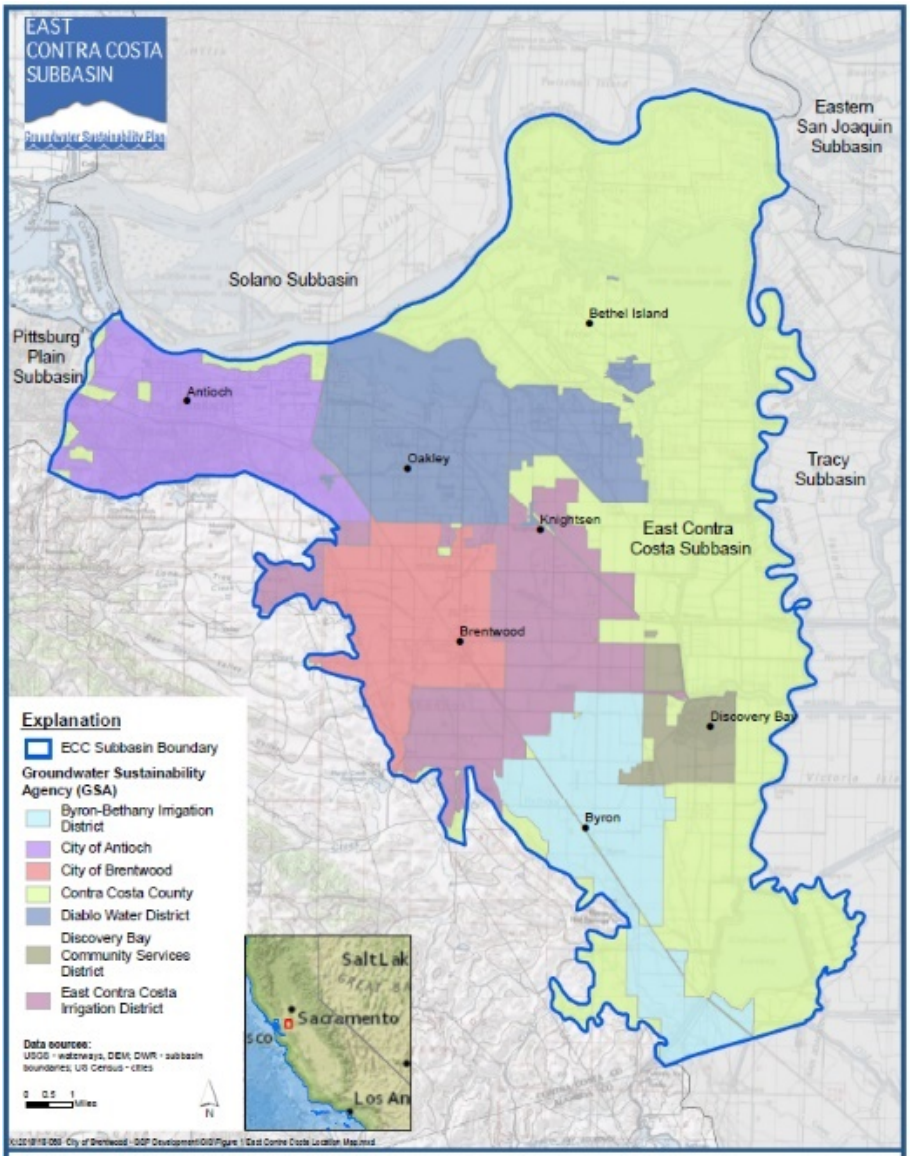
ES 1. EXECUTIVE SUMMARY (CCR §354.4(A))

In 2014, a three-bill legislative package, referred to as the Sustainable Groundwater Management Act (SGMA), created a fundamental change in the governance of California's groundwater. SGMA required the formation of groundwater sustainability agencies (GSAs) for over 140 groundwater basins, including the East Contra Costa (ECC) Subbasin. Signed into law by Governor Jerry Brown, and effective January 1, 2015, SGMA set forth a long-term, statewide framework to protect groundwater resources.

Under the new law, seven GSAs, each charged with the development and implementation of a groundwater sustainability plan (GSP), were formed within the ECC Subbasin (Subbasin). The purpose of a GSP is to sustainably manage groundwater and avoid undesirable results within and beyond the 50-year planning and implementation horizon. The GSAs along with partners, worked collaboratively to prepare this GSP. The Subbasin boundary and GSA areas are shown below.

Figure ES-1 East Contra Costa Subbasin Groundwater Sustainability Agencies



The GSP provides information demonstrating that the past and present actions of the ECC GSAs have created a sustainably managed groundwater basin. The GSP outlines planned management oversight and activities that will result in continued sustainability of the groundwater resources in east Contra Costa.

This Executive Summary and the companion GSP are organized as follows:

- Executive Summary
- Section 1 Introduction
- Section 2 Plan Area
- Section 3 Basin Setting
- Section 4 Historical, Current, and Projected Water Supply
- Section 5 Water Budget
- Section 6 Monitoring Network and Data Management System
- Section 7 Sustainable Management Criteria
- Section 8 Project and Management Actions
- Section 9 Plan Implementation
- Section 10 Notice and Communication

The following sections provide key factors about the ECC Subbasin and an overview of each section in the GSP.

ES 2. KEY FACTORS FOR THE ECC SUBBASIN GSP

Through preparation of this GSP, key factors governed the approach and planning to meet the requirements of new SGMA regulations to ensure sustainability of groundwater resources in the plan area (see **Figure ES-1**). Some of these factors are listed below.

ECC Subbasin Priority Ranking

Many groundwater basins and subbasins in the state have experienced significant adverse effects attributed to overpumping; that is, pumping that exceeds groundwater replenishment. Such basins were assigned Critically Overdrafted and High priority rankings. The ECC Subbasin shows no signs of overpumping and was assigned a Medium priority ranking and is required to submit a GSP in January 2022. Although the ECC Subbasin has not been overdrafted, its ranking was based on the importance that groundwater serves as a source of supply for varied uses including domestic, agricultural, and environmental. Domestic users include individual residences, small water systems, and municipalities. In addition, there are many disadvantaged communities[1] that rely on groundwater as a sole source of supply. East Contra Costa also has a long history of agriculture dating back over 100 years.

[1] Disadvantaged communities refer to the areas which most suffer from a combination of economic, health, and environmental burdens. The state identifies these areas by collecting and analyzing information from communities all over the state.
https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/disadvantaged-communities

Sustainable Conditions in the ECC Subbasin

Groundwater conditions in the ECC Subbasin are favorable and reflect stability over the past 30 years or more. Using various analogies, the Subbasin can be described as generally full through various water-year types, including drought, and is in good "health." The favorable conditions are in part due to surface water availability that represents the largest source of supply for municipal and agricultural uses in the Subbasin.

Outlook for Future Sustainability

Using the best available data and a robust water budget model, the ECC Subbasin is projected to be sustainable under various future scenarios including those that incorporate climate change and sea level rise.

Local Management of the ECC Subbasin

On March 28, 2019, the state approved a subdivision of the Tracy Subbasin that separated the East Contra Costa portion (now called the ECC Subbasin) from the San Joaquin County portion (retained the Tracy Subbasin name), thereby providing more local control of groundwater resources. In addition, seven GSAs were formed by local public agencies to ensure that their diverse constituents are represented in this GSP. If needed, each GSA has authorities to enact policies to protect groundwater resources based on conditions within their respective jurisdictions. This provides stakeholders with more focused engagement through a local GSA.

Non-Applicability to De Minimis Extractors

SGMA is intended to address existing and potential adverse effects typically attributed to the largest groundwater uses and users. Policies and programs aimed at achieving and maintaining sustainability may include pumping restrictions, fees, and reporting requirements. Such actions, which would be enacted locally by GSAs, *do not* apply to de minimis extractors. Under SGMA, a de minimis extractor is defined as a person who extracts two acre-feet or less per year of groundwater for domestic use. Thus, typical residential well owners are shielded from practically all potential management actions described in this GSP. Further, the GSP sustainability goal (**Section 7**) is intended to protect such users from adverse effects of sustainable management undertaken by the GSAs.

Impacts to Individual Wells

The GSP is concerned with protecting groundwater resources for future generations and maintaining sustainability as required under SGMA legislation. The GSP identifies baseline groundwater levels and water quality that protect all classes of beneficial users. The GSP *does not* mitigate conditions that were present prior to January 1, 2015 (Water Code 10727.2(b)(4)) such operational problems related to well features (e.g., depth, perforation interval, pump setting).

Water Quality

Groundwater contains numerous naturally occurring minerals that vary throughout the ECC Subbasin. While groundwater quality is generally favorable with respect to primary drinking water quality constituents, some areas have elevated total dissolved minerals, hardness, and some secondary constituents which may affect domestic and agricultural uses. The GSP is intended to avoid degradation of water quality through management actions that, for example, affect pumping patterns resulting movement and mixing of

groundwater sources that adversely affect certain users. The GSP does not mitigate groundwater quality in the Subbasin that is naturally occurring during the historical baseline.

Impacts of Drought

Temporary imbalances between extraction and replenishment due to drought are not considered an undesirable result as long as groundwater conditions recover in subsequent normal to wet years. Thus, a drop in groundwater levels may occur in very dry years, which may produce a short-term impact on wells.

ES 3. OVERVIEW OF THE GSP

An overview of each section of the ECC Subbasin GSP is presented below.

Section 1 Introduction

The ECC Subbasin, also referred to as San Joaquin Valley-East Contra Costa Subbasin (5-022.19), is a Medium priority groundwater basin based on the Groundwater Basin Prioritization by the State Department of Water Resources (DWR). Under SGMA, Medium priority subbasins must submit an adopted GSP by January 31, 2022. Management of the ECC Subbasin through the GSP will be based on achieving and maintaining groundwater sustainability over a 50-year planning and implementation horizon.

SGMA authorizes a "local public agency that has water supply, water management, or land use responsibilities within a groundwater subbasin or basin to elect to become a GSA and to develop, adopt, and implement a GSP (Water Code § 10721(n).)" The following agencies formed GSAs and coordinated preparation of this GSP. **Figure ES-1** shows the service area for each GSA.

- Byron Bethany Irrigation District (BBID) GSA
- City of Antioch GSA
- City of Brentwood GSA
- Contra Costa County (CCC) GSA
- Diablo Water District (DWD) GSA
- Discovery Bay Community Services District (DBCSD[2]) GSA
- East Contra Costa Irrigation District (ECCID) GSA

Contra Costa Water District (CCWD), while not a GSA, is a partner in the development of this jointly prepared GSP. CCWD provides surface water to various entities within its service area. Because surface water plays a part in future water resources management for the Subbasin, CCWD is an equal partner in the development of the ECC Subbasin GSP.

On May 9, 2017, the seven GSAs and CCWD entered into a Memorandum of Understanding (MOU). Under this MOU the agencies share costs and management of the development and implementation of the GSP.

[2] Also referred to as Town of Discovery Bay (TODB).

Section 2 Plan Area

The ECC Subbasin covers a 168-square mile area (107,596 acres) in the eastern portion of Contra Costa County (**Figure ES-1**). The Subbasin includes the communities of Antioch, Bethel Island, Byron, Brentwood, the Town of Discovery Bay (TODB), Knightsen, and Oakley and two agricultural districts (Byron Bethany Irrigation District and East Contra Costa Irrigation District). The Subbasin is located on the southwestern part of the Sacramento-San Joaquin Delta, which is the largest estuary on the West Coast and provides critical habitat to fish and wildlife species. The 2015 land use in the Subbasin is mainly agricultural (41 percent), followed by urban (about 23 percent), then by water and native vegetation (both about 14 percent). As quantified in Section 4, the Subbasin has three main water supply sources: surface water, groundwater, and recycled water. Surface water provides, on average, about 80 percent of the aggregate demand for all use sectors in the Subbasin. This percentage is projected to remain stable at 80 to 85 percent through at least 2050 (see **Section 4**, **Table 4-5**).

Section 3 Basin Setting

The ECC Subbasin setting is described through a hydrogeologic conceptual model depicting the physical features of the aquifer system and groundwater conditions.

Hydrogeologic Conceptual Model

- ECC Subbasin is bounded on the north, east, and south by the Contra Costa County line, which is contiguous with the San Joaquin River (north) and Old River (east). In the west, the Subbasin is bounded by marine sediments of the Coast Range.
- Topography and geological formations gently slope to the northwest. The upper 400 feet of sediments are comprised of alluvial deposits with discontinuous clay layers interspersed with more permeable coarse-grained units.
- The ECC Subbasin aquifer system is divided into the upper unconfined Shallow Zone (to about 150 feet below ground surface) and a lower semi-confined to confined Deep Zone (the Corcoran Clay is not present in the Subbasin). Most water wells are constructed within the upper 400 feet of the aquifer system.
- Groundwater conditions throughout the Subbasin are monitored through water level measurements and water quality testing. Water level data indicate that groundwater storage is largely stable and fluctuate with water-year type (wet, normal, dry).

Sustainability Indicators

DWR is charged with determining the adequacy of GSPs in meeting SGMA's requirements. Generally, to achieve sustainability, the amount of groundwater extracted must be less than or equal to the amount of groundwater replenishment. Temporary imbalances between extraction and replenishment due to drought are not considered an undesirable result as long as groundwater conditions recover in subsequent normal to wet years. In addition, the GSP regulations[3] list six sustainability indicators that must be addressed in GSPs.

[3] California Water Code § 354.26

California Department of Water Resources, 2016

Following are the ECC findings for each of the sustainability indicators.

- **Groundwater Elevations**- Groundwater levels in the ECC Subbasin are stable indicating that the Subbasin has been managed within its sustainable yield[4]. This is partially due to surface water availability for agricultural and urban uses.
- **Change in Groundwater Storage** - As determined through the water budget analysis in **Section 5**, the cumulative change in groundwater storage was unchanged between 1997 and 2018 despite three drought periods (2001-2002, 2007-2009, 2012-2016).
- **Seawater Intrusion** - The ECC Subbasin is situated in the San Francisco Bay/Sacramento-San Joaquin Delta. This GSP recognizes the potential for interactions between saline baywater and shallow groundwater. While the baywater is fresh, adverse intrusion may occur if saline water infiltrates the Delta and intrudes into shallow groundwater. This potential mechanism may be triggered or exacerbated by sea level rise and/or shifts in groundwater flow directions and gradients caused by future pumping patterns. There is no direct connection between ocean seawater and groundwater in the Subbasin.
- **Groundwater Quality** - Groundwater quality is generally favorable with respect to primary drinking water quality constituents. Naturally elevated mineral content may pose localized restrictions for domestic (e.g., hardness) and agricultural (crop sensitivity) uses. Key monitoring constituents are total dissolved solids, chloride, hardness, nitrate, and boron. With the exception of nitrate, these constituents are naturally occurring in the ECC Subbasin.
- **Land Subsidence** - There is no historical evidence of inelastic land subsidence due to groundwater withdrawal in the ECC Subbasin.
- **Depletions of Interconnected Surface Water** – This indicator is of concern where shallow groundwater and surface water are hydraulically connected. Marsh Creek, the San Joaquin River, and Old River are considered interconnected surface water bodies in the ECC Subbasin. Impacts to these features due to groundwater pumping will be managed through this GSP through monitoring of shallow wells and stream gage stations.

[4] "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. Cited from: Section 10733.2, Water Code

Section 4 Historical, Current, and Projected Water Supply

This section describes the ECC Subbasin land uses, population, and metered historical, current and projected water supplies. Water supply amounts were provided by the GSAs and CCWD. When historical or projected water supply were not provided, land uses and population data were used to estimate these data. This information is integrated into the Subbasin surface water/groundwater model (GSP **Section 5**).

Section 5 Water Budget

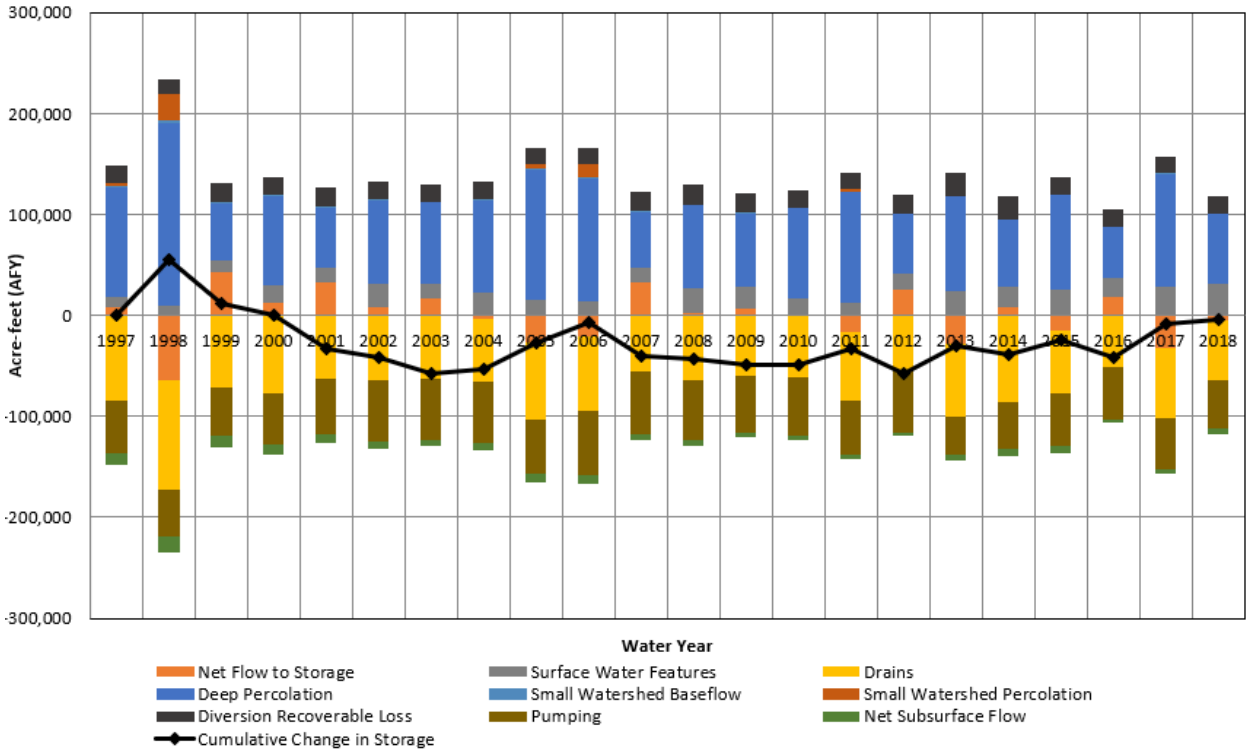
In accordance with technical guidance documents provided by DWR, water budget scenarios were evaluated using a groundwater flow model that quantified historical, current, and projected groundwater budget conditions. The development of the ECC Groundwater-Surface Water Simulation Model (ECCSim) was a refinement of two other validated and widely used modeling platforms, IWFM and C2VSim-FG Beta2[5]. These were selected as the modeling platform due to the versatility in simulating crop-water demands in the predominantly agricultural setting of the Subbasin, groundwater surface-water interaction, the existing hydrologic inputs existing in the model for the time period through the end of water year 2015, and the ability to customize the existing C2VSim-FG Beta2 model to be more representative of local conditions in the area of the ECC Subbasin. Use of publicly available modeling platforms is a guiding principle under DWR Best Management Practices[6] and facilitates independent assessment of modeling results.

Based on the modeling results, the ECC Subbasin is historically, currently, and projected to be sustainable. **Figure ES-2** shows a breakdown in water budget components for the model base period of 1997 to 2018. The modeling results indicate that the cumulative change in groundwater storage fluctuated while cumulative storage was essentially unchanged at the end of the base period despite three state-wide drought periods (2001-2002, 2007-2009, 2012-2016). Over the base period, total pumping in the Subbasin ranged from 38,000 to 64,000 AF and averaged 54,000 AFY.

[5] The development of the East Contra Costa Groundwater-Surface Water Simulation Model (ECCSim) involved starting with and evaluating the U.S. Geological Survey's Central Valley Hydrologic Model (CVHM) and the beta version (released 5/1/2018) of DWR's fine-grid version of the California Central Valley Groundwater-Surface Water Flow Model (C2VSim-FG Beta2). C2VSim-FG Beta2 utilizes the most current version of the Integrated Water Flow Model (IWFM) code available at the time of the ECCSim development.

[6] 23 CCR §352.4(f)

Figure ES-2 Groundwater Budget for East Contra Costa Subbasin Historical Calibration Period (1997-2018)



Various future scenarios were evaluated using the ECC Subbasin groundwater flow model including sustainable yield. The projected sustainable yield is the amount of pumping that can occur while avoiding undesirable results for the six sustainability indicators. The sustainable yield for the ECC Subbasin is estimated at approximately 75,000 AFY, or about 50 percent greater pumping than the historical average. At higher levels of pumping, the modeling indicates the potential to increase streamflow depletion and inter-basin flow beyond historical baselines. Like the base period scenario, a chronic decline in groundwater storage was not a factor in the sustainable yield threshold.

The projected water budget was also evaluated under climate change and sea level rise. Based on the model results, the ECC Subbasin is projected to be sustainable over the 50-year implementation and planning horizon required under SGMA.

Through adaptive management, the groundwater flow detailed in **Section 5** will be updated and refined to reflect actual future conditions and serve in the adaptive management of the ECC Subbasin using the best available information.

Section 6 Monitoring Networks and Data Management System

Monitoring networks are developed to quantify current and future groundwater conditions in the ECC Subbasin, as well as within individual GSA jurisdictions. Monitoring networks were developed for each of the six SGMA sustainability indicators. Some sustainability indicators needed to be expanded to fill data gaps and improve the ability to demonstrate sustainability and refine the hydrogeologic conceptual model. The networks include:

- **Groundwater Level Monitoring Network**- Groundwater level data from a network of monitoring wells reflect groundwater occurrence, flow direction, hydraulic gradients between principal aquifers, and interaction between groundwater and surface water features. Dedicated monitoring wells are located within the jurisdiction of the seven GSAs. The ECC Subbasin has 55 basin-wide wells and 12 of these comprise a network of representative monitoring sites (RMS) as defined under new regulations governing GSPs.
- **Groundwater Storage** – Groundwater levels serve as a proxy for the groundwater storage sustainability indicator monitoring network.
- **Seawater Intrusion** – Intrusion of saline baywater, if it occurs, is evaluated based on chloride concentrations from monitoring wells adjacent to the San Joaquin River.
- **Groundwater Quality** –Groundwater quality monitoring will be conducted at an existing network of 22 basin-wide water supply wells, 11 of these are part of a representative monitoring network.
- **Land Subsidence** – A land subsidence monitoring network is comprised of four Plate Boundary Observatory (PBO) stations in and adjacent to the ECC Subbasin and data collected by DWR using InSAR[7] satellite data.
- **Interconnected Surface Water** – Interconnected surface water will be monitored through existing stream gages (19) and Shallow Zone groundwater level monitoring wells (15). New shallow wells were installed as part of this GSP to address a data gap.

A Data Management System (DMS) was developed to store and analyze data collected as part of this GSP. With submittal and implementation of the ECC Subbasin GSP, there will be a publicly accessible weblink to view reports, maps, graphs, and current data under the Subbasin monitoring plan.

[7] InSAR is Interferometric Synthetic Aperture Radar.

Section 7 Sustainable Management Criteria

Sustainable management criteria include establishing a sustainability goal for the Subbasin, defining undesirable results, and quantifying minimum thresholds and measurable objectives.

The sustainability goal for the ECC Subbasin GSP is to manage the groundwater Subbasin to:

- Protect and maintain safe and reliable sources of groundwater for all beneficial uses and users.
- Ensure current and future groundwater demands account for changing groundwater conditions due to climate change.
- Establish and protect sustainable yield for the Subbasin by achieving measurable objectives set forth in this GSP in accordance with implementation and planning periods[8].
- Avoid undesirable results defined in the GSP in accordance with SGMA.

Sustainable management criteria (SMC) also define the conditions that constitute sustainable groundwater management. Note that undesirable results have not occurred historically in the ECC Subbasin and are not projected to occur in the future. The sustainable management criteria will commit the GSAs to meeting the sustainability goal for the Subbasin.

Table ES-1 summarizes the SMC for the six SGMA sustainability indicators and includes the minimum thresholds and measurable objectives required under GSP regulations:

Table ES-1 Sustainable Management Criteria Summary

Sustainability Indicator	Measurable Objective (MO)	Minimum Threshold (MT)	Undesirable Result
Chronic Lowering of Groundwater Levels	Average spring elevation of groundwater at the Representative Monitoring Site (RMS) and its vicinity	The lowest historical water levels observed in a well plus an additional 10 feet lower	The MT in any well is exceeded over three consecutive years, indicating a trend, and do not recover in normal to wet years
Reduction in Groundwater Storage	Use as a proxy, the MO for chronic lowering of groundwater levels	Use as a proxy, the MT for chronic lowering of groundwater levels	Use as a proxy, the undesirable result for chronic lowering of groundwater levels
Seawater intrusion	The MO at each RMS is the average chloride concentrations from 2013 to 2017.	Chloride concentration for any Shallow Zone or Deep Zone well is set at 250 mg/L secondary maximum contaminant level	A bayside monitoring well has a chloride concentration above 250 mg/L over three consecutive years and is determined to be induced by GSAs' actions.

[8] As defined under SGMA, the GSP implementation period is 20 years. The planning and implementation horizon is a 50-year time period over which the GSAs determine that plans and measures will be implemented to ensure that the basin or subbasin is operated within its sustainable yield.

Sustainability Indicator	Measurable Objective (MO)	Minimum Threshold (MT)	Undesirable Result
Degraded Groundwater Quality	The MO for each RMS is the average concentrations (2013 to 2017) for each constituent of concern	The three-year running average exceedance of an MCL for a key monitoring constituent.	Any RMS that exceeds any state drinking water standard during GSP implementation because of GSAs' actions
Land Subsidence	The MO is set at UNAVCO station P256 at the average seasonal elastic movement (0.6 inch vertical).	An MT of 1-inch land surface elevation outside the historical elastic range over a three-year period as shown by monitoring data at the UNAVCO site P256.	Associated impacts due to groundwater pumping: • Impacts to infrastructure such as damage to roads and structures, reduced capacity of water conveyances, and increased vulnerability to flooding.
Depletion of interconnected surface water	The MO is set at the average annual groundwater pumping during the Base Period 1997 to 2018, or 54,000 AFY.	Based on the groundwater flow model results, a conservative interim MT is set at a value for sustained basin-wide pumping above the historic baseline average which induces exceedances in estimated streamflow depletion as compared to baseline conditions. [9]	Depletions that result in reductions in flow or stage of major rivers and streams that are hydrologically connected to groundwater in the Subbasin and which cause significant and unreasonable impacts on beneficial uses and users of surface water and the environment

Section 8 Projects and Management Actions

Projects and management actions (PMAs) were developed to achieve the ECC Subbasin sustainability goal by 2042 and avoid undesirable results during and beyond the GSP planning and implementation horizon. Because the ECC Subbasin is currently and projected to be sustainable (i.e., no onset of undesirable results), PMAs are not expected to be essential for sustainability. However, future conditions are uncertain and PMAs will be employed through the principle of adaptive management on an as-needed basis.

[9] The interim MT for interconnected surface water will be replaced with monitored shallow groundwater levels and calculations of the rate or volume of depletion when the data gap for shallow monitoring is filled as described in **Section 6**.

Seven projects are included in the GSP representing a variety of project types to increase water supply availability and reliability including infrastructure to provide in-lieu recharge, improve water quality, and increase use of recycled wastewater. Projects are divided into three status categories: completed, under construction, and planned. The three completed projects are operating and provide in-lieu groundwater benefits of over 5,500 AFY. The two projects under construction will be operating by 2042 and are projected to provide over 8,000 AFY.

Management actions consisting of water well policies (e.g., metering and reporting, spacing, and construction features) and demand management would be implemented locally by individual GSAs on an as-needed basis. Except for a measure designed to protect water quality, such as seal depths, such management actions are not applicable to de minimis users.

Section 9 Plan Implementation

Estimated Cost to Implement the GSP

The estimated total cost to the ECC GSP Working Group[10] over the first five years of GSP implementation is between $2.6 and 3.1 million. Costs are based on best available estimates. These costs include public outreach, monitoring and well maintenance, data management, and GSP reporting (e.g., annual and 5-year updates). Individual member agencies will continue to fund individual projects and/or management actions and monitoring activities. The budget will be adjusted over time as the GSP implementation costs are better understood through sustainable management activities and guidance from DWR on the submitted GSP and subsequent reporting.

Implementation of the projects will be borne by the project proponents.

Funding Sources and Mechanisms

GSA implementation costs will be paid for through contributions from the member GSAs and CCWD under a cost-sharing arrangement to be developed following GSP adoption. Grant funding will be pursued when available.

Schedule for Implementation

Figure ES-3 provides a projected schedule for ECC GSP implementation including outreach and communication, monitoring, and GSP reporting activities.

[10] ECC GSP Working Group consists of the seven GSAs and Contra Costa Water District.

Figure ES-3 GSP Implementation Schedule

Task Name	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Plan Implementation																					
GSP Submittal to DWR	x																				
Joint Implementation Agreement			x																		
Outreach and Communication																					
Monitoring and DMS																					
GSP Reporting																					
Annual Reports	x	x	x	x	x		x	x	x	x		x	x	x	x		x	x	x	x	
5-year GSP Evaluation Reports						x					x					x					x

x Indicates a submittal.
Indicates ongoing event.

Section 10 Notice and Communication

Development of the ECC GSP was a collaborative effort among the ECC GSP Working Group (seven GSAs and CCWD), technical consultants, community members, and stakeholders. The Working Group conducted over 40 meetings, from 2018 to 2021. Documents posted to a publicly accessible website, Working Group meeting notes, surveys, newspaper notices, and direct email outreach were used to keep the public informed of the GSP development and provide opportunities for public input.

The Working Group members also provided regular updates through individual agency public meetings and websites. Information was also provided through social media by those agencies with a presence on such platforms. Three public workshops, held between July 2020 and September 2021, were used to inform and engage beneficial users of groundwater in the ECC Subbasin and discuss each section of the GSP. Stakeholder comments were incorporated into the final GSP.