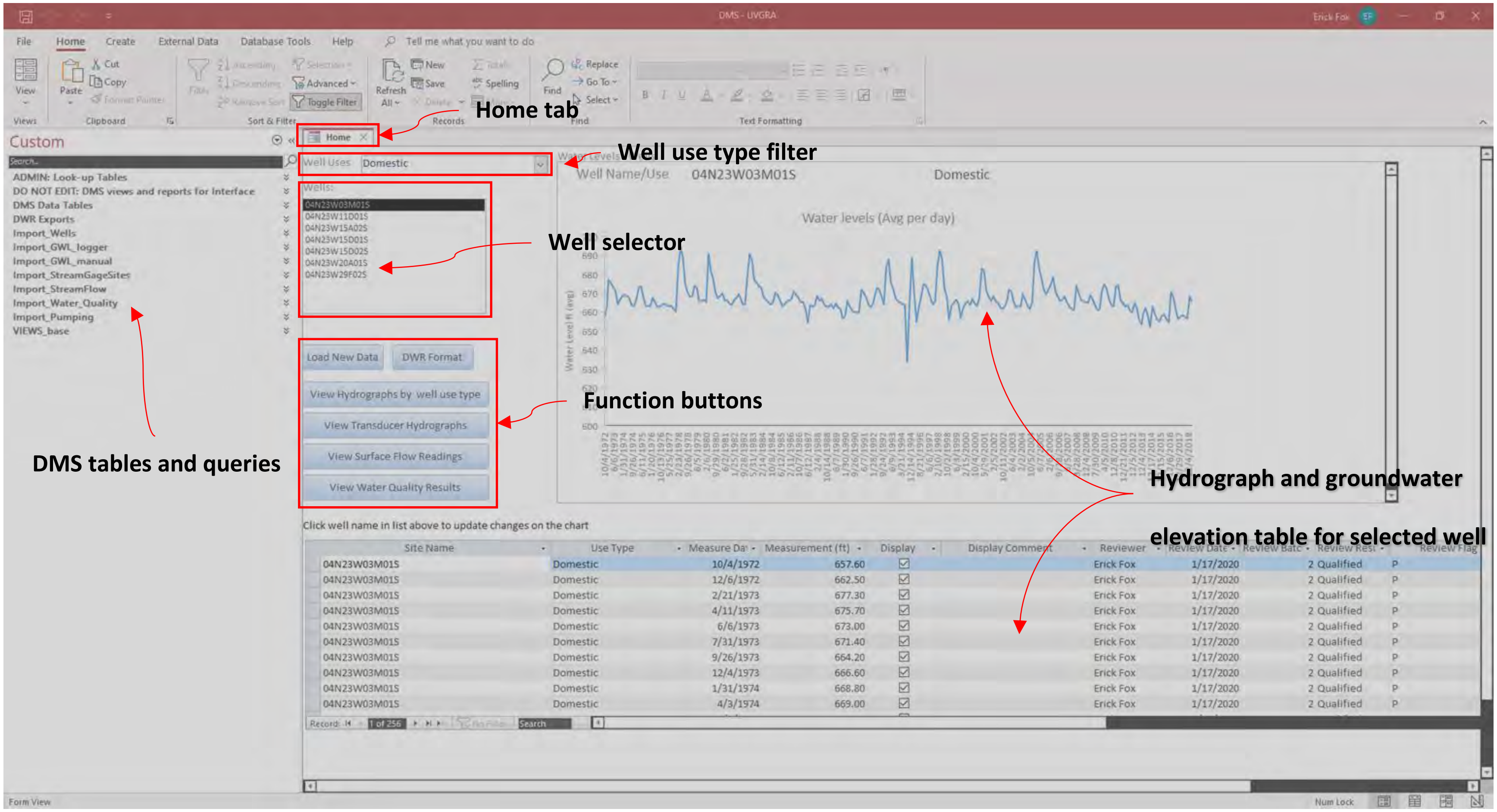
The DMS is housed in an Access database, which has the ability to import data from Excel, perform filtering and charting for some data, and export to Excel tables that are formatted according to DWR templates for upload with the GSP. The data in the DMS have undergone quality control checks prior to import in line with the UVRGA Data Quality Control Review Procedures document, adopted by the UVRGA board on September 13, 2018.

The DMS is designed to contain the following data:

- Well construction details
- Groundwater level elevations (manual measurements and logger data)
- Water quality
- Pumping
- Stream gages
- Streamflow data

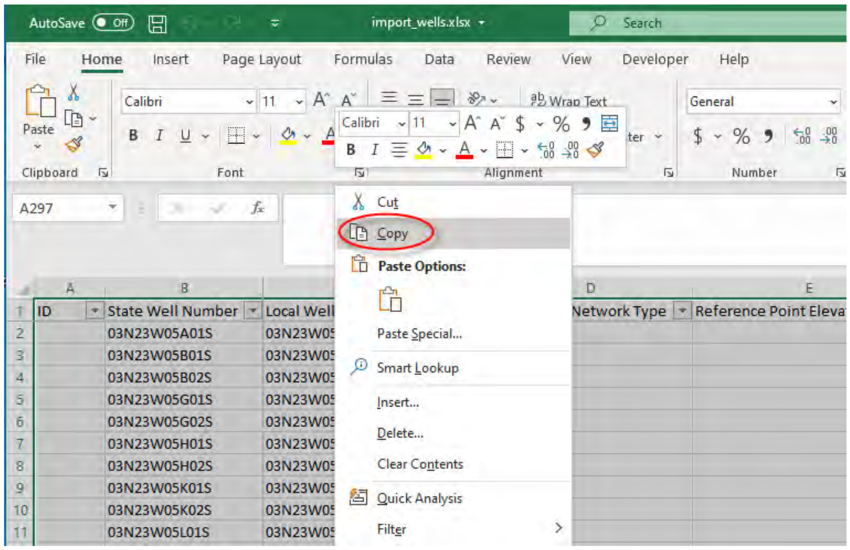
In addition to the data tables that hold the above information, the DMS also contains a number of tables and queries that are used for importing, data format verification, and other backend functions. See DMS Object Description (attached) for a description of these tables and queries. DMS Object Map (attached) shows how these tables and queries are used for the import and export functions.

The default starting view shows the Home tab that contains a dropdown list of wells filtered by use type, a hydrograph and groundwater elevation data table for the selected well, and several buttons that can be used to access certain functions of the DMS—see screenshot next page. (If the Home tab is not visible, expand the DMS views and reports for Interface group in the table of contents on the left hand side of the screen, and open chart_WaterLevels_wells.)

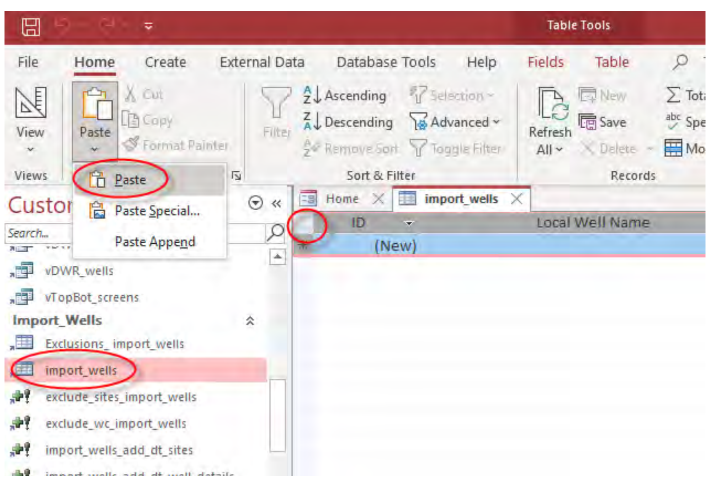

Home tab
Well use type filter
Well selector
Function buttons
DMS tables and queries
Hydrograph and groundwater
elevation table for selected well
Load New Data
DWR Format
View Hydrographs by well use type
View Transducer Hydrographs
View Surface Flow Readings
View Water Quality Results
Click well name in list above to update changes on the chart

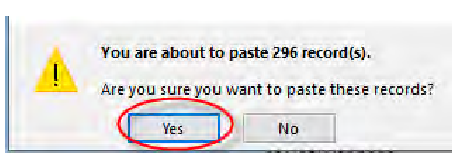
Importing Well Site Details

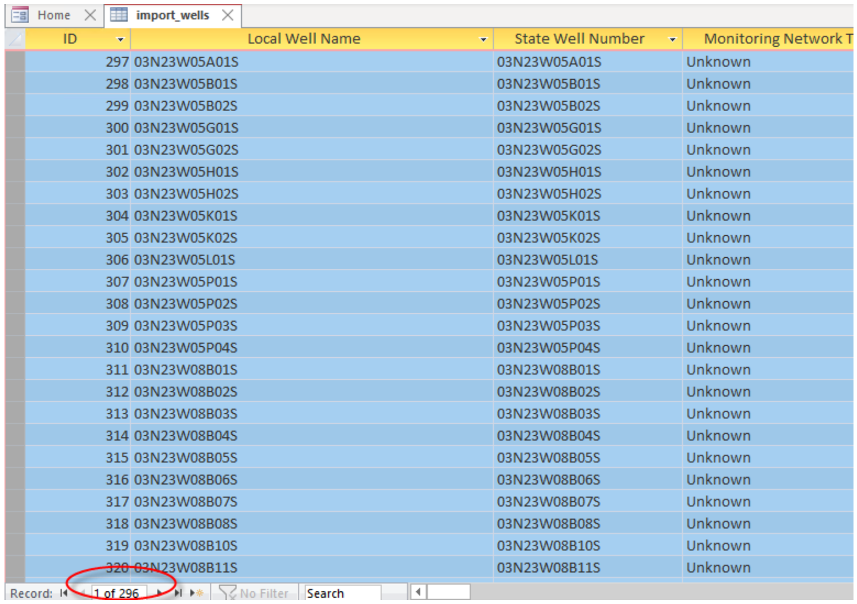
1. Format the data in Excel according to the “import_wells.xlsx” file. Select and copy the data to be imported to DMS (including column headers).



2. Import to DMS by opening the “import_wells” table in Access, clicking the top left corner of the table, and pasting the copied data from Step 1. Click “Yes” to confirm. After pasting the data, verify that the number of records in the “import_wells” table is equal to the number of rows copied from Excel.

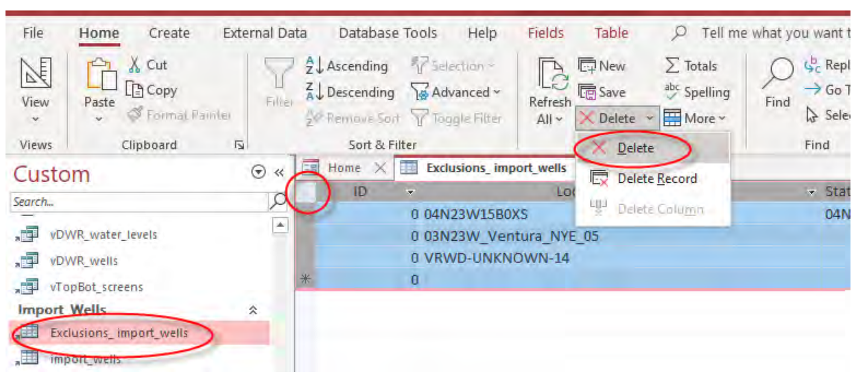




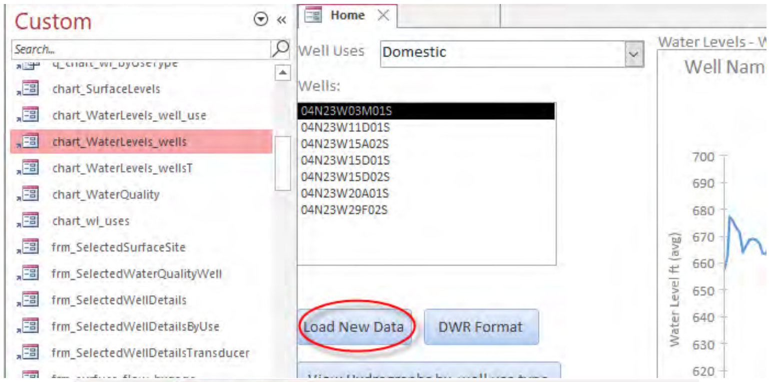


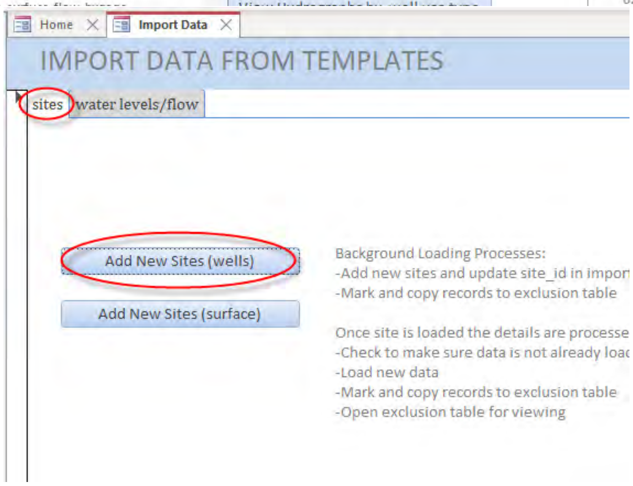
ID	Local Well Name	State Well Number	Monitoring Network T
297	03N23W05A01S	03N23W05A01S	Unknown
298	03N23W05B01S	03N23W05B01S	Unknown
299	03N23W05B02S	03N23W05B02S	Unknown
300	03N23W05G01S	03N23W05G01S	Unknown
301	03N23W05G02S	03N23W05G02S	Unknown
302	03N23W05H01S	03N23W05H01S	Unknown
303	03N23W05H02S	03N23W05H02S	Unknown
304	03N23W05K01S	03N23W05K01S	Unknown
305	03N23W05K02S	03N23W05K02S	Unknown
306	03N23W05L01S	03N23W05L01S	Unknown
307	03N23W05P01S	03N23W05P01S	Unknown
308	03N23W05P02S	03N23W05P02S	Unknown
309	03N23W05P03S	03N23W05P03S	Unknown
310	03N23W05P04S	03N23W05P04S	Unknown
311	03N23W08B01S	03N23W08B01S	Unknown
312	03N23W08B02S	03N23W08B02S	Unknown
313	03N23W08B03S	03N23W08B03S	Unknown
314	03N23W08B04S	03N23W08B04S	Unknown
315	03N23W08B05S	03N23W08B05S	Unknown
316	03N23W08B06S	03N23W08B06S	Unknown
317	03N23W08B07S	03N23W08B07S	Unknown
318	03N23W08B08S	03N23W08B08S	Unknown
319	03N23W08B10S	03N23W08B10S	Unknown
320	03N23W08B11S	03N23W08B11S	Unknown

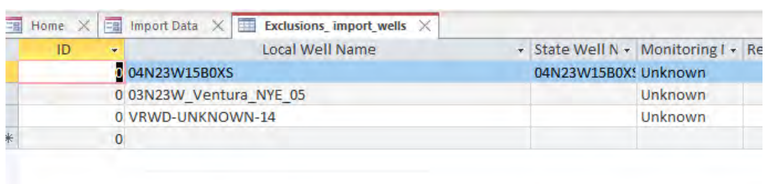
3. Open the "Exclusions_import_wells" table. If the table is not empty, then delete all records in it. After making sure that it is empty, close the table.



4. Open the "chart_WaterLevels_wells" form, i.e. the Home tab (if not already open). Click the "Load New Data" button and then the "Add New Sites (wells)" button under the "Sites" tab. This adds the new acceptable data from the "import_wells" table to the master "dt_sites" and "dt_well_details" tables and opens the "Exclusions_import_wells" table to show which new data were not added to the master tables due to missing information.





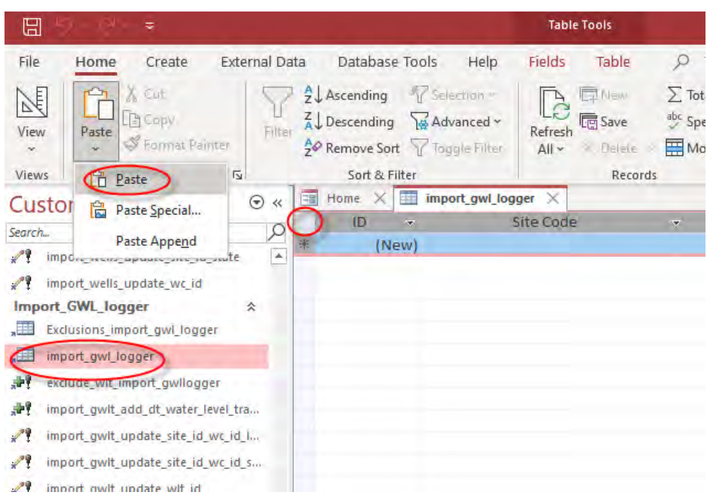


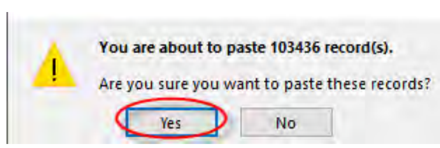
5. For the new data that were not added to the master "dt_sites" and "dt_well_details" tables (i.e., records showing up in the "Exclusions_import_wells" table), go back to the Excel template in Step 1, add the missing details (e.g., latitude, longitude, coordinates method, coordinates accuracy, and county), and repeat Steps 1 – 4.

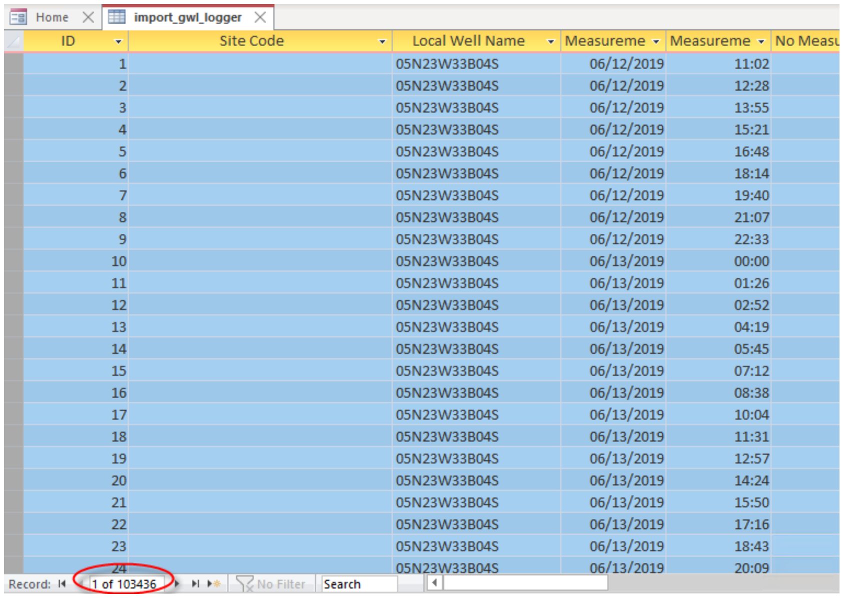
Importing Electronic Logger GWL Data

1. Format the data in Excel according to the "import_gwl_logger.xlsx" file. Make sure that the Measurement Date is in the correct format. Select and copy the data to be imported to DMS (including column headers).

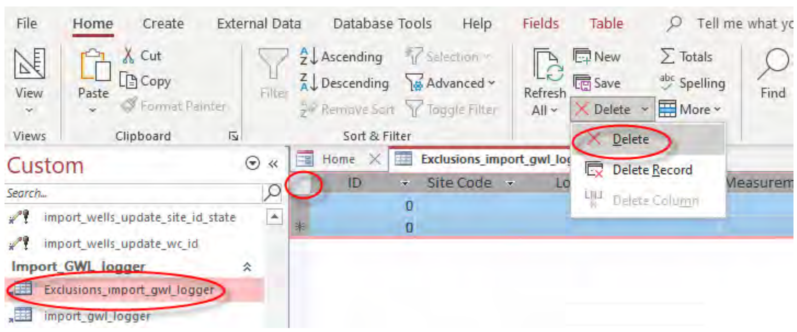
2. Import to DMS by opening the "import_gwl_logger" table in Access, clicking the top left corner of the table, and pasting the copied data from Step 1. This may take a few minutes if the number of records is large. Click "Yes" to confirm. After pasting the data, verify that the number of records in the "import_gwl_logger" table is equal to the number of rows copied from Excel.



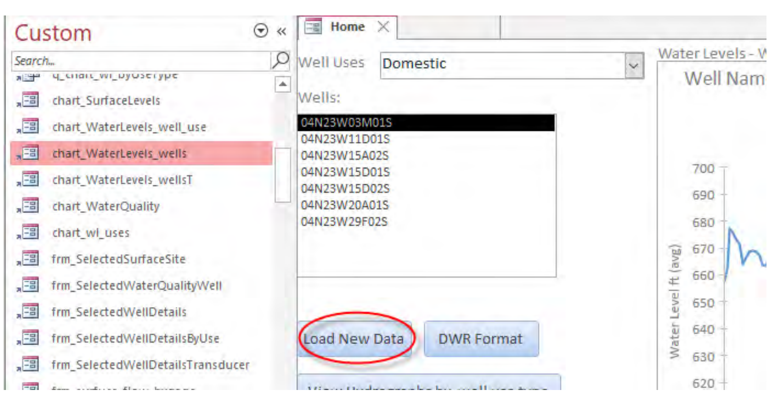


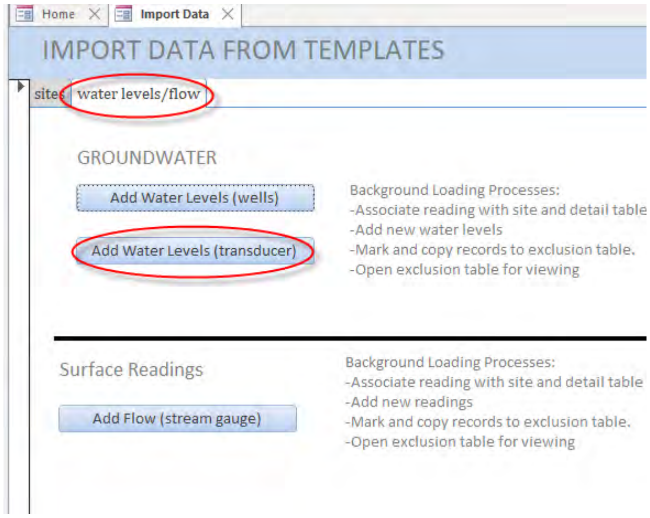


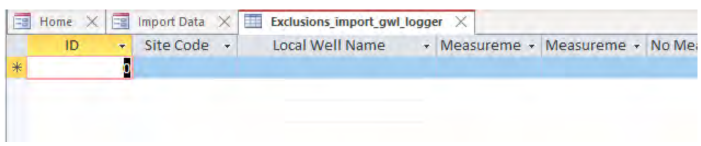
3. Open the "Exclusions_import_gwl_logger" table. If the table is not empty, then delete all records in it. After making sure that it is empty, close the table.



4. Open the "chart_WaterLevels_wells" form, i.e. the Home tab (if not already open). Click the "Load New Data" button and then the "Add Water Levels (transducer)" button under the "water levels/flow" tab. This adds the new acceptable data from the "import_gwl_logger" table to the master "dt_water_levels_transducer" table and opens the "Exclusions_import_gwl_logger" table to show which new data were not added to the master table due to missing information.







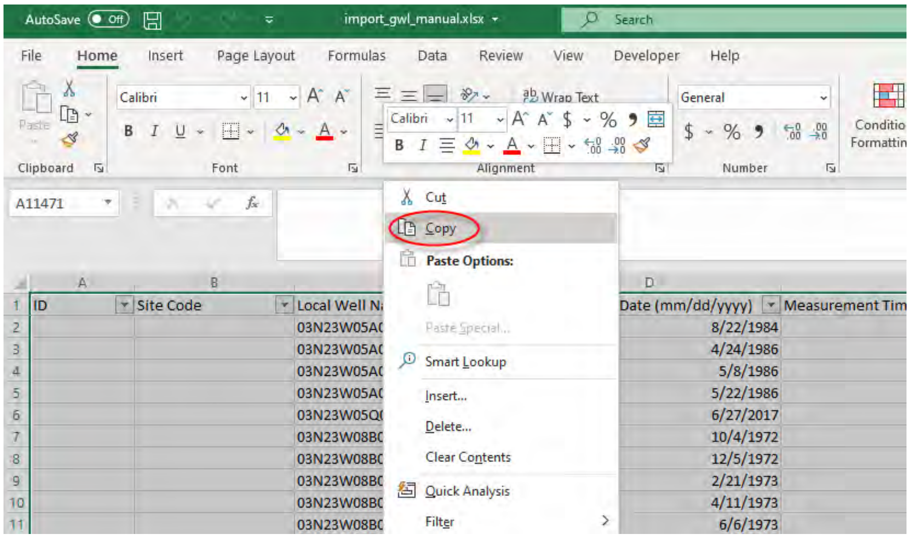
5. For the new data that were not added to the master "dt_water_levels_transducer" table (i.e., records showing up in the "Exclusions_import_gwl_logger" table), check the Site Code and Local Well Name and make sure that they exist in the "dt_sites" and "dt_well_details" tables.

   If the Site Code, Local Well Name, or any field in the GWL logger data needs to be corrected, then go back to the Excel template in Step 1, edit the information, and repeat Steps 1 – 4.

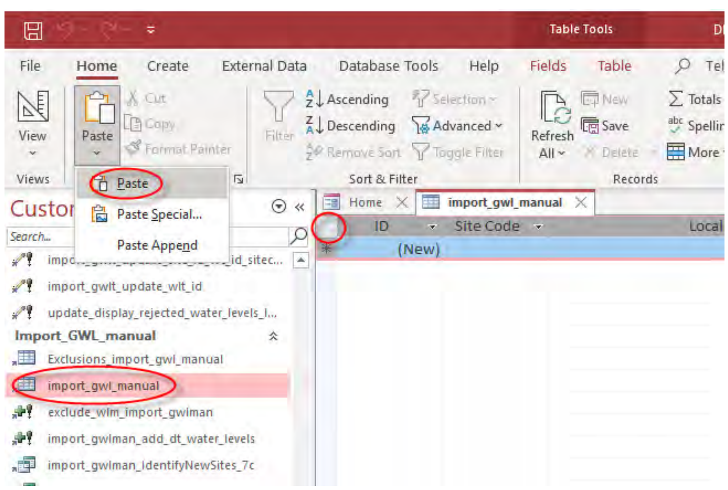
   If the well information does not exist in the "dt_sites" or "dt_well_details" table, then follow the steps for "Importing Well Data."

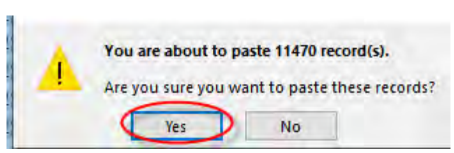
Importing Manual GWL Data

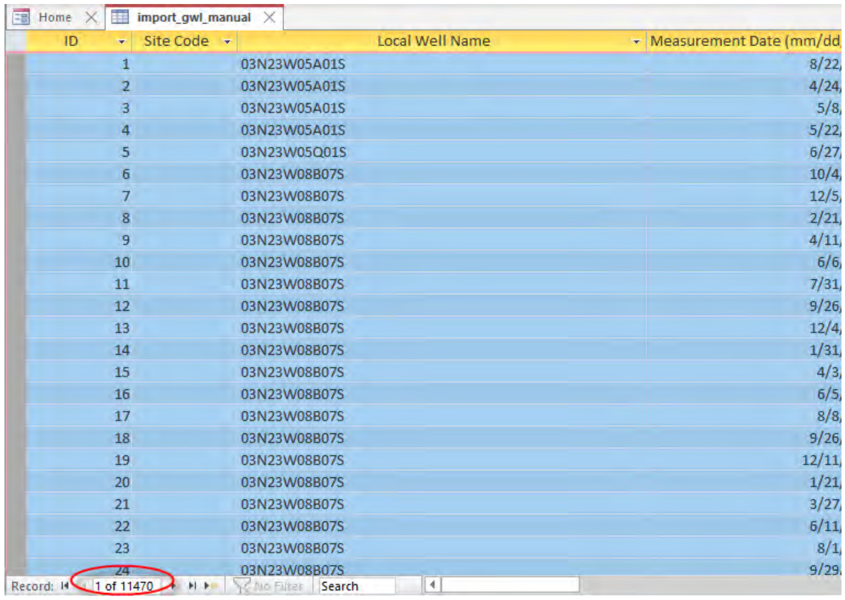
1. Format the data in Excel according to the "import_gwl_manual.xlsx" file. Make sure that the Measurement Date is in the correct format. Select and copy the data to be imported to DMS (including column headers).



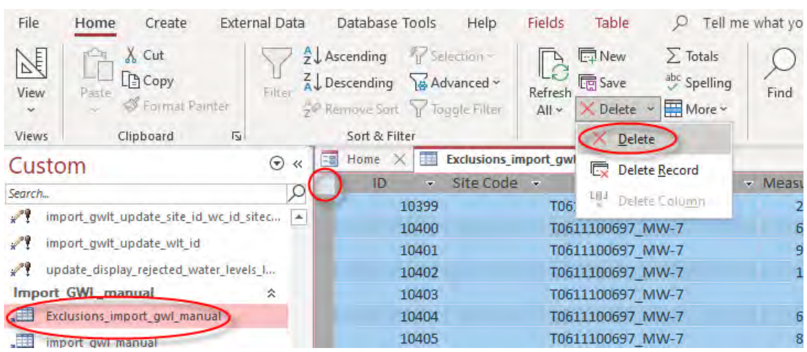
2. Import to DMS by opening the "import_gwl_manual" table in Access, clicking the top left corner of the table, and pasting the copied data from Step 1. This may take a few minutes if the number of records is large. Click "Yes" to confirm. After pasting the data, verify that the number of records in the "import_gwl_manual" table is equal to the number of rows copied from Excel.



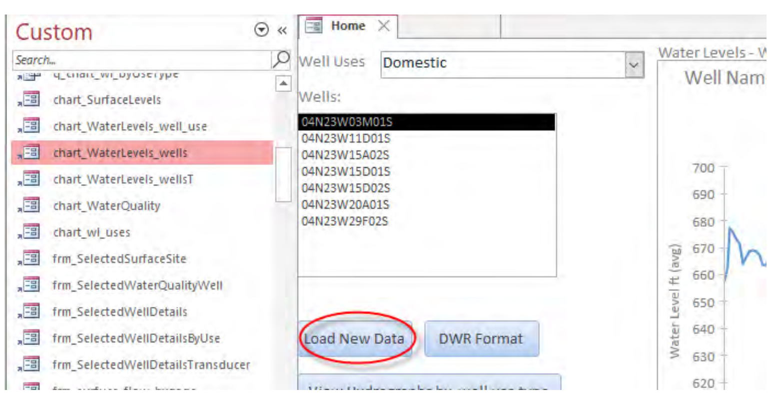


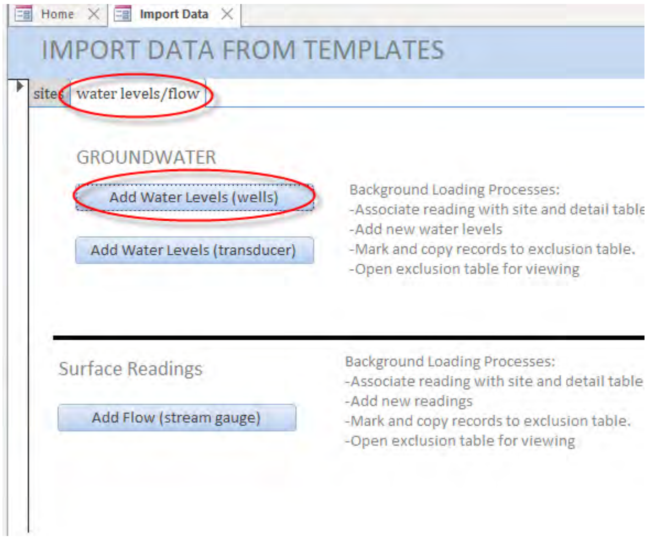


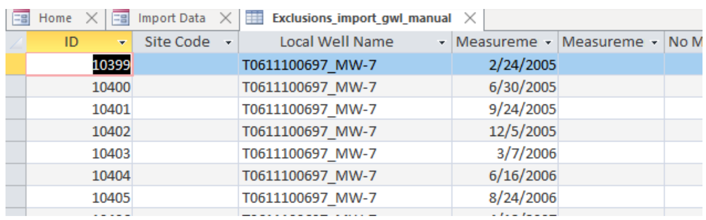
3. Open the “Exclusions_import_gwl_manual” table. If the table is not empty, then delete all records in it. After making sure that it is empty, close the table.



4. Open the “chart_WaterLevels_wells” form, i.e. the Home tab (if not already open). Click the “Load New Data” button and then the “Add Water Levels (wells)” button under the “water levels/flow” tab. This adds the new acceptable data from the “import_gwl_manual” table to the master “dt_water_levels” table and opens the “Exclusions_import_gwl_manual” table to show which new data were not added to the master table due to missing information.







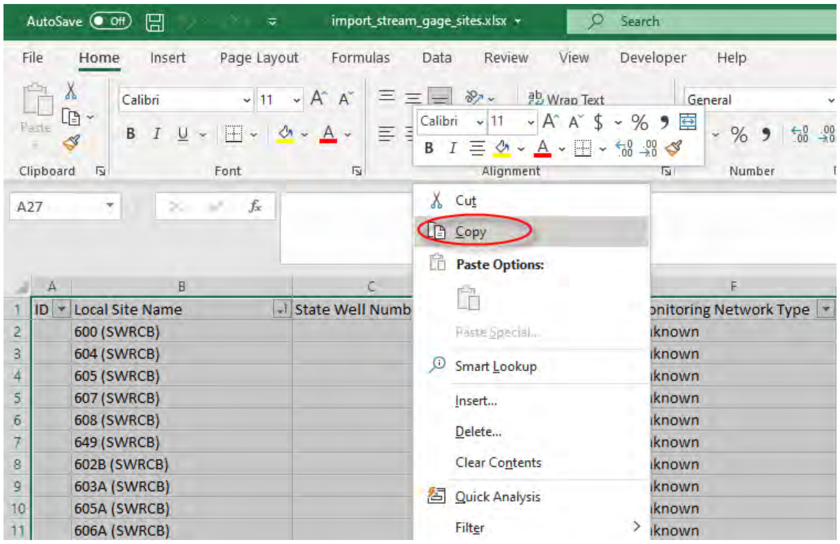
5. For the new data that were not added to the master “dt_water_levels” table (i.e., records showing up in the “Exclusions_import_gwl_manual” table), check the Local Well Name and make sure that it exists in the “dt_sites” and “dt_well_details” tables.

   If the Local Well Name or any field in the GWL manual data needs to be corrected, then go back to the Excel template in Step 1, edit the information, and repeat Steps 1 – 4.

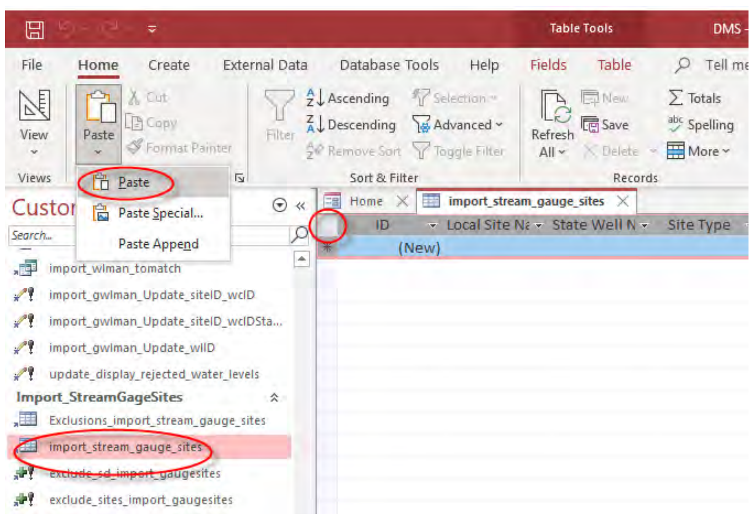
   If the well information does not exist in the “dt_sites” or “dt_well_details” table, then follow the steps for “Importing Well Data.”

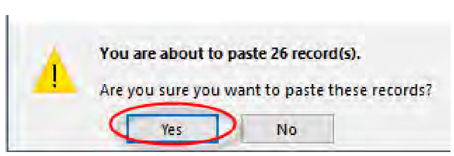
Importing Stream Gage Site Details

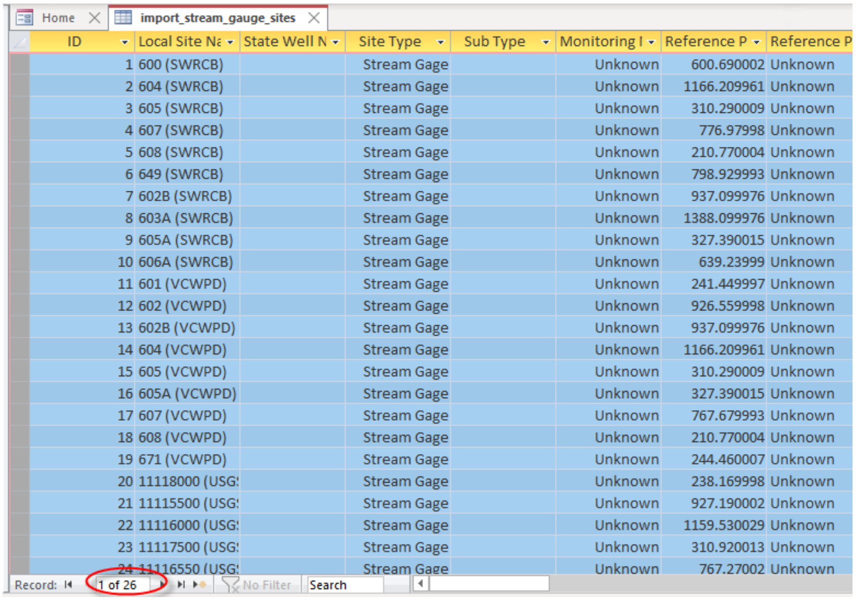
1. Format the data in Excel according to the "import_stream_gage_sites.xlsx" file. Select and copy the data to be imported to DMS (including column headers).



2. Import to DMS by opening the "import_stream_gauge_sites" table in Access, clicking the top left corner of the table, and pasting the copied data from Step 1. Click "Yes" to confirm. After pasting the data, verify that the number of records in the "import_stream_gauge_sites" table is equal to the number of rows copied from Excel.

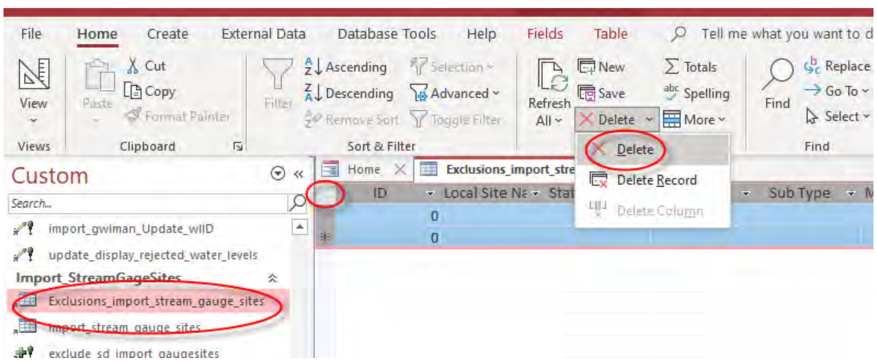




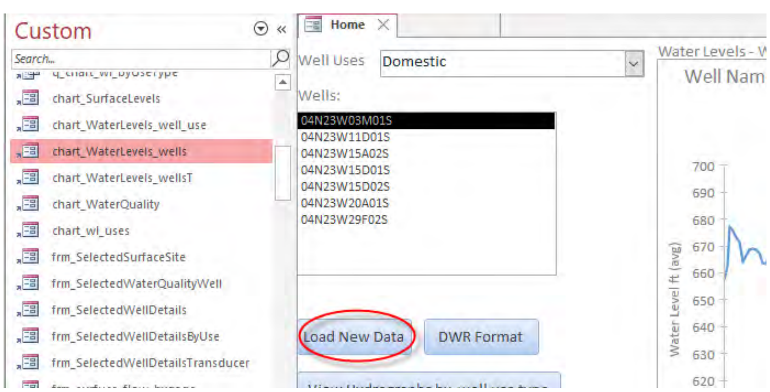


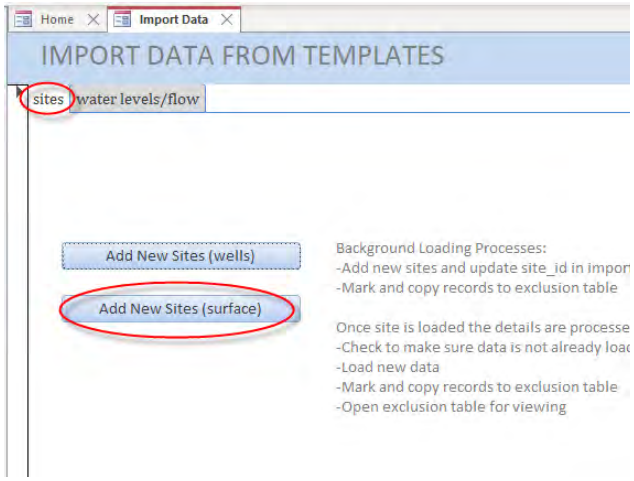
ID	Local Site Na	State Well N	Site Type	Sub Type	Monitoring I	Reference P	Reference P
1	600 (SWRCB)		Stream Gage		Unknown	600.690002	Unknown
2	604 (SWRCB)		Stream Gage		Unknown	1166.209961	Unknown
3	605 (SWRCB)		Stream Gage		Unknown	310.290009	Unknown
4	607 (SWRCB)		Stream Gage		Unknown	776.97998	Unknown
5	608 (SWRCB)		Stream Gage		Unknown	210.770004	Unknown
6	649 (SWRCB)		Stream Gage		Unknown	798.929993	Unknown
7	602B (SWRCB)		Stream Gage		Unknown	937.099976	Unknown
8	603A (SWRCB)		Stream Gage		Unknown	1388.099976	Unknown
9	605A (SWRCB)		Stream Gage		Unknown	327.390015	Unknown
10	606A (SWRCB)		Stream Gage		Unknown	639.23999	Unknown
11	601 (VCWPD)		Stream Gage		Unknown	241.449997	Unknown
12	602 (VCWPD)		Stream Gage		Unknown	926.559998	Unknown
13	602B (VCWPD)		Stream Gage		Unknown	937.099976	Unknown
14	604 (VCWPD)		Stream Gage		Unknown	1166.209961	Unknown
15	605 (VCWPD)		Stream Gage		Unknown	310.290009	Unknown
16	605A (VCWPD)		Stream Gage		Unknown	327.390015	Unknown
17	607 (VCWPD)		Stream Gage		Unknown	767.679993	Unknown
18	608 (VCWPD)		Stream Gage		Unknown	210.770004	Unknown
19	671 (VCWPD)		Stream Gage		Unknown	244.460007	Unknown
20	11118000 (USG:		Stream Gage		Unknown	238.169998	Unknown
21	11115500 (USG:		Stream Gage		Unknown	927.190002	Unknown
22	11116000 (USG:		Stream Gage		Unknown	1159.530029	Unknown
23	11117500 (USG:		Stream Gage		Unknown	310.920013	Unknown
24	11116550 (USG:		Stream Gage		Unknown	767.27002	Unknown

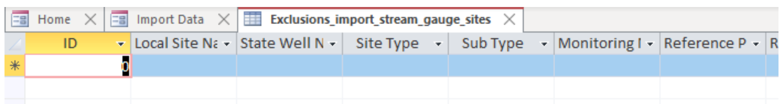
3. Open the “Exclusions_import_stream_gauge_sites” table. If the table is not empty, then delete all records in it. After making sure that it is empty, close the table.



4. Open the “chart_WaterLevels_wells” form, i.e. the Home tab (if not already open). Click the “Load New Data” button and then the “Add New Sites (surface)” button under the “Sites” tab. This adds the new acceptable data from the “import_stream_gauge_sites” table to the master “dt_sites” and “dt_site_details” tables and opens the “Exclusions_import_stream_gauge_sites” table to show which new data were not added to the master tables due to missing information.



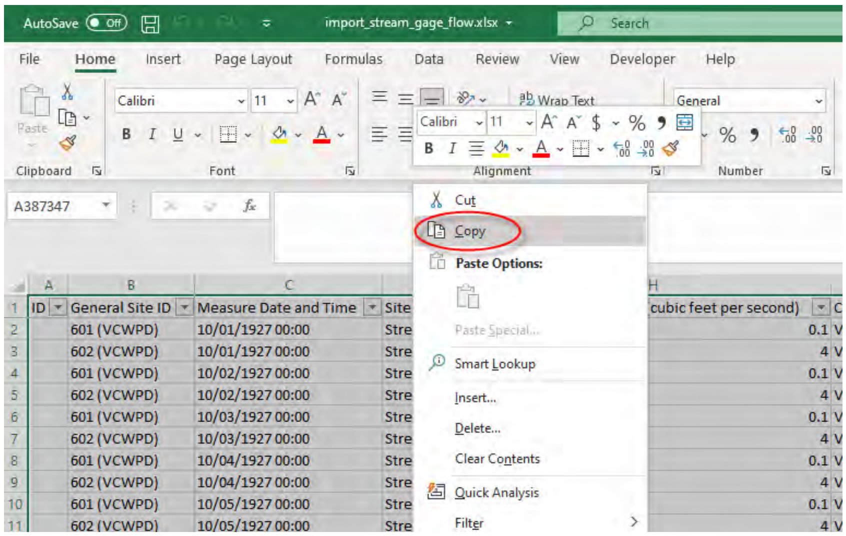




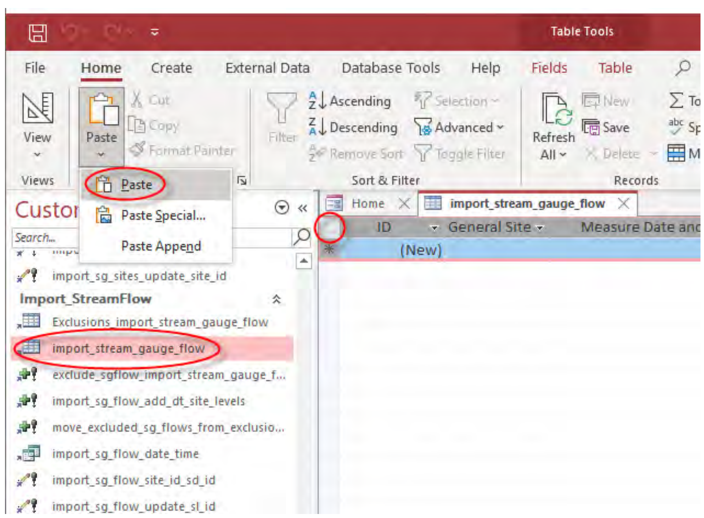
5. For the new data that were not added to the master “dt_sites” and “dt_site_details” tables (i.e., records showing up in the “Exclusions_import_stream_gauge_sites” table), go back to the Excel template in Step 1, add the missing details (e.g., latitude, longitude, coordinates method, coordinates accuracy, and county), and repeat Steps 1 – 4.

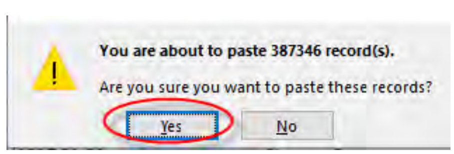
Importing Streamflow Data

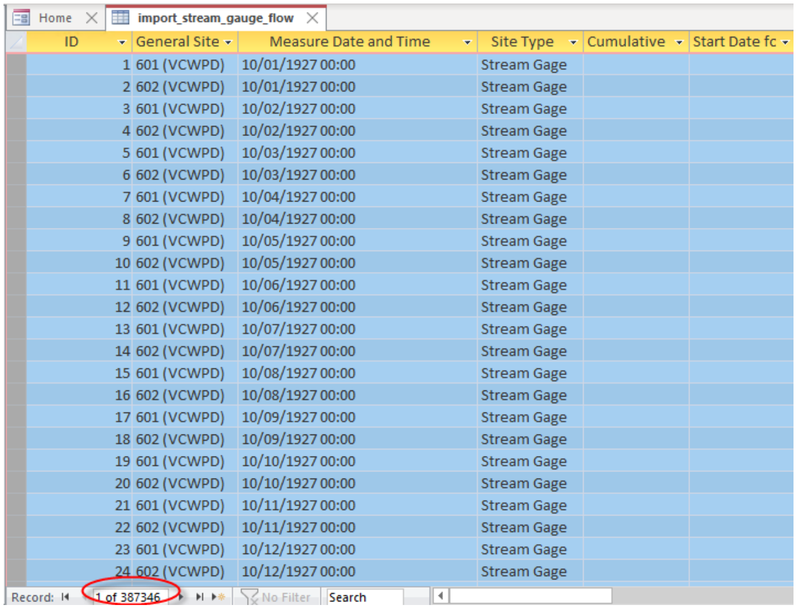
1. Format the data in Excel according to the "import_stream_gage_flow.xlsx" file. Make sure that the Measure Date and Time is in the correct format and that the Surface Water Discharge (cubic feet per second) is not missing. Select and copy the data to be imported to DMS (including column headers).



2. Import to DMS by opening the "import_stream_gauge_flow" table in Access, clicking the top left corner of the table, and pasting the copied data from Step 1. This may take a few minutes if the number of records is large. Click "Yes" to confirm. After pasting the data, verify that the number of records in the "import_stream_gauge_flow" table is equal to the number of rows copied from Excel.

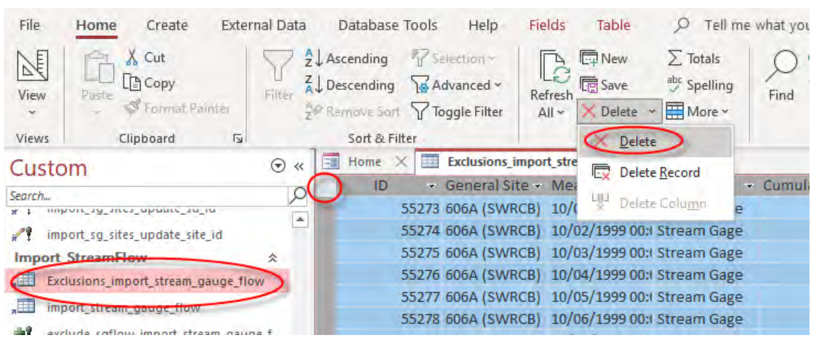




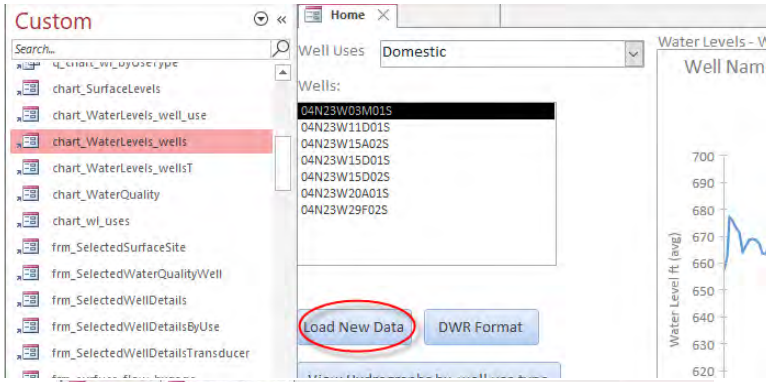


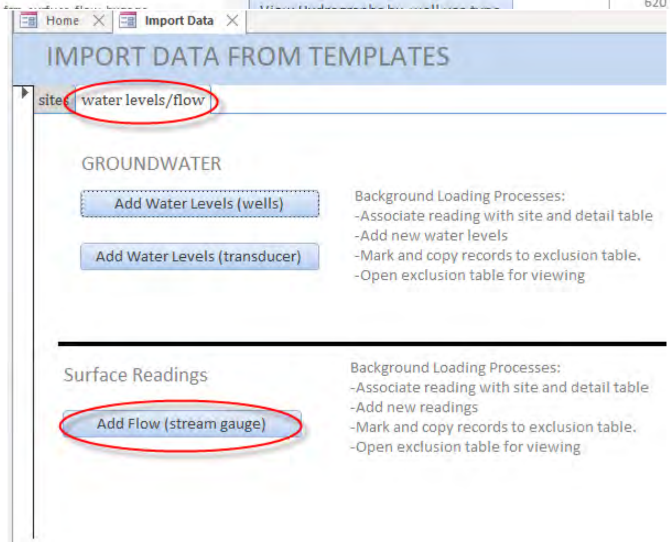
ID	General Site	Measure Date and Time	Site Type	Cumulative	Start Date fc
1	601 (VCWPD)	10/01/1927 00:00	Stream Gage		
2	602 (VCWPD)	10/01/1927 00:00	Stream Gage		
3	601 (VCWPD)	10/02/1927 00:00	Stream Gage		
4	602 (VCWPD)	10/02/1927 00:00	Stream Gage		
5	601 (VCWPD)	10/03/1927 00:00	Stream Gage		
6	602 (VCWPD)	10/03/1927 00:00	Stream Gage		
7	601 (VCWPD)	10/04/1927 00:00	Stream Gage		
8	602 (VCWPD)	10/04/1927 00:00	Stream Gage		
9	601 (VCWPD)	10/05/1927 00:00	Stream Gage		
10	602 (VCWPD)	10/05/1927 00:00	Stream Gage		
11	601 (VCWPD)	10/06/1927 00:00	Stream Gage		
12	602 (VCWPD)	10/06/1927 00:00	Stream Gage		
13	601 (VCWPD)	10/07/1927 00:00	Stream Gage		
14	602 (VCWPD)	10/07/1927 00:00	Stream Gage		
15	601 (VCWPD)	10/08/1927 00:00	Stream Gage		
16	602 (VCWPD)	10/08/1927 00:00	Stream Gage		
17	601 (VCWPD)	10/09/1927 00:00	Stream Gage		
18	602 (VCWPD)	10/09/1927 00:00	Stream Gage		
19	601 (VCWPD)	10/10/1927 00:00	Stream Gage		
20	602 (VCWPD)	10/10/1927 00:00	Stream Gage		
21	601 (VCWPD)	10/11/1927 00:00	Stream Gage		
22	602 (VCWPD)	10/11/1927 00:00	Stream Gage		
23	601 (VCWPD)	10/12/1927 00:00	Stream Gage		
24	602 (VCWPD)	10/12/1927 00:00	Stream Gage		

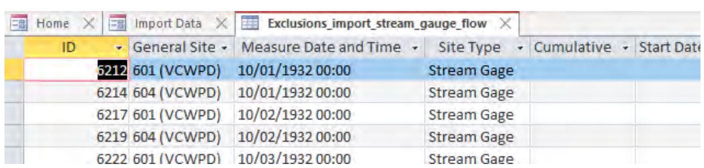
3. Open the "Exclusions_import_stream_gauge_flow" table. If the table is not empty, then delete all records in it. After making sure that it is empty, close the table.



4. Open the "chart_WaterLevels_wells" form, i.e. the Home tab (if not already open). Click the "Load New Data" button and then the "Add Flow (stream gauge)" button under the "water levels/flow" tab. This adds the new acceptable data from the "import_stream_gauge_flow" table to the master "dt_site_levels" table and opens the "Exclusions_import_stream_gauge_flow" table to show which new data were not added to the master table due to missing information.







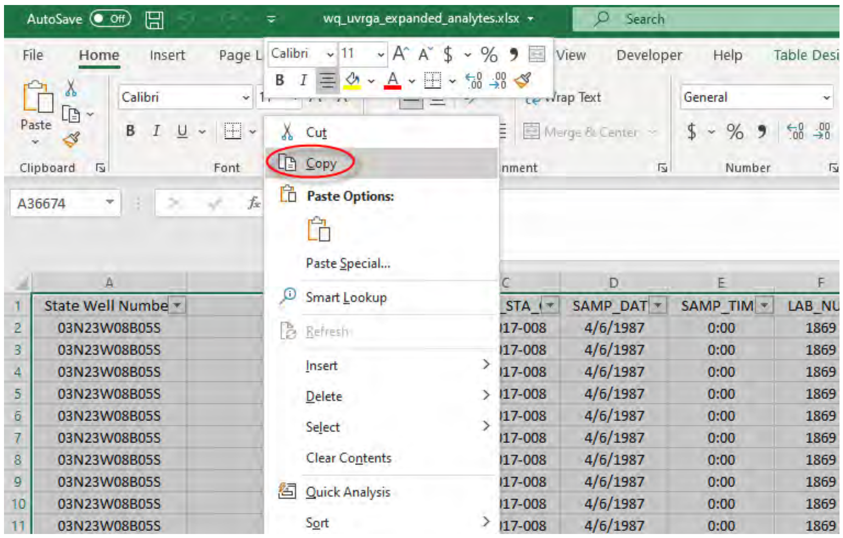
5. For the new data that were not added to the master "dt_site_levels" table (i.e., records showing up in the "Exclusions_import_stream_gauge_flow" table), check the General Site ID and make sure that it exists in the "dt_sites" and "dt_site_details" tables.

   If the General Site ID or any field in the streamflow data needs to be corrected, then go back to the Excel template in Step 1, edit the information, and repeat Steps 1 – 4.

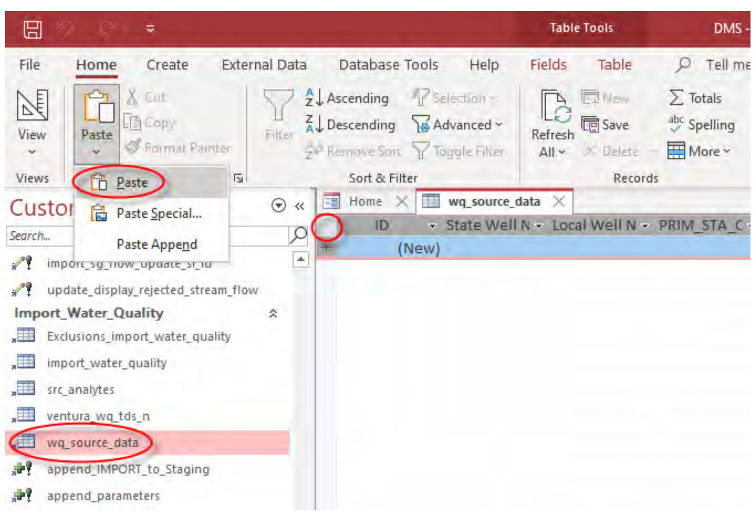
   If the site information does not exist in the "dt_sites" or "dt_site_details" table, then follow the steps for "Importing Stream Gage Site Data."

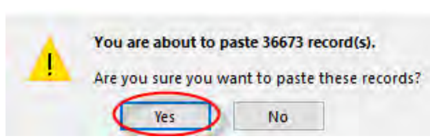
Importing Water Quality Data

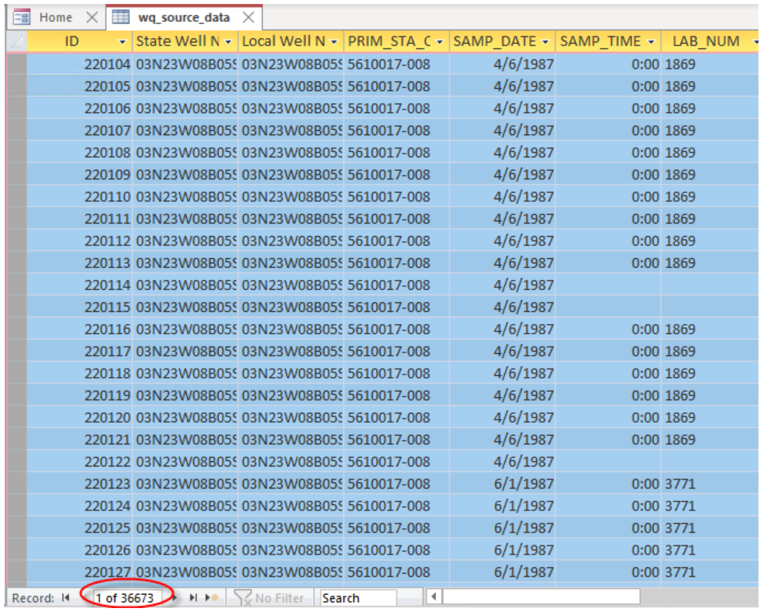
1. Format the data in Excel according to the "import_wq.xlsx" file. Select and copy the data to be imported to DMS (including column headers).



2. Import to DMS by opening the "wq_source_data" table in Access, clicking the top left corner of the table, and pasting the copied data from Step 1. This may take a few minutes if the number of records is large. Click "Yes" to confirm. After pasting the data, verify that the number of records in the "wq_source_data" table is equal to the number of rows copied from Excel.

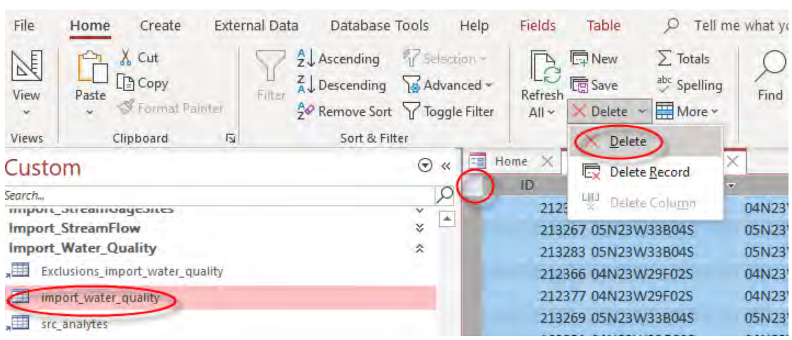




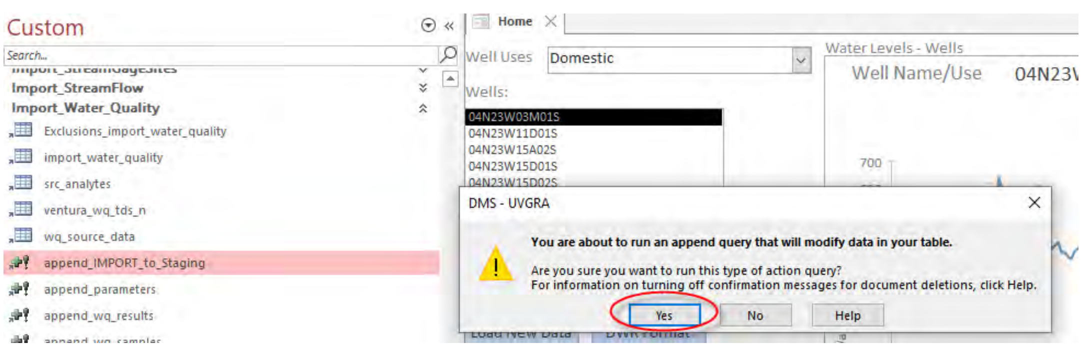


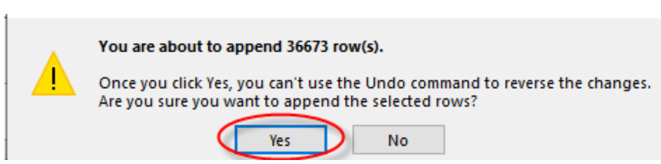
ID	State Well N	Local Well N	PRIM_STA_C	SAMP_DATE	SAMP_TIME	LAB_NUM
220104	03N23W08B05S	03N23W08B05S	5610017-008	4/6/1987	0:00	1869
220105	03N23W08B05S	03N23W08B05S	5610017-008	4/6/1987	0:00	1869
220106	03N23W08B05S	03N23W08B05S	5610017-008	4/6/1987	0:00	1869
220107	03N23W08B05S	03N23W08B05S	5610017-008	4/6/1987	0:00	1869
220108	03N23W08B05S	03N23W08B05S	5610017-008	4/6/1987	0:00	1869
220109	03N23W08B05S	03N23W08B05S	5610017-008	4/6/1987	0:00	1869
220110	03N23W08B05S	03N23W08B05S	5610017-008	4/6/1987	0:00	1869
220111	03N23W08B05S	03N23W08B05S	5610017-008	4/6/1987	0:00	1869
220112	03N23W08B05S	03N23W08B05S	5610017-008	4/6/1987	0:00	1869
220113	03N23W08B05S	03N23W08B05S	5610017-008	4/6/1987	0:00	1869
220114	03N23W08B05S	03N23W08B05S	5610017-008	4/6/1987		
220115	03N23W08B05S	03N23W08B05S	5610017-008	4/6/1987		
220116	03N23W08B05S	03N23W08B05S	5610017-008	4/6/1987	0:00	1869
220117	03N23W08B05S	03N23W08B05S	5610017-008	4/6/1987	0:00	1869
220118	03N23W08B05S	03N23W08B05S	5610017-008	4/6/1987	0:00	1869
220119	03N23W08B05S	03N23W08B05S	5610017-008	4/6/1987	0:00	1869
220120	03N23W08B05S	03N23W08B05S	5610017-008	4/6/1987	0:00	1869
220121	03N23W08B05S	03N23W08B05S	5610017-008	4/6/1987	0:00	1869
220122	03N23W08B05S	03N23W08B05S	5610017-008	4/6/1987		
220123	03N23W08B05S	03N23W08B05S	5610017-008	6/1/1987	0:00	3771
220124	03N23W08B05S	03N23W08B05S	5610017-008	6/1/1987	0:00	3771
220125	03N23W08B05S	03N23W08B05S	5610017-008	6/1/1987	0:00	3771
220126	03N23W08B05S	03N23W08B05S	5610017-008	6/1/1987	0:00	3771
220127	03N23W08B05S	03N23W08B05S	5610017-008	6/1/1987	0:00	3771

3. Open the "import_water_quality" table. If the table is not empty, then delete all records in it. After making sure that it is empty, close the table.

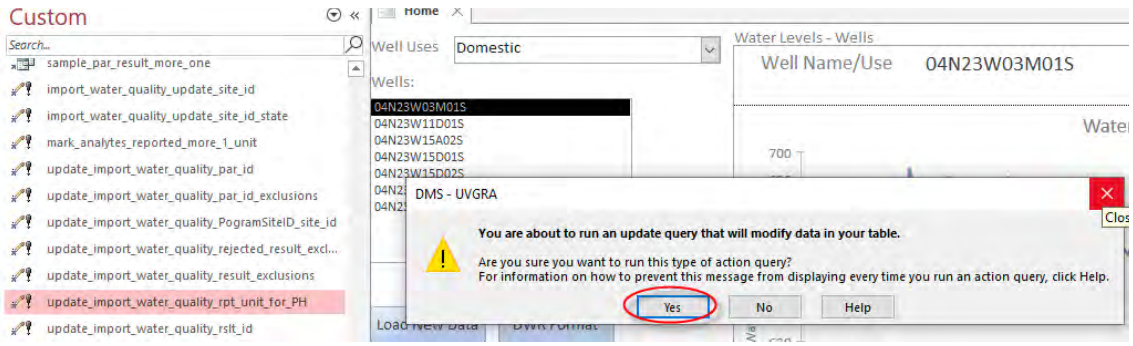


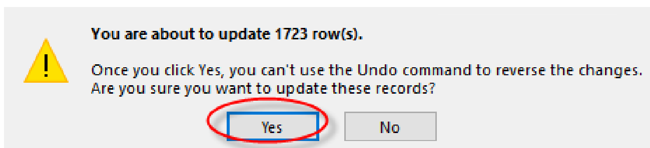
4. Run the "append_IMPORT_to_Staging" query. Click "Yes" to confirm. This adds the source data from the "wq_source_data" table to the "import_water_quality" table.





5. Run the "update_import_water_quality_rpt_unit_for_PH" query. Click "Yes" to confirm. This assigns the unit S.U. to the PH laboratory analytes.

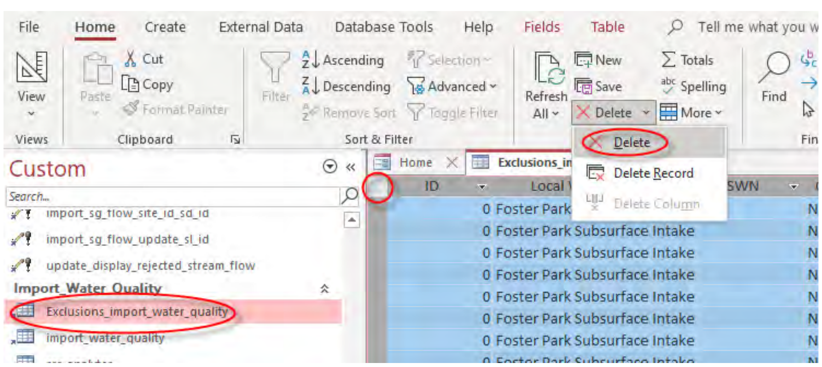




6. Run the following queries:
check_each_chem_reported_in_one_unit – to check the unit of each analyte.
chemicals_results_multiple_units – to identify the analytes reported in more than one unit.

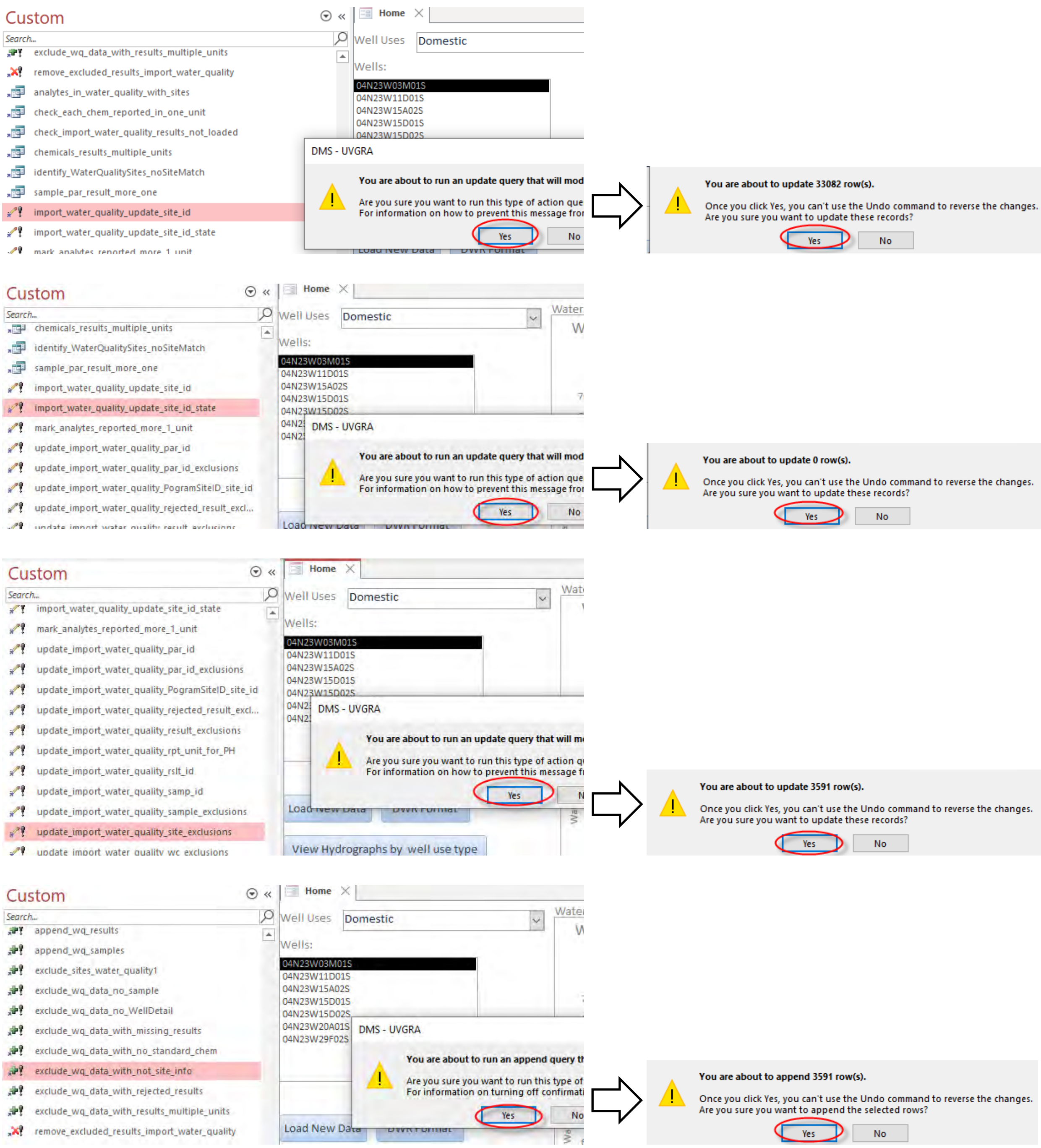
If the units need to be corrected, then go back to the Excel template in Step 1, edit the information, and repeat Steps 1 – 5.

7. Open the "Exclusions_import_water_quality" table. If the table is not empty, then delete all records in it. After making sure that it is empty, close the table.



8. Run the following queries in the order shown:
   import_water_quality_update_site_id
   → import_water_quality_update_site_id_state
   → update_import_water_quality_site_exclusions
   → exclude_wq_data_with_not_site_info

   This marks the records in the "import_water_quality" table for which neither Local Well Name nor SWN exists in the "dt_sites" table and adds those records to the "Exclusions_import_water_quality" table.



9. Similar to Step 8, run the following queries in the order shown:
update_site_wc_ids_inimport
→ update_import_water_quality_wc_exclusions
→ exclude_wq_data_no_WellDetail

   This marks the records in the "import_water_quality" table for which neither Local Well Name nor SWN exists in the "dt_well_details" table and adds those records to the "Exclusions_import_water_quality" table.

10. Similar to Step 8, run the following queries in the order shown:
update_import_water_quality_par_id
→ update_import_water_quality_par_id_exclusions
→ exclude_wq_data_with_no_standard_chem

   This marks the records in the "import_water_quality" table for which the CHEMICAL does not exist in the "lu_parameters" table and adds those records to the "Exclusions_import_water_quality" table.

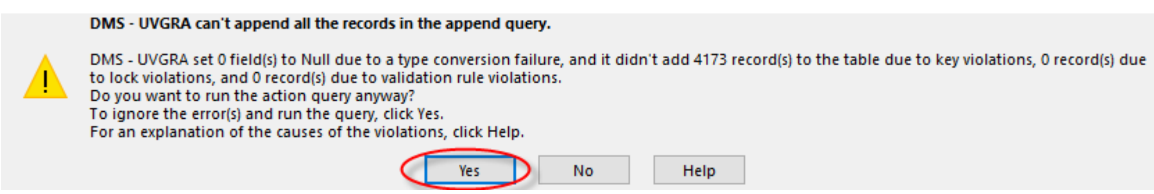
11. Similar to Step 8, run the following queries in the order shown:
update_import_water_quality_rejected_result_exclusions
→ exclude_wq_data_with_rejected_results

   This marks the records in the "import_water_quality" table for which the Review_Result is Rejected and adds those records to the "Exclusions_import_water_quality" table.

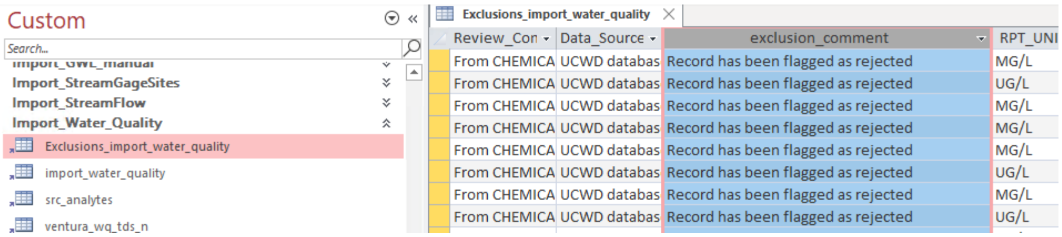
12. Similar to Step 8, run the following queries in the order shown:
update_import_water_quality_samp_id
→ append_wq_samples
→ update_import_water_quality_samp_id
→ update_import_water_quality_sample_exclusions
→ exclude_wq_data_no_sample

   This adds the new acceptable data from the "import_water_quality" table to the master "dt_samples" table.

   Note: Click "Yes" if the message below appears while running the queries.



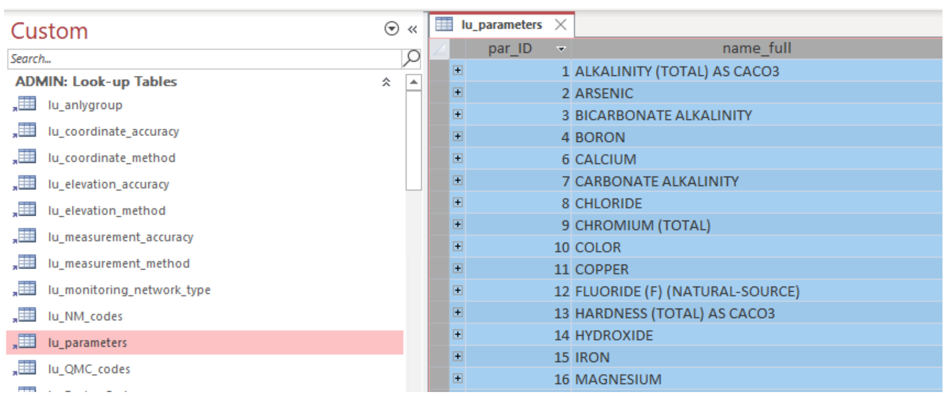
13. Open the "Exclusions_import_water_quality" table to see which new data were not added to the master "dt_samples" table and check the exclusion_comment.



If any field in the water quality data needs to be corrected, then go back to the Excel template in Step 1, edit the information, and repeat Steps 1 – 12.

If the well information does not exist in the "dt_sites" or "dt_well_details" table, then follow the steps for "Importing Well Data."

If the chemical information does not exist in the "lu_parameters" table, then update the "lu_parameters" table accordingly. If the chemical information exists in the "lu_anlygroup" table, then run the "update_lu_parameter_anlygroup_from_lu_anlygroup" query to copy that information to the "lu_parameters" table.



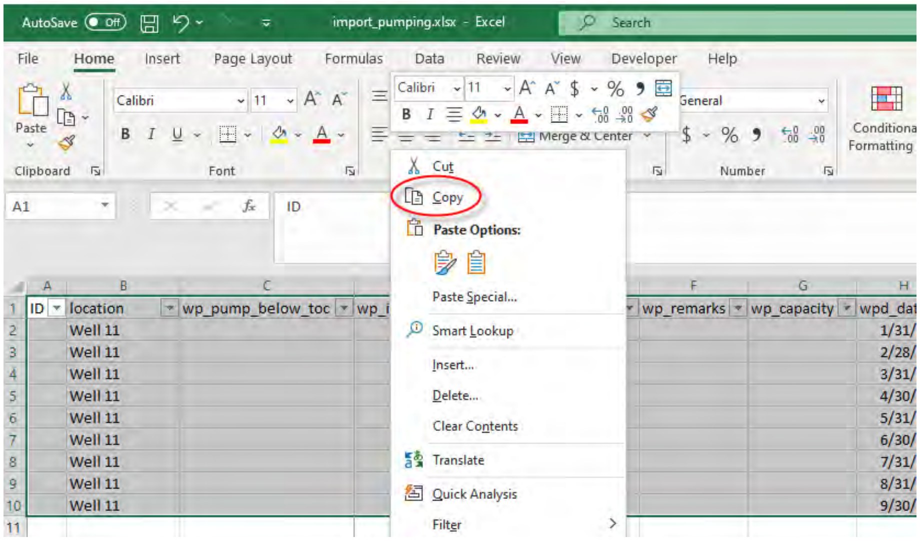
14. Similar to Step 12, run the following queries in the order shown:
update_import_water_quality_result_exclusions
→ update_import_water_quality_rslt_id
→ append_wq_results
→ update_import_water_quality_rslt_id

This adds the new acceptable data from the "import_water_quality" table to the master "dt_results" table.

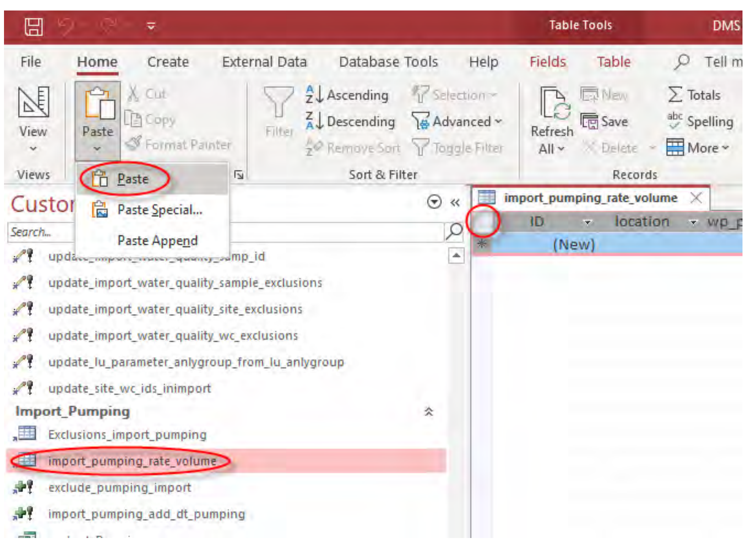
15. Run the "check_import_water_quality_results_not_loaded" query to see which new data were not added to the master "dt_results" table.

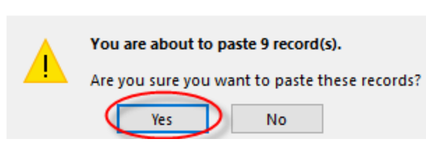
Importing Pumping Data

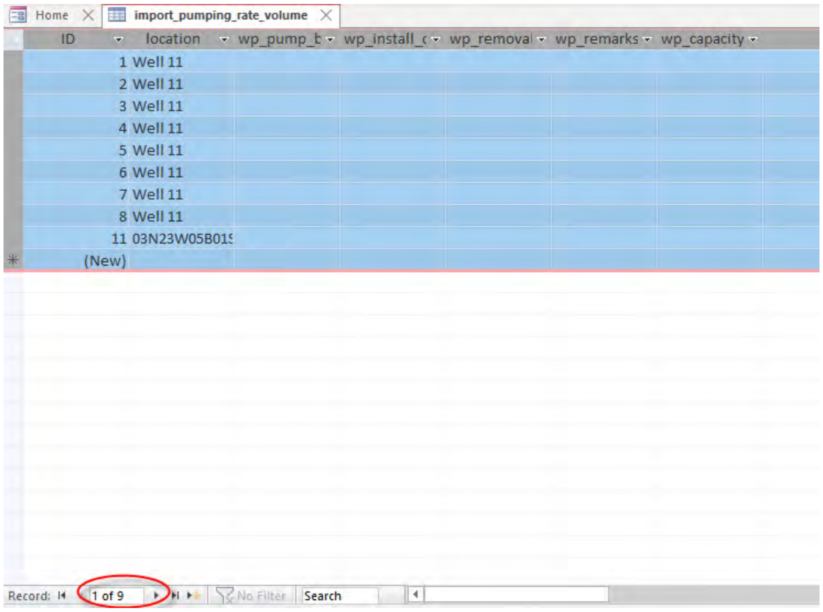
1. Format the data in Excel according to the "import_pumping.xlsx" file. Select and copy the data to be imported to DMS (including column headers).



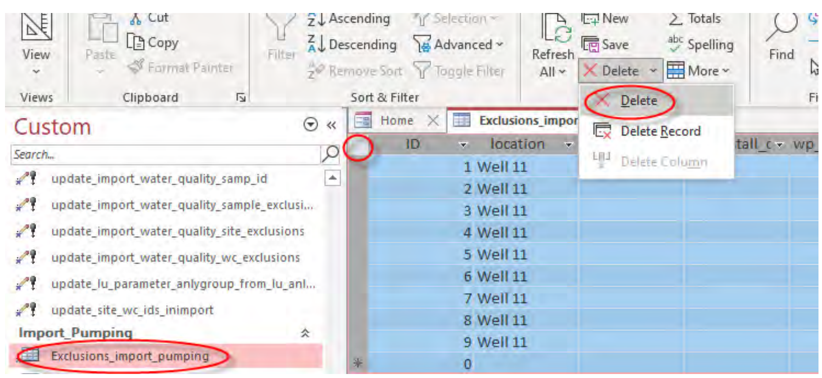
2. Import to DMS by opening the "import_pumping_rate_volume" table in Access, clicking the top left corner of the table, and pasting the copied data from Step 1. This may take a few minutes if the number of records is large. Click "Yes" to confirm. After pasting the data, verify that the number of records in the "import_pumping_rate_volume" table is equal to the number of rows copied from Excel.



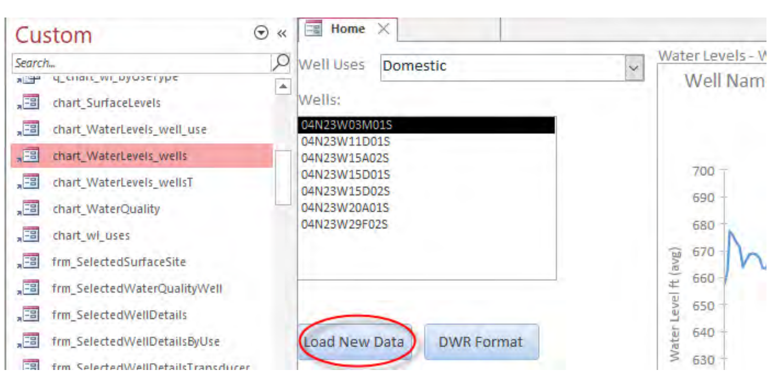


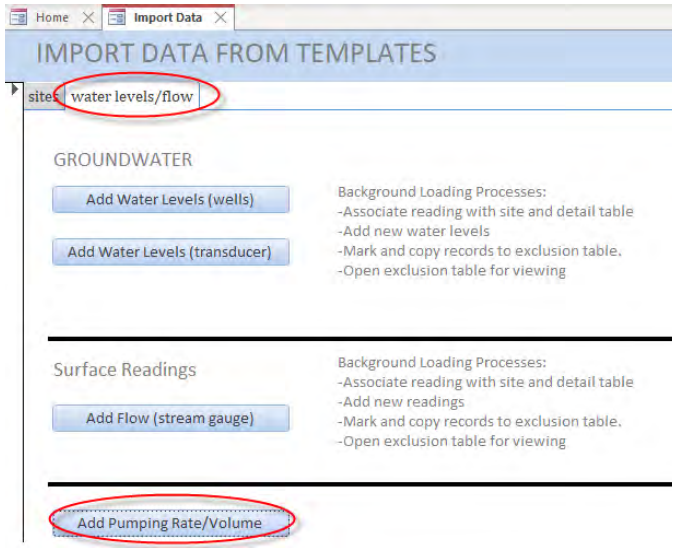


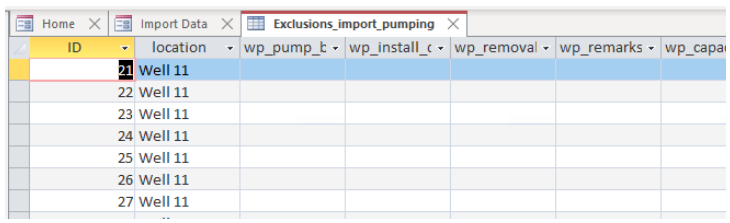
3. Open the "Exclusions_import_pumping" table. If the table is not empty, then delete all records in it. After making sure that it is empty, close the table.



4. Open the "chart_WaterLevels_wells" form, i.e. the Home tab (if not already open). Click the "Load New Data" button and then the "Add Pumping Rate/Volume" button under the "water levels/flow" tab. This adds the new acceptable data from the "import_pumping_rate_volume" table to the master "dt_pumping" table and opens the "Exclusions_import_pumping" table to show which new data were not added to the master table due to missing information.







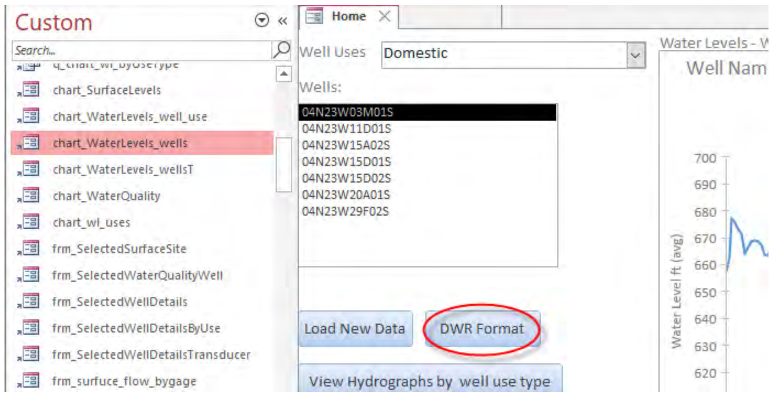
5. For the new data that were not added to the master "dt_pumping" table (i.e., records showing up in the "Exclusions_import_pumping" table), check the location and make sure that it exists in the "dt_sites" and "dt_well_details" tables.

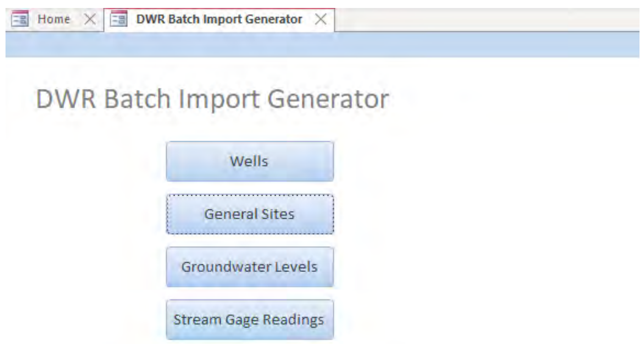
   If the location or any field in the pumping data needs to be corrected, then go back to the Excel template in Step 1, edit the information, and repeat Steps 1 – 4.

   If the well information does not exist in the "dt_sites" or "dt_well_details" table, then follow the steps for "Importing Well Data."

Exporting to DWR Templates

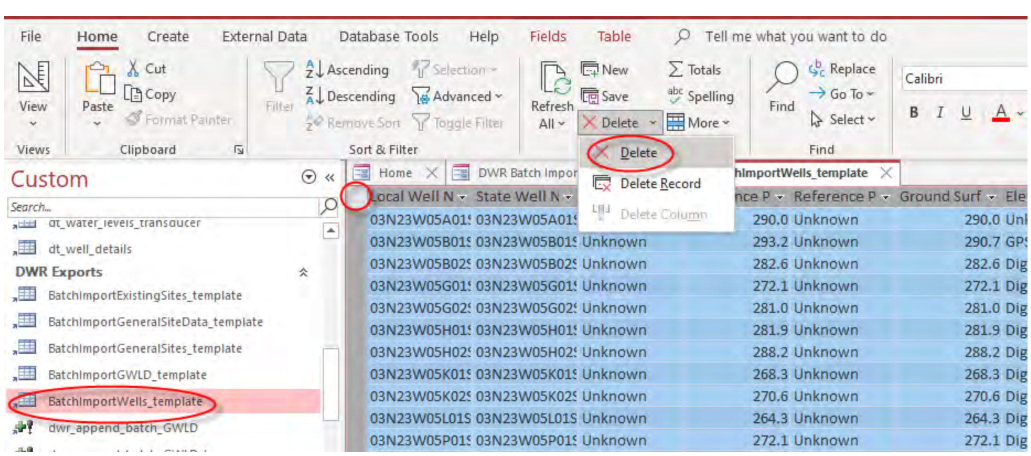
1. Open the "chart_WaterLevels_wells" form, i.e. the Home tab (if not already open). Click the "DWR Format" button. This opens the "DWR Batch Import Generator" form.





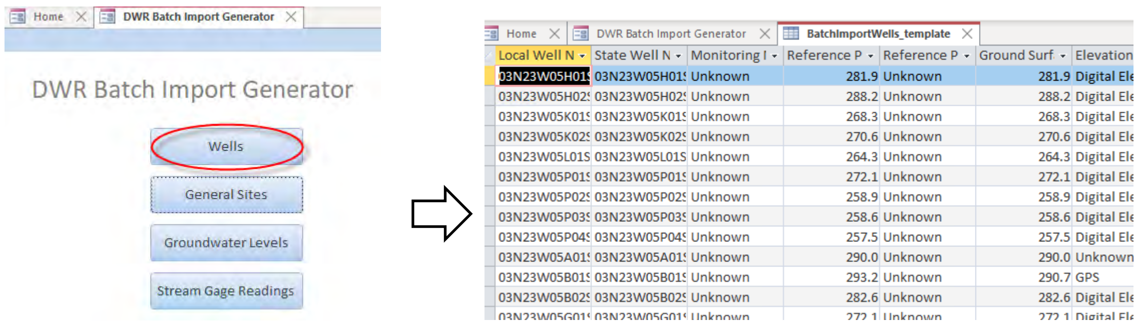
2. For the well template, open the "BatchImportWells_template" table.
   For the general site template, open the "BatchImportGeneralSites_template" table.
   For the groundwater level template, open the "BatchImportGWLD_template" table.
   For the stream gage reading template, open the "BatchImportGeneralSiteData_template" table.

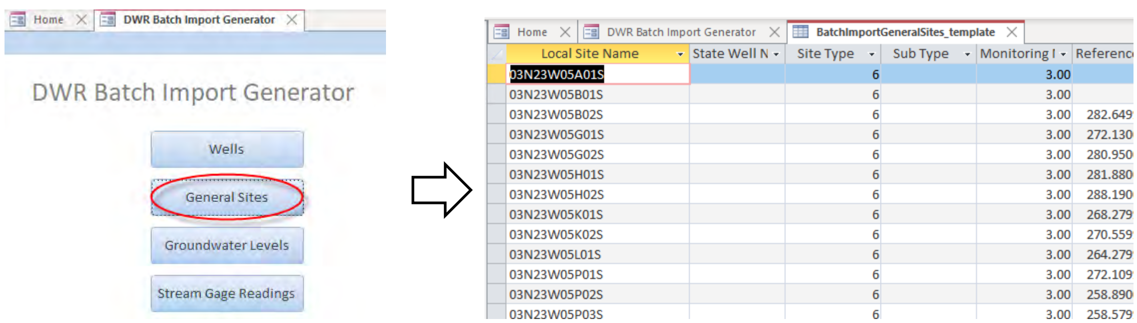
   If the table is not empty, then delete all records in it. After making sure that it is empty, close the table and go back to the "DWR Batch Import Generator" form.

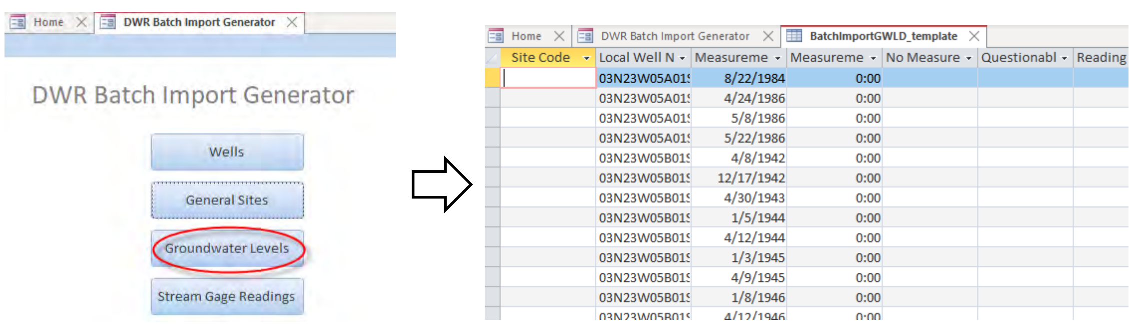


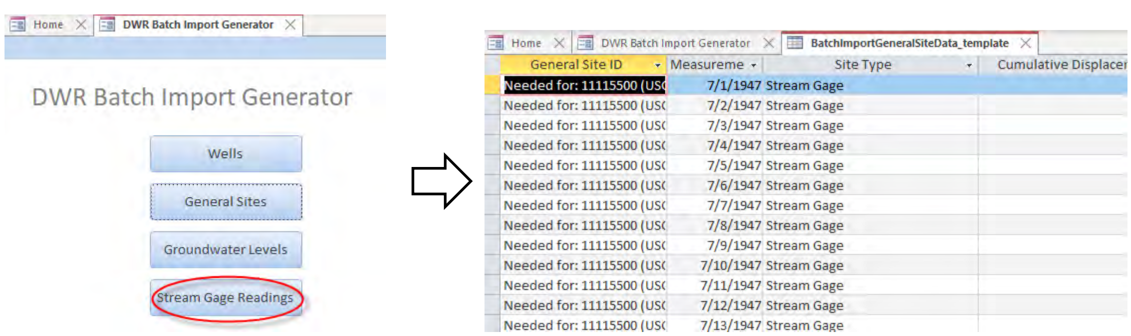
3. For the well template, click the "Wells" button.
For the general site template, click the "General Sites" button.
For the groundwater level template, click the "Groundwater Levels" button.
For the stream gage reading template, click the "Stream Gage Readings" button.

Click "Yes" to confirm. This fills the corresponding template table emptied in Step 2. The data from the template table may be copied and pasted to Excel.



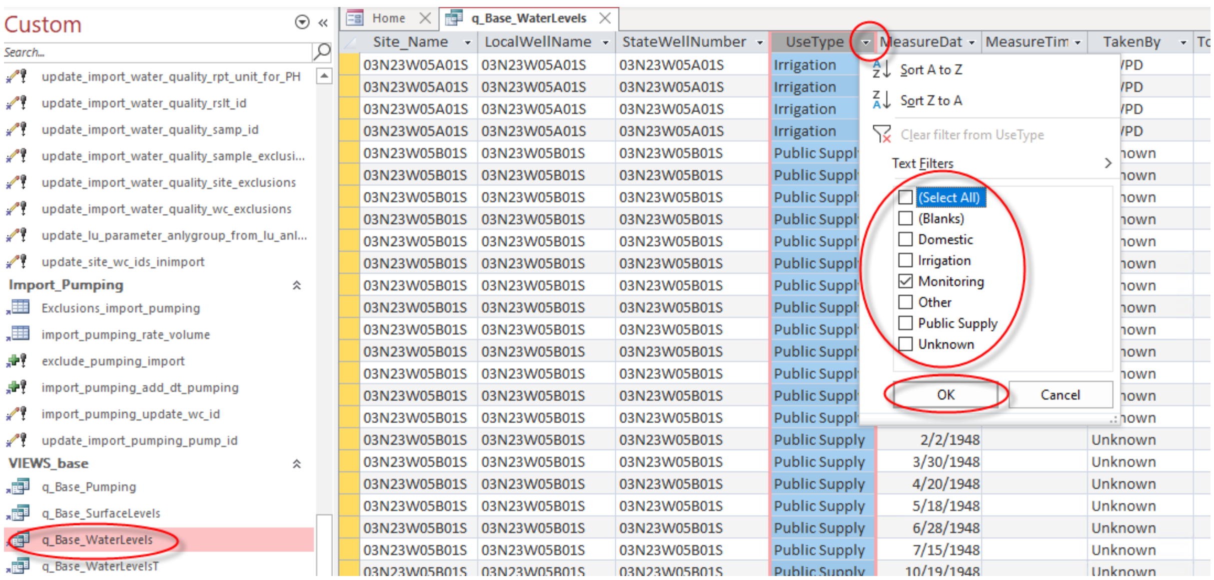


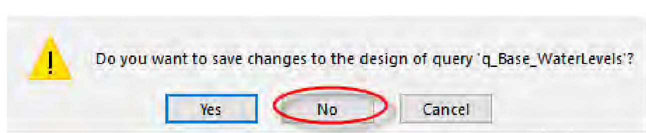




Viewing the Data Tables

1. The queries under the "VIEWS_base" group can be used to view the data saved in the production data tables. Open the query of interest and click the arrow next to the field name to see the drop-down list. The data can be filtered by checking/unchecking boxes in the drop-down list and clicking "OK." When closing the query, click "No" so that the filter criteria are not saved.





DMS OBJECT DESCRIPTION

Group	Object Name	Object Type	Description
ADMIN: Look-up Tables	lu_anlygroup	Table	Reference table.
	lu_coordinate_accuracy	Table	Reference table.
	lu_coordinate_method	Table	Reference table.
	lu_elevation_accuracy	Table	Reference table.
	lu_elevation_method	Table	Reference table.
	lu_measurement_accuracy	Table	Reference table.
	lu_measurement_method	Table	Reference table.
	lu_monitoring_network_type	Table	Reference table.
	lu_NM_codes	Table	Reference table.
	lu_parameters	Table	Reference table.
	lu_QMC_codes	Table	Reference table.
	lu_ReviewCodes	Table	Reference table.
	lu_SG_codes	Table	Reference table.
	lu_site_type	Table	Reference table.
	lu_well_completion_type	Table	Reference table.
	lu_well_status	Table	Reference table.
	lu_well_type	Table	Reference table.
	lu_well_use_type	Table	Reference table.
	map_well_status	Table	Reference table.
	map_well_use	Table	Reference table.
DMS Data Tables	dt_pumping	Table	Table for storing the pumping data.
	dt_results	Table	Table for storing the water quality results.
	dt_samples	Table	Table for storing the water quality sample data.
	dt_site_details	Table	Table for storing the gage site details.
	dt_site_levels	Table	Table for storing the streamflow data from gages.
	dt_sites	Table	Table for storing the well/gage site info.
	dt_sources	Table	Table for storing the source info.
	dt_water_levels	Table	Table for storing the water level data from wells.
	dt_water_levels_transducer	Table	Table for storing the water level data from transducers.
	dt_well_details	Table	Table for storing the well site details.
DWR Exports	BatchImportGeneralSiteData_template	Table	Table for exporting the streamflow data in DWR format.
	BatchImportGeneralSites_template	Table	Table for exporting the general well/gage site info in DWR format.
	BatchImportGWLD_template	Table	Table for exporting the water level data in DWR format.
	BatchImportWells_template	Table	Table for exporting the well site info in DWR format.
	dwr_append_batch_GWLD	Append Query	Formats the water level data from the "dt_water_levels" table and adds them to the "BatchImportGWLD_template" table.
	dwr_append_batch_GWLD_loggers	Append Query	Formats the water level data from the "dt_water_levels_transducer" table and adds them to the "BatchImportGWLD_template" table.
	dwr_append_batchGeneralSitesGages	Append Query	Formats the gage site info from the "dt_sites" and "dt_site_details" tables and adds it to the "BatchImportGeneralSites_template" table.
	dwr_append_batchGeneralSitesWells	Append Query	Formats the well site info from the "dt_sites" and "dt_well_details" tables and adds it to the "BatchImportGeneralSites_template" table.
	dwr_append_batchGenSitesData_gage	Append Query	Formats the streamflow data from the "dt_site_levels" table and adds them to the "BatchImportGeneralSiteData_template" table.
	dwr_append_batchWells	Append Query	Formats the well site info from the "vDWR_wells" query and adds it to the "BatchImportWells_template" table.
	vDWR_wells	Select Query	Extracts the well site info from the "dt_sites" and "dt_well_details" tables if SiteType = 6. Used as an intermediate step for the "dwr_append_batchWells" query.
	vTopBot_screens	Select Query	Extracts the screening info from the "dt_well_details" table. Used as an intermediate step for the "dwr_append_batchGeneralSitesWells" query.
Import_Wells	Exclusions_ import_wells	Table	Table for viewing the records from the "import_wells" table that have not been loaded to the "dt_sites" or "dt_well_details" table.
	import_wells	Table	Table for importing the well site info.

Group	Object Name	Object Type	Description
	exclude_sites_import_wells	Append Query	Adds the records from the "import_wells" table to the "Exclusions_ import_wells" table if the required well site info (e.g., latitude/longitude, coordinates method/accuracy, county) is missing.
	exclude_wc_import_wells	Append Query	Adds the records from the "import_wells" table to the "Exclusions_ import_wells" table if the required well site details are missing.
	import_wells_add_dt_sites	Append Query	Formats the well site info from the "import_wells" table and adds it to the "dt_sites" table. Does not add if a record with the same Local Well Name/State Well Number already exists in the "dt_sites" table.
	import_wells_add_dt_well_details	Append Query	Formats the well site details from the "import_wells" table and adds them to the "dt_well_details" table. Does not add if a record with the same Local Well Name/State Well Number already exists in the "dt_well_details" table.
	import_wells_update_site_id	Update Query	Adds site_id to the records in the "import_wells" table if the matching Local Well Name is found in the "dt_sites" table.
	import_wells_update_site_id_state	Update Query	Adds site_id to the records in the "import_wells" table if the matching State Well Number is found in the "dt_sites" table.
	import_wells_update_wc_id	Update Query	Adds wc_id to the records in the "import_wells" table if the matching site_id is found in the "dt_well_details" table.
Import_GWL_logger	Exclusions_import_gwl_logger	Table	Table for viewing the records from the "import_gwl_logger" table that have not been loaded to the "dt_water_levels_transducer" table.
	import_gwl_logger	Table	Table for importing the water level data from transducers.
	exclude_wlt_import_gwllogger	Append Query	Adds the records from the "import_gwl_logger" table to the "Exclusions_import_gwl_logger" table if the required well site info is missing.
	import_gwlt_add_dt_water_level_trans	Append Query	Formats the water level data from the "import_gwl_logger" table and adds them to the "dt_water_levels_transducer" table. Does not add if a record with the same Local Well Name/Site Code and Measurement Date/Time already exists in the "dt_water_levels_transducer" table.
	import_gwlt_update_site_id_wc_id_localname	Update Query	Adds site_id and wc_id to the records in the "import_gwl_logger" table if the matching Local Well Name is found in the "dt_sites" table.
	import_gwlt_update_site_id_wc_id_sitecode	Update Query	Adds site_id and wc_id to the records in the "import_gwl_logger" table if the matching Site Code is found in the "dt_sites" table.
	import_gwlt_update_wlt_id	Update Query	Adds wlt_id to the records in the "import_gwl_logger" table if the matching wc_id and Measurement Date/Time are found in the "dt_water_levels_transducer" table.
	update_display_rejected_water_levels_logger	Update Query	Sets use_flag = 0 in the "dt_water_levels_transducer" table if Review_Result = "Rejected."
Import_GWL_manual	Exclusions_import_gwl_manual	Table	Table for viewing the records from the "import_gwl_manual" table that have not been loaded to the "dt_water_levels" table.
	import_gwl_manual	Table	Table for importing the water level data from wells.
	exclude_wlm_import_gwlman	Append Query	Adds the records from the "import_gwl_manual" table to the "Exclusions_import_gwl_manual" table if the required well site info is missing.
	import_gwlman_add_dt_water_levels	Append Query	Formats the water level data from the "import_gwl_manual" table and adds them to the "dt_water_levels" table. Does not add if a record with the same Local Well Name and Measurement Date already exists in the "dt_water_levels" table.
	import_wlman_tomatch	Select Query	Formats Measurement Date in the "import_gwl_manual" table. Used as an intermediate step for the "import_gwlman_Update_wlID" query.

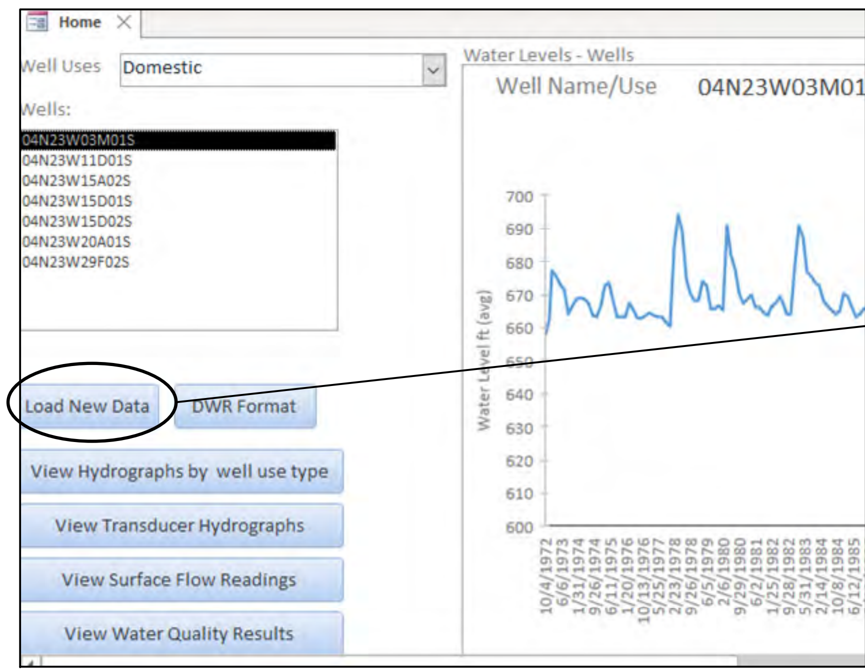
Group	Object Name	Object Type	Description
	import_gwlman_Update_siteID_wcID	Update Query	Adds site_id and wc_id to the records in the "import_gwl_manual" table if the matching Local Well Name is found in the "dt_sites" table.
	import_gwlman_Update_siteID_wcIDStateWell	Update Query	Adds site_id and wc_id to the records in the "import_gwl_manual" table if the matching Local Well Name is found in the "dt_well_details" table.
	import_gwlman_Update_wlID	Update Query	Adds wl_id to the records in the "import_gwl_manual" table if the matching wc_id and Measurement Date are found in the "dt_water_levels" table.
	update_display_rejected_water_levels	Update Query	Sets use_flag = 0 in the "dt_water_levels" table if Review_Result = "Rejected."
Import_StreamGageSites	Exclusions_import_stream_gauge_sites	Table	Table for viewing the records from the "import_stream_gage_sites" table that have not been loaded to the "dt_sites" or "dt_site_details" table.
	import_stream_gauge_sites	Table	Table for importing the gage site info.
	exclude_sd_import_gaugesites	Append Query	Adds the records from the "import_stream_gauge_sites" table to the "Exclusions_import_stream_gauge_sites" table if the required gage site details are missing.
	exclude_sites_import_gaugesites	Append Query	Adds the records from the "import_stream_gauge_sites" table to the "Exclusions_import_stream_gauge_sites" table if the required gage site info (e.g., latitude/longitude, coordinates method/accuracy, county) is missing.
	import_sg_sites_add_dt_site_details	Append Query	Formats the gage site details from the "import_stream_gauge_sites" table and adds them to the "dt_site_details" table. Does not add if a record with the same Local Site Name already exists in the "dt_site_details" table.
	import_sg_sites_add_dt_sites	Append Query	Formats the gage site info from the "import_stream_gauge_sites" table and adds it to the "dt_sites" table. Does not add if a record with the same Local Site Name already exists in the "dt_sites" table.
	import_sg_sites_update_sd_id	Update Query	Adds sd_id to the records in the "import_stream_gauge_sites" table if the matching site_id is found in the "dt_site_details" table.
	import_sg_sites_update_site_id	Update Query	Adds site_id to the records in the "import_stream_gauge_sites" table if the matching Local Site Name is found in the "dt_sites" table.
Import_StreamFlow	Exclusions_import_stream_gauge_flow	Table	Table for viewing the records from the "import_stream_gauge_flow" table that have not been loaded to the "dt_site_levels" table.
	import_stream_gauge_flow	Table	Table for importing the streamflow data from gages.
	exclude_sgflow_import_stream_gauge_flow	Append Query	Adds the records from the "import_stream_gauge_flow" table to the "Exclusions_import_stream_gauge_flow" table if the required gage site info or Surface Water Discharge (cubic feet per second) is missing.
	import_sg_flow_add_dt_site_levels	Append Query	Formats the streamflow data from the "import_stream_gauge_flow" table and adds them to the "dt_site_levels" table. Does not add if a record with the same General Site ID and Measure Date and Time already exists in the "dt_site_levels" table.
	import_sg_flow_date_time	Select Query	Formats Measure Date and Time in the "import_stream_gauge_flow" table. Used as an intermediate step for the "import_sg_flow_update_sl_id" query.
	import_sg_flow_site_id_sd_id	Update Query	Adds site_id and sd_id to the records in the "import_stream_gauge_flow" table if the matching General Site ID is found in the "dt_sites" table.
	import_sg_flow_update_sl_id	Update Query	Adds sl_id to the records in the "import_stream_gauge_flow" table if the matching sd_id and Measure Date and Time are found in the "dt_site_levels" table.
	update_display_rejected_stream_flow	Update Query	Sets use_flag = 0 in the "dt_site_levels" table if Review_Result = "Rejected."
Import_Water_Quality	Exclusions_import_water_quality	Table	Table for viewing the records from the "import_water_quality" table that have not been loaded to the "dt_samples" table.

Group	Object Name	Object Type	Description
	import_water_quality	Table	Contents from the "wq_source_data" table plus Data_Source.
	wq_source_data	Table	Table for importing the water quality data.
	append_IMPORT_to_Staging	Append Query	Adds all records from the "wq_source_data" table to the “import_water_quality” table.
	append_wq_results	Append Query	Formats the water quality data from the "import_water_quality" table and adds them to the "dt_results" table. Does not add if a record with the same Local Well Name/SWN, SAMP DATE, and CHEMISTRY already exists in the "dt_results" table.
	append_wq_samples	Append Query	Formats the water quality data from the "import_water_quality" table and adds them to the "dt_samples" table. Does not add if a record with the same Local Well Name/SWN and SAMP DATE already exists in the "dt_samples" table.
	exclude_wq_data_no_sample	Append Query	Adds the records from the "import_water_quality" table to the "Exclusions_import_water_quality" table if the matching wc_id and SAMP DATE are not found in the "dt_samples" table.
	exclude_wq_data_no_WellDetail	Append Query	Adds the records from the "import_water_quality" table to the "Exclusions_import_water_quality" table if neither Local Well Name nor SWN is found in the "dt_well_details" table.
	exclude_wq_data_with_no_standard_chem	Append Query	Adds the records from the "import_water_quality" table to the "Exclusions_import_water_quality" table if the matching CHEMISTRY is not found in the "lu_parameters" table.
	exclude_wq_data_with_not_site_info	Append Query	Adds the records from the "import_water_quality" table to the "Exclusions_import_water_quality" table if neither Local Well Name nor SWN is found in the "dt_sites" table.
	exclude_wq_data_with_rejected_results	Append Query	Adds the records from the "import_water_quality" table to the "Exclusions_import_water_quality" table if Review_Result = "Rejected."
	check_each_chem_reported_in_one_unit	Select Query	Shows the unit of each analyte.
	check_import_water_quality_results_not_loaded	Select Query	Shows the records from the "import_water_quality" table that have not been loaded to the "dt_results" table.
	chemicals_results_multiple_units	Select Query	Shows the analytes reported in more than one unit.
	import_water_quality_update_site_id	Update Query	Adds site_id to the records in the "import_water_quality" table if the matching Local Well Name is found in the "dt_sites" table.
	import_water_quality_update_site_id_state	Update Query	Adds site_id to the records in the "import_water_quality" table if the matching SWN is found in the "dt_sites" table.
	update_import_water_quality_par_id	Update Query	Adds par_id to the records in the "import_water_quality" table if the matching CHEMISTRY is found in the "lu_parameters" table.
	update_import_water_quality_par_id_exclusions	Update Query	Adds exclusion_comment to the records in the "import_water_quality" table if the matching CHEMISTRY is not found in the "lu_parameters" table.
	update_import_water_quality_rejected_result_exclusions	Update Query	Adds exclusion_comment to the records in the "import_water_quality" table if Review_Result = "Rejected."
	update_import_water_quality_result_exclusions	Update Query	Adds exclusion_comment to the records in the "import_water_quality" table if the matching samp_id and par_id are not found in the "dt_results" table.
	update_import_water_quality_rpt_unit_for_PH	Update Query	Sets rpt_unit = "S.U." in the "import_water_quality" table if CHEMICAL = "PH, LABORATORY."
	update_import_water_quality_rslt_id	Update Query	Adds rslt_id to the records in the "import_water_quality" table if the matching samp_id and par_id are found in the "dt_results" table.
	update_import_water_quality_samp_id	Update Query	Adds samp_id to the records in the "import_water_quality" table if the matching wc_id and SAMP DATE are found in the "dt_samples" table.
	update_import_water_quality_sample_exclusions	Update Query	Adds exclusion_comment to the records in the "import_water_quality" table if the matching wc_id and SAMP DATE are not found in the "dt_samples" table.

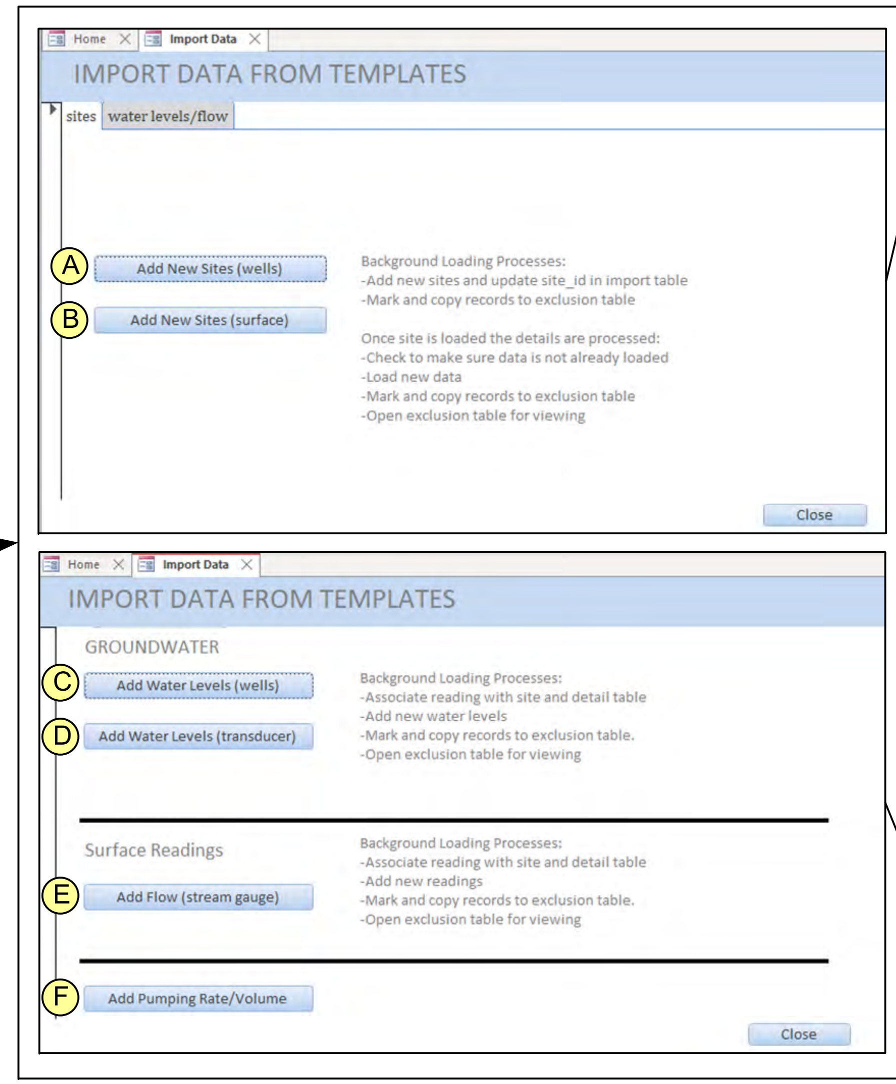
Group	Object Name	Object Type	Description
	update_import_water_quality_site_exclusions	Update Query	Adds exclusion_comment to the records in the "import_water_quality" table if neither Local Well Name nor SWN is found in the "dt_sites" table.
	update_import_water_quality_wc_exclusions	Update Query	Adds exclusion_comment to the records in the "import_water_quality" table if neither Local Well Name nor SWN is found in the "dt_well_details" table.
	update_lu_parameter_anlygroup_from_lu_anlygroup	Update Query	Copies the chemical info from the "lu_anlygroup" table to the "lu_parameters" table.
	update_site_wc_ids_inimport	Update Query	Adds wc_id to the records in the "import_water_quality" table if the matching Local Well Name/SWN is found in the "dt_well_details" table.
Import_GWL_logger	Exclusions_import_pumping	Table	Table for viewing the records from the "import_pumping_rate_volume" table that have not been loaded to the "dt_pumping" table.
	import_pumping_rate_volume	Table	Table for importing the pumping data.
	exclude_pumping_import	Append Query	Adds the records from the "import_pumping_rate_volume" table to the "Exclusions_import_pumping" table if the required well site info is missing.
	import_pumping_add_dt_pumping	Update Query	Formats the pumping data from the "import_pumping_rate_volume" table and adds them to the "dt_pumping" table. Does not add if a record with the same location, wpd_date, wpd_vol, wpd_vol_unit, and wpd_vol_period already exists in the "dt_pumping" table.
	import_pumping_update_wc_id	Update Query	Adds site_id and sd_id to the records in the "import_stream_gauge_flow" table if the matching location is found in the "dt_sites" table.
	update_import_pumping_pump_id	Update Query	Adds pump_id to the records in the "import_pumping_rate_volume" table if the matching wc_id, wpd_date, wpd_vol, wpd_vol_unit, and wpd_vol_period are found in the "dt_pumping" table.
VIEWS_base	q_Base_Pumping	Select Query	Shows the contents of select fields in the "dt_pumping" table.
	q_Base_SurfaceLevels	Select Query	Shows the contents of select fields in the "dt_site_levels" table.
	q_Base_WaterLevels	Select Query	Shows the contents of select fields in the "dt_water_levels" table.
	q_Base_WaterLevelsT	Select Query	Shows the contents of select fields in the "dt_water_levels_transducer" table.
	q_Base_WaterQuality	Select Query	Shows the contents of select fields in the "dt_samples" and "dt_results" tables.

DMS Object Map: Importing Data

"chart_WaterLevels_wells" Form



"frmImportData" Form



A

Input Tables:	Queries (run in order shown):	Output Tables:
• import_wells • lu_monitoring_network_type • lu_site_type	import_wells_update_site_id import_wells_update_site_id_state import_wells_add_dt_sites import_wells_update_site_id import_wells_update_site_id_state exclude_sites_import_wells import_wells_update_wc_id import_wells_add_dt_well_details import_wells_update_wc_id exclude_wc_import_wells	• dt_sites • dt_well_details • Exclusions_ import_wells

B

Input Tables:	Queries (run in order shown):	Output Tables:
• import_stream_gauge_sites • lu_monitoring_network_type • lu_site_type	import_sg_sites_update_site_id import_sg_sites_add_dt_sites import_sg_sites_update_site_id exclude_sites_import_gaugesites import_sg_sites_update_sd_id import_sg_sites_add_dt_site_details import_sg_sites_update_sd_id exclude_sd_import_gaugesites	• dt_sites • dt_site_details • Exclusions_import_stream _gauge_sites

C

Input Tables:	Queries (run in order shown):	Output Tables:
• import_gwl_manual • dt_sites • dt_well_details	import_gwlman_Update_siteID_wcID import_gwlman_Update_siteID_wcIDState Well import_gwlman_Update_wlID import_gwlman_add_dt_water_levels import_gwlman_Update_wlID exclude_wlm_import_gwlman update_display_rejected_water_levels	• dt_water_levels • Exclusions_import_gwl _manual

D

Input Tables:	Queries (run in order shown):	Output Tables:
• import_gwl_logger • dt_sites • dt_well_details	import_gwlt_update_site_id_wc_id_localname import_gwlt_update_site_id_wc_id_sitecode import_gwlt_update_wlt_id import_gwlt_add_dt_water_level_trans import_gwlt_update_wlt_id exclude_wlt_import_gwllogger update_display_rejected_water_levels_logger	• dt_water_levels_transducer • Exclusions_import_gwl _logger

E

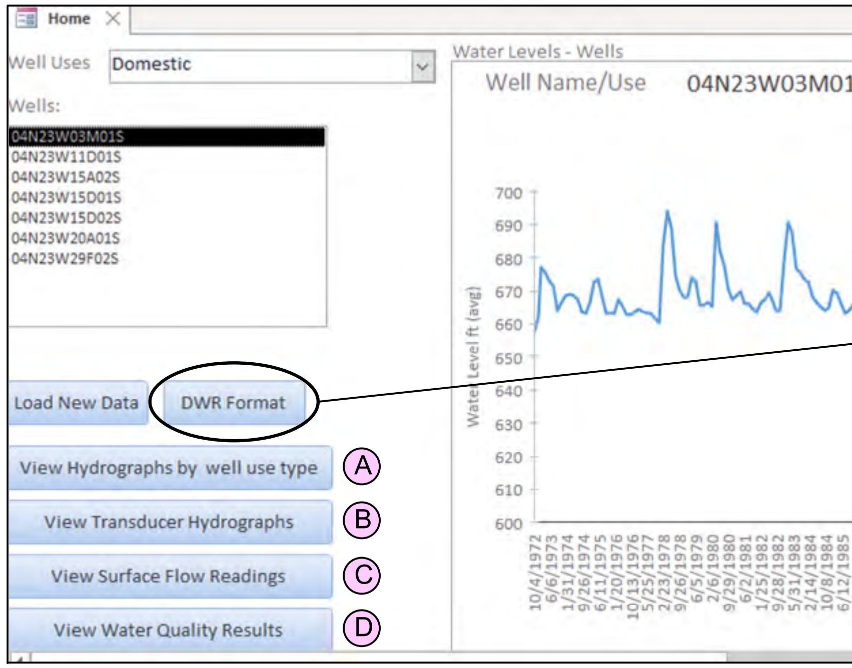
Input Tables:	Queries (run in order shown):	Output Tables:
• import_stream_gauge_flow • dt_sites • dt_site_details	import_sg_flow_site_id_sd_id import_sg_flow_add_dt_site_levels import_sg_flow_update_sl_id exclude_sgflow_import_stream_gauge_flow update_display_rejected_stream_flow	• dt_site_levels • Exclusions_import_stream _gauge_flow

F

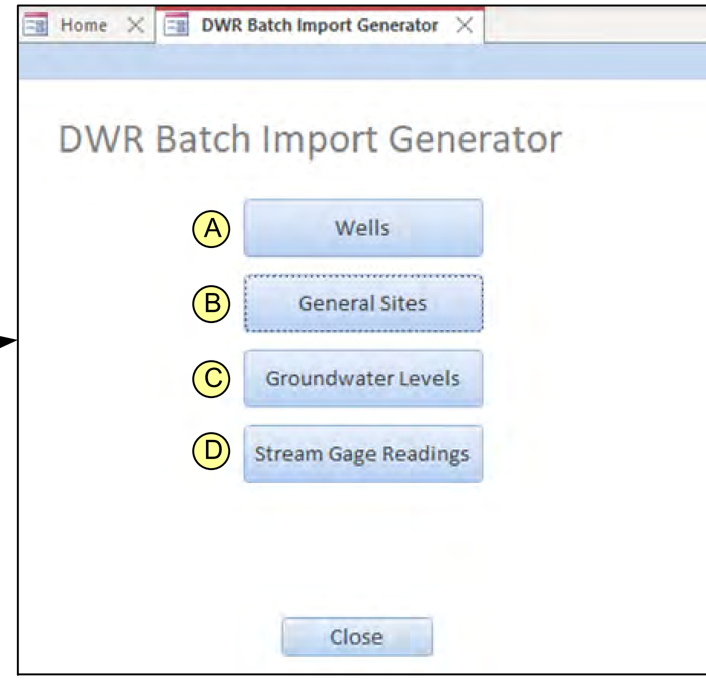
Input Tables:	Queries (run in order shown):	Output Tables:
• import_pumping_rate _volume • dt_sites • dt_well_details • dt_sources	import_pumping_update_wc_id update_import_pumping_pump_id import_pumping_add_dt_pumping update_import_pumping_pump_id exclude_pumping_import	• dt_pumping • Exclusions_import_pumping

DMS Object Map: Formatting Data & Graphing

“chart_WaterLevels_wells” Form



“frmDWR_Exports” Form



(A)

Input Tables:
- dt_sites
- dt_well_details
- lu_monitoring_network_type

Queries (run in order shown):
- dwr_append_batchWells

Output Tables:
- BatchImportWells_template

(B)

Input Tables:
- dt_sites
- dt_site_details
- dt_well_details

Queries (run in order shown):
- dwr_append_batchGeneralSitesGages
- dwr_append_batchGeneralSitesWells

Output Tables:
- BatchImportGeneralSites _template

(C)

Input Tables:
- dt_sites
- dt_well_details
- dt_water_levels
- dt_water_levels_transducer

Queries (run in order shown):
- dwr_append_batch_GWLD
- dwr_append_batch_GWLD_loggers

Output Tables:
- BatchImportGWLD_template

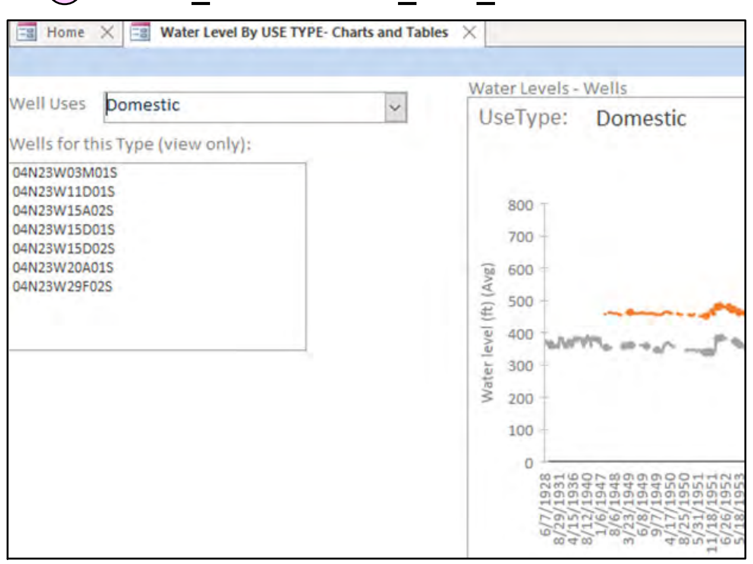
(D)

Input Tables:
- dt_sites
- dt_site_details
- dt_site_levels
- lu_site_type

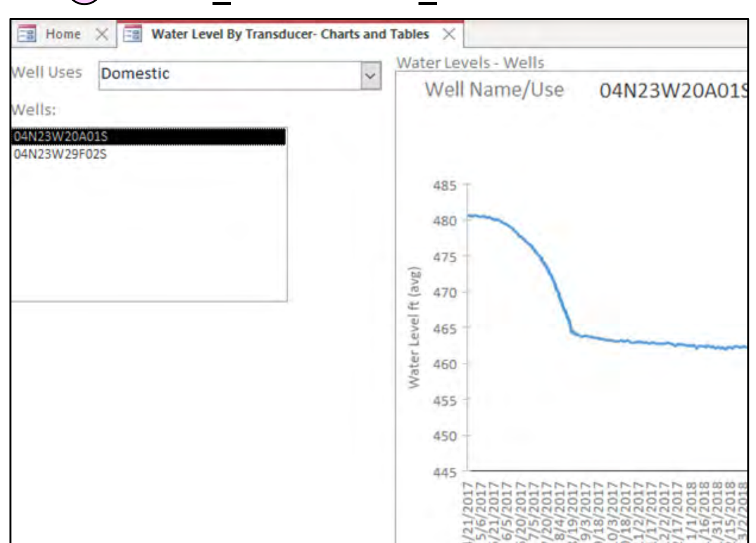
Queries (run in order shown):
- dwr_append_batchGenSitesData_gage

Output Tables:
- BatchImportGeneralSiteData _template

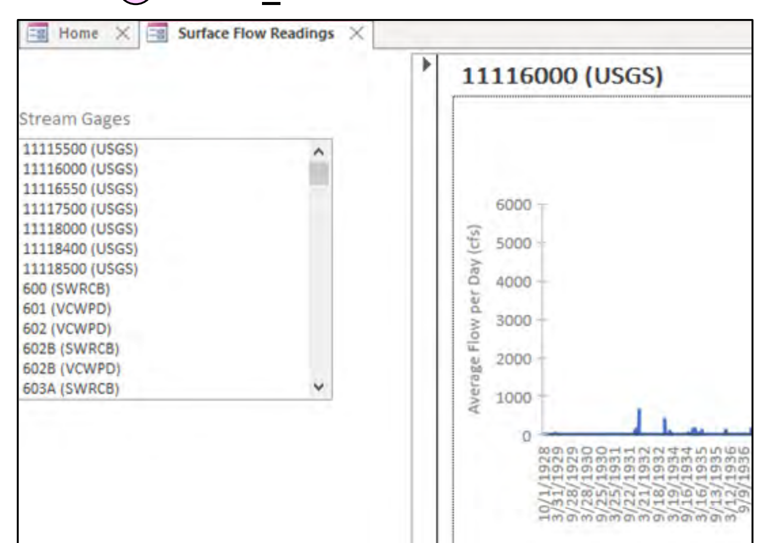
(A) “chart_WaterLevels_well_use” Form



(B) “chart_WaterLevels_wellsT” Form



(C) “chart_SurfaceLevels” Form



(D) “chart_WaterQuality” Form