EXECUTIVE SUMMARY (ES)

The Santa Cruz Mid-County Groundwater Agency (MGA or Agency) developed this Groundwater Sustainability Plan (GSP or Plan) for the Santa Cruz Mid-County Groundwater Basin (Basin) (Basin Number 3-001). The purpose of the Plan is to guide groundwater management that ensures long-term sustainability of the Basin's groundwater resources. The Plan presents detailed information on the Basin, including groundwater conditions, water resource monitoring and management programs, land uses, and other background information. The Plan sets sustainability management criteria (SMC) for each of the five sustainability indicators applicable to the Basin, and identifies projects and management actions to achieve and maintain Basin sustainability. The Plan includes details about the Basin monitoring network and the monitoring program that will be implemented to measure progress toward Basin sustainability. Finally, the Plan outlines annual and periodic (five-year) reports on GSP implementation that the MGA is required to submit to the California Department of Water Resources (DWR) under the Sustainable Groundwater Management Act (SGMA).

The GSP and this Executive Summary are organized following DWR's guidance documents (DWR, 2016). The Plan includes:

- Executive Summary
- Section 1 Introduction
- Section 2 Plan and Basin Setting
- Section 3 Sustainable Management Criteria
- Section 4 Projects and Management Actions to Achieve Sustainability Goal
- Section 5 Plan Implementation
- Section 6 References and Technical Studies

ES Section 1.0 Introduction

Effective January 1, 2015, the State of California enacted SGMA, the first legislation in the state's history to comprehensively mandate the sustainable management of the state's groundwater resources. The SGMA requires the establishment of Groundwater Sustainability Agencies (GSA) charged with the obligation to develop and implement a GSP that will guide ongoing management of their groundwater basins with a goal to achieve and maintain Basin sustainability over a 50-year planning and implementation horizon.

In response to the SGMA, the MGA formed in March 2016 as the designated GSA for the Santa Cruz Mid-County Groundwater Basin. The MGA was formed as a Joint Exercise of Powers Agency, with four member agencies: Central Water District, City of Santa Cruz, County of Santa Cruz, and Soquel Creek Water District. These are the principal public agencies that use groundwater from or regulate groundwater extraction and/or land use activities within the Basin.

These four agencies have been actively collaborating since the 1990's to improve groundwater management in the Basin, well before SGMA became law in 2015.

The MGA is governed by an 11-member board of directors consisting of two representatives from each member agency and three private well owner representatives. As authorized under SGMA and the JPA, the MGA has the authority to carry out management actions, exercise powers, and accept responsibility for managing groundwater sustainably within the Basin.

Based upon DWR's classification of the Basin as a high priority basin in a state of critical overdraft, the MGA is required to submit its approved GSP to DWR by January 31, 2020. The MGA initiated development of the GSP in 2017. Plan development was a collaborative effort between the member agencies and technical consultants, and was informed by the input of resource management agencies, community members, and stakeholders. The SGMA includes detailed requirements for public engagement during the development and ongoing implementation of GSPs. The MGA, committed to effective public outreach, implemented a robust community engagement effort that began prior to the Agency's inception.

In recognition of the fundamental importance of public engagement in the GSP development process, the MGA Board established a GSP Advisory Committee selected from a well-qualified pool of community-member applicants representing groundwater users and stakeholders in the Basin. The 13 members represented: Agricultural, Business, Environmental Uses, Institutional Users, Small Water Systems, and Water Utility Rate Payers. Between October 2017 and June 2019, the GSP Advisory Committee convened in 20 formal meetings, additional orientation sessions, enrichment sessions, and technical working groups. They worked collaboratively in an open and public process to deliberate based on scientific data regarding current and projected basin conditions. The Committee provided the Board with recommendations on how to address key policy issues required by SGMA and their recommendations directly informed Sustainable Management Criteria developed for each sustainability indicator.

Throughout GSP development, the MGA provided many public outreach opportunities as summarized in Table ES-1. Individual member agencies also conducted outreach to their customers to inform them of the MGA's groundwater sustainability efforts.

Table ES-1. Summary of Public Outreach

Topic	Detail
Public Meetings	• 12 private well owner/stakeholder meetings between May 2014 and June 2018 • 6 informational sessions between October 2017 and April 2019 • 2-hour community drop-in sessions every other month since 2016 • 20 GSP Advisory committee meetings between October 2017 and June 2019 • 2 GSP Workshops and 1 GSP Q&A Session planned between July 2019 and August 2019 • 34 MGA, SAGMC, BIG, GSA FC meetings between February 2014 and June 2019

Topic	Detail
Postcard Mailings and letters	• June 2019 – GSP Survey and Plan update to all Basin residents and owners • March 2018 – GSP update to private well owners and small water systems • June 2017 – GSP update meeting to private well owners and small water systems • January 2017 - GSP update meeting to Basin agricultural and commercial pumpers • December 2015 – GSP update meeting to private well owners
Survey	• June 2019 - GSP outreach mechanism and to inform future MGA outreach efforts • Nov 2017 to May 2018 - Private well owner outreach to inform GSP planning process
Email List-Serve	• Monthly E-newsletter to approximately 650 unique email addresses, including interested parties
Brochure	Targeted at rural users mailed to all private well owners and small water systems
Road Signs	4 message boards placed at prominent thoroughfares before meetings and events
Public MGA Board Meetings	34 public Board meetings between February 2014 and June 2019 for MGA, and predecessor agencies
GSP Advisory Committee	Total of 20 monthly public meetings from October 2017 through June 2019
Surface Water-Groundwater Working Group	4 Surface Water Working Group meetings consisting of GSP Advisory Committee participants, resource agencies, local planning agencies, and environmental groups.
Tabling and Presentations	Connecting the Drops, Water Harvest Festival, presentations and conferences
Website	midcountygroundwater.org
Miscellaneous	Newspaper articles/editorials, social media through partner agencies, handouts, tour, tabling events

As required by SGMA, the GSP includes a sustainability goal for the Basin, which is to:

> Manage the groundwater Basin to ensure beneficial uses and users have access to a safe and reliable groundwater supply that meets current and future Basin demand without causing undesirable results and:

- Ensures groundwater is available for beneficial uses and a diverse population of beneficial users;
- Protects groundwater supply against seawater intrusion;
- Prevents groundwater overdraft within the Basin and resolves problems resulting from prior overdraft;
- Maintains or enhances groundwater levels where groundwater dependent ecosystems exist;
- Maintains or enhances groundwater contributions to streamflow;
- Supports reliable groundwater supply and quality to promote public health and welfare;
- Ensures operational flexibility within the Basin by maintaining a drought reserve;
- Accounts for changing groundwater conditions related to projected climate change and sea level rise in Basin planning and management; and,

- Does no harm to neighboring groundwater basins in regional efforts to achieve groundwater sustainability.

ES Section 2.0 Plan and Basin Setting

Section 2 describes the Basin setting based on existing studies relating to geology, climate, historical groundwater conditions and Basin management.

The Basin extends from the Santa Cruz Mountains to the Pacific Ocean – the hydrologic connection between the coastal portions of the Basin's freshwater aquifers and seawater has a defining role in shaping the Basin's setting and its historic and current management. The Plan area and Basin setting are defined by both geologic and jurisdictional boundaries. The Basin includes a portion of the City of Santa Cruz, all of the City of Capitola, and unincorporated areas of Santa Cruz County. Land use in the Basin is predominantly residential (50%) and open space/parks (34%), with limited commercial (8%) and agriculture (2%). Land use is further divided between urban and rural areas; development densities are greatest in the urban/suburban areas located on the coastal terraces and much lower in the rural areas in the foothills and mountains.

The Basin extends under Monterey Bay, at the northern end of the Central Coast hydrologic region. All the major water supply purveyors in Santa Cruz County rely upon local sources and receive no imported water from outside the County. The estimated population within the Basin is 92,000 (AMBAG, 2018). Approximately 80,500 residents (88%) receive water from municipal suppliers and 11,600 are supplied by private wells or small water systems. Roughly 50,000 of Basin residents (54%) rely solely upon groundwater. The remaining 42,000 are served by the City of Santa Cruz Water Department (SCWD). In years with average or above average rainfall SCWD's water supply is approximately 95% surface water from outside the Basin and 5% groundwater from within the Basin (SCWD, 2016).

There are two water-bearing geologic formations within the Basin: the Purisima Formation and the Aromas Red Sands. The Basin is dominated by the Purisima Formation which extends throughout the Basin and overlies granitic basement rock. The Aromas Red Sands overlie the Purisima Formation in the western third of the Basin, east of Valencia Creek. The Purisima Formation is divided up into a sequence of named aquifer and aquitard layers, where the Aromas Red Sands is considered a single aquifer unit that has significant heterogeneities. Both the Purisima Formation and Aromas Red Sands aquifers are hydrologically connected to the Pacific Ocean. This connection creates a threat of seawater intrusion into the freshwater aquifers when groundwater pumping from the Basin exceeds natural and artificial groundwater recharge into the Basin.

The Purisima Formation dips to the southeast, groundwater flows southeast toward the Basin boundary with the Pajaro Valley Sub-Basin. Because of the interlayering of aquifers with aquitards, groundwater is confined in some Purisima aquifer units. Groundwater produced in the

Basin is generally of good quality and does not regularly exceed primary drinking water standards.

DWR classified the Basin as high priority and designated it as critically overdrafted because of seawater intrusion (DWR, 2018b). Groundwater extractions in the Basin peaked between the mid-1980s and mid 1990's causing historic groundwater overdraft when pumping exceeded natural groundwater recharge. Overpumping of Basin aquifers dramatically lowered groundwater elevations in the coastal portions of the Basin where the majority of municipal pumping takes place between 35 and 140 feet lower than current levels. Lowered groundwater levels allowed seawater intrusion into portions of the aquifer and posed the threat of more widespread saltwater intrusion. Since 1995, extensive and effective water conservation efforts have reduced water demand and total Basin groundwater pumping. Recent Basin management has and will continue to focus on controlling seawater intrusion to keep groundwater elevations at the coast high enough to prevent further onshore movement of seawater into the Basin's coastal freshwater aquifers. Section 2 of GSP details the Plan Area and Basin Setting.

The first hydrogeologic study of the Soquel-Aptos area, which the greatest demand for water was conducted by the USGS in 1968 (Hickey, 1968). The USGS identified the regional aquifers that support groundwater production, described how groundwater pumping created conditions to draw the saltwater wedge closer to shore, and noted seawater intrusion as the greatest threat to regional groundwater production, but that it had not yet come onshore. The natural groundwater discharge from the Purisima aquifers was estimated to be 10,000 acre-feet per year (Hickey, 1968). In 1980, in response to observed seawater intrusion in the Purisima aquifers, the USGS produced a report on seawater intrusion and potential yield of aquifers in the Soquel-Aptos area (Muir, 1980). This report concluded pumping from the Purisima Formation, averaging about 5,400 acre-feet per year since 1970, had caused groundwater levels along the coast to decline below sea level and allowed seawater to enter the aquifer. Potential yields of the two principal aquifers in the Soquel-Aptos area were included in the report: 4,400 acre-feet per year from the Purisima Formation and 1,500 acre-feet per year from the Aromas Red Sands (Muir, 1980).

Over the past 30 years, and especially in the past ten years, groundwater levels in the Basin have recovered from the historic low levels that occurred in the 1980s. In 2017, the highest groundwater elevation conditions were measured since groundwater monitoring began. These improved groundwater elevations are a result of ongoing management actions taken to protect against seawater intrusion, including redistributing pumping inland, water conservation, and related efforts to reduce water demand. After below average rainfall in Water Year 2018, groundwater levels have declined slightly from 2017 and are still below protective groundwater elevations set to protect against seawater intrusion in 5 of 13 coastal monitoring wells. Projected future groundwater levels, that include conservative projections of climate change and sea level rise, are not expected to improve to above protective groundwater elevations without the additional projects and management actions described in this Plan, or significant and ongoing groundwater curtailment by Basin water users.

Groundwater Model

Understanding of the Basin and projections of groundwater conditions is based on the use of the Basin GSFLOW model (model), which is a computerized mathematical model that simulates basin-wide hydrogeologic and hydrologic conditions. The model is an integrated surface water and groundwater model that combines both Precipitation-Runoff Modeling System (PRMS) and MODFLOW code. PRMS handles watershed flows, MODFLOW simulates subsurface flow, and the MODFLOW Streamflow-Routing (SFR) package simulates streamflow.

Nine model layers simulate major hydrostratigraphic units in the Basin that include both aquifers and aquitards. The model is calibrated using measured groundwater level data from 121 individual monitoring locations, streamflow data from 11 stream gauges, and potential ET and solar radiation data from two weather stations. The calibrated MGA Model is used to simulate both historical and future groundwater levels, streamflow and other Basin conditions. With this tool, the MGA can evaluate how the Basin might respond to the implementation of projects, management actions, or other Basin planning scenarios. For example, by simulating changes in the amount of inland groundwater pumping, model results indicated that inland groundwater pumping had little effect on coastal groundwater levels and seawater intrusion. The model is also used to develop historical, present and future water budgets, and calculate changes in groundwater storage.

All groundwater models contain assumptions and some level of uncertainty, particularly when predicting future conditions. Model uncertainty stems from heterogeneity in Basin geology, hydrology, and climate. However, inputs to the model are carefully selected using best available data and science, resulting in a model well suited to predict Basin hydrogeologic conditions. As GSP implementation proceeds, the model will be updated and recalibrated as new data are obtained to better inform model simulations of water budgets and Basin responses to changes. Specific assumptions implemented when modeling future conditions are discussed in Section 2.2.3.6.1.

Projected Future Basin Conditions, Land Use and Water Use

The Plan includes projects and management actions to eliminate Basin current overdraft conditions and to maintain sustainability under future Basin conditions that take into account projected changes in land use, water use, and climate. The projected climate change effects include 2.3 feet of sea level rise by 2070 and a catalog of warmer climate years with an average temperature increase of 2.4° F, a decrease in precipitation of 1.3 - 3.1 inches per year, and a 6% increase in evapotranspiration. Land use patterns are assumed to be unchanged. Projected non-municipal groundwater demand for domestic use assumes pre-drought (2012 – 2015) water demand of 0.35 acre-feet per year per household. The assumed water demand is applied to projected annual population growths of 4.2% pre-2035 and 2.1% post-2035. Groundwater demand for larger institutions such as camps, retreats, and schools, and agricultural irrigation are assumed to remain the same as historical demands.

Projected baseline municipal groundwater demand, without projects and management actions, is based on several different assumptions: Central Water District demand will be the pre-drought average groundwater production from Water Year 2008 through 2011; Soquel Creek Water District projects groundwater demand will increase to 3,900 acre-feet per year after historically low pumping achieved from 2010-2015, and then remain stable; City of Santa Cruz projected groundwater pumping is based on City of Santa Cruz demand during 2016-2018. All of the demand projections are designed to accommodate projected increases in population and development based on local land use plans and regional growth projections. Even taking into account the projected increases in development and population, the projected increases in water use efficiencies result in stable water use projections.

Water Budget

Based on output from the model of the Basin, the Basin's historical groundwater budget (Water Years 1985 – 2015) consists of inflows from surface recharge (60% of inflows) and subsurface inflows from the Purisima Highlands Subbasin (40% of inflows). Outflows are primarily from groundwater extraction (59% of outflows) and to the Pajaro Valley (32% of outflows), with only 3% of outflows to the Santa Margarita Basin. Overall, groundwater flows to and from the ocean are net outflows to the ocean (6% of outflows), but net flows from offshore occur in the Purisima DEF/F and A-unit aquifers where seawater intrusion is already observed. Over the 31 years of the historical water budget period, there has been an overall increase in groundwater in storage (average of 481 acre-feet per year) or 14,910 acre-feet cumulatively, with only 6% of this increase occurring north of the simulated Aptos Fault where there is no municipal pumping and seawater intrusion is not a concern. Although there are known locations where Soquel Creek is gaining flow from groundwater, basin-wide there is a net recharge from alluvium underlying Creeks to the deeper aquifer units of the Basin.

The current groundwater budget (Water Years 2010 – 2015), also based on output of the Basin model, has similar proportions of inflow and outflows to the historical budget. The main changes in the groundwater budget over this recent period are that reduced municipal pumping (averaging reduction of 1,200 acre-feet per year over historical pumping) has raised groundwater levels in the Basin which causes more outflow to the ocean and a lesser increase in outflows to the Pajaro Valley Subbasin of the Corralitos Basin. Lower precipitation over the recent period, due to the drought, resulted in less groundwater recharge to the Basin. Even though the recent period included a four-year drought, increased water conservation and reduced pumping resulted in there being only a small decrease of groundwater in storage of 162 acre-feet per year or 974 acre-feet, cumulatively over the six-year period.

Without projects and management actions implemented to achieve groundwater sustainability (baseline), it is projected from Water Year 2016 to Water Year 2069 that the Basin will experience only a very small loss of groundwater in storage of 4,864 acre-feet cumulatively over the fifty-four-year period. Projections take into account both climate change and sea level rise. Climate change results in an average decrease in projected Basin inflows of around 700 acre-feet per year from current inflows. Projected groundwater pumping in the baseline groundwater budget is almost the same as recent pumping. As a result of the projected recharge and pumping conditions, outflow to the ocean remains virtually the same as current outflows which will do little to improve current seawater intrusion.

With projects and management actions implemented to achieve groundwater sustainability, projected average net pumping from Water Year 2016 – 2069 is reduced by 1,700 acre-feet per year because groundwater demand is offset by supplemental water injected into the Basin. This results in an average outflow increase of 850 acre-feet per year to the ocean that will ensure seawater intrusion does not move onshore farther than it is currently, and will even push it back.

Sustainable Yield

The projected sustainable yield is the amount of net Basin pumping that can occur while being able to avoid undesirable results for the Basin's applicable sustainability indicators. Net pumping is pumping minus volume of managed aquifer recharge. Table ES-2 lists the projected sustainable yields for three aquifer groups that are grouped according to how production wells are typically screened. Section 2.2.3.7 provides details on how the sustainable yield was developed.

Table ES-2. Projected Sustainable Yield

Aquifer Group	Sustainable Yield (acre-feet per year)
Aromas Red Sands and Purisima F	1,650
Purisima DEF, D, BC, A and AA	2,290
Tu	930
Total	**4,870**

ES Section 3.0 Sustainable Management Criteria

SGMA's requirements for establishing and maintaining Basin sustainability are translated from planning theory to implementation practice by development of sustainable management criteria (SMC) for six sustainability indicators**.** GSA's are given substantial authority to customize the SMC's to meet local needs and values as long as the projects and management actions that are identified for implementation achieve Basin sustainability.

As required by the SGMA, the MGA developed a Sustainability Goal for the Basin that was described in Section 1 of the Executive Summary, and developed undesirable results, minimum thresholds, measurable objectives, and interim milestones for the sustainability indicators that are relevant to the Basin. The Plan does not include SMCs for the subsidence indicator because subsidence was determined not to an indicator of sustainability for the Basin. The required six sustainability indicators are listed below with a general summary of key Basin management objectives for each:

Seawater Intrusion: Prevent seawater moving farther inland than has been observed from 2013 through 2017, and seek to maintain groundwater levels in coastal monitoring wells at levels that will provide more than 99% probability that further intrusion will not occur.

Degradation of Groundwater Quality: Maintain groundwater quality so that no representative monitoring well exceeds any state drinking water standard, as a result of groundwater pumping or managed aquifer recharge.

Chronic Lowering of Groundwater Levels: Do not allow groundwater levels to decline so that a significant number of private, agricultural, industrial, and municipal production wells can no longer provide enough groundwater to supply beneficial uses.

Depletion of Interconnected Surface Water: Prevent depletion of surface water due to groundwater extraction, in interconnected streams supporting priority species, so that there is no more depletion than experienced since the start of shallow groundwater level monitoring through 2015.

Land Subsidence: This sustainability indicator has little applicability to this Basin as it is not geologically susceptible to subsidence. However, key management objectives ae to prevent any land subsidence caused by lowering of groundwater levels from occurring in the Basin.

Reduction of Groundwater in Storage: Maintain net groundwater extraction (pumping minus annual volume of managed aquifer recharge) so that other sustainability indicators do not have undesirable results.

As noted in the discussion in ES Section 2 above, seawater intrusion is the primary reason why the Basin is classified as being critically overdrafted and therefore seawater intrusion prevention is the main focus of Basin sustainability planning. It is demonstrated through use of the MGA Model that if protective groundwater elevations at the coast are achieved, undesirable results do not occur in the reduction of groundwater in storage, chronic lowering of groundwater levels, and depletion of interconnected surface water sustainability indicators. This Executive Summary includes only the details of the seawater intrusion SMC as it is a highly relevant and representative example of Section 3 which provides detailed discussion of how SMCs for each of the applicable sustainability indicators were developed and what their specific criteria are for undesirable results, minimum thresholds, measurable objectives, and interim milestones.

SEAWATER INTRUSION SUSTAINABLE MANAGEMENT CRITERIA

SIGNIFICANT AND UNREASONABLE CONDITIONS

Seawater moving farther inland than has been observed from 2013 through 2017.

SEAWATER INTRUSION UNDESIRABLE RESULTS

The undesirable results for seawater intrusion are related to the inland movement of chloride related to seawater intrusion which would be considered significant and unreasonable. Chloride concentrations are tracked in representative monitoring wells along the coast relative to an established isocontour, which defines the currently observed extent of seawater intrusion. Additionally, protective groundwater elevations are used as a proxy for seawater intrusion. Any of the following undesirable results would be considered significant and unreasonable conditions for seawater intrusion.

1. **Undesirable Results for Intruded Coastal Monitoring Wells**
   Any coastal monitoring well with current seawater intrusion has a chloride concentration above their 2013-2017 maximum chloride concentration. This concentration must be exceeded in 2 or more of the last 4 consecutive quarterly samples.

2. **Undesirable Results for Unintruded Coastal Monitoring Wells, and Inland Monitoring and Production Wells closest to the Coast**
   A. Any unintruded coastal monitoring well has a chloride concentration above 250 mg/L. This concentration must be exceeded in 2 or more of the last 4 consecutive quarterly samples.

   B. Any unintruded inland monitoring well (which includes municipal production wells closest to the coast and other non-coastal monitoring wells) has a chloride concentration above 150 mg/L. This concentration must be exceeded in 2 or more of the last 4 consecutive quarterly samples.

3. **Undesirable Results for Protective Groundwater Elevations**
   Five-year average groundwater elevations below protective groundwater elevations for any coastal monitoring well.

Components of Sustainable Management Criteria

Significant and Unreasonable Condition: A qualitative statement regarding conditions that should be avoided.

Undesirable Results: Undesirable results are a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the Basin.

Minimum Thresholds: Minimum thresholds are the quantitative values used to define undesirable results.

Measurable Objectives: Measurable objectives are quantitative goals that reflect the desired groundwater conditions and will guide the MGA to achieve its sustainability goal within 20 years.

SEAWATER INTRUSION MINIMUM THRESHOLDS

Chloride Isocontours Minimum Threshold (Aromas and Purisima aquifers)

Separate 250 mg/L chloride isocontours for Aromas and Purisima aquifers based on current chloride concentrations in coastal monitoring wells.

Groundwater Elevations as a Proxy Minimum Thresholds

Groundwater elevations are used as a proxy for seawater intrusion because it is more responsive to the threat of seawater intrusion to manage groundwater elevations and hydraulic gradients than the location of the chloride isocontour and chloride concentrations in representative monitoring wells that are not optimally located for purposes of tracking concentrations around an isocontour. Since 2009, seawater intrusion in the Basin has been managed using protective elevations established to prevent seawater intrusion at the coastline without significant and unreasonable conditions occurring. Protective elevations are established at specific elevations above sea level to keep the equilibrium position of the freshwater / seawater interface from impacting underlying aquifers from which production wells pump.

Chloride Isocontours Minimum Threshold (Aromas and Purisima aquifers)

Separate 250 mg/L chloride isocontours for Aromas and Purisima aquifers (Figure ES-0-1) based on current chloride concentrations in coastal monitoring wells.

Groundwater Elevations as a Proxy Minimum Thresholds

Groundwater elevations are used as a proxy for seawater intrusion because it is more responsive to the threat of seawater intrusion to manage groundwater elevations and hydraulic gradients than the location of the chloride isocontour and chloride concentrations in representative monitoring wells that are not optimally located for purposes of tracking concentrations around an isocontour. Since 2009, seawater intrusion in the Basin has been managed using protective elevations established to prevent seawater intrusion at the coastline without significant and unreasonable conditions occurring. Protective elevations are established at specific elevations above sea level to keep the equilibrium position of the freshwater / seawater interface from impacting underlying aquifers from which production wells pump.

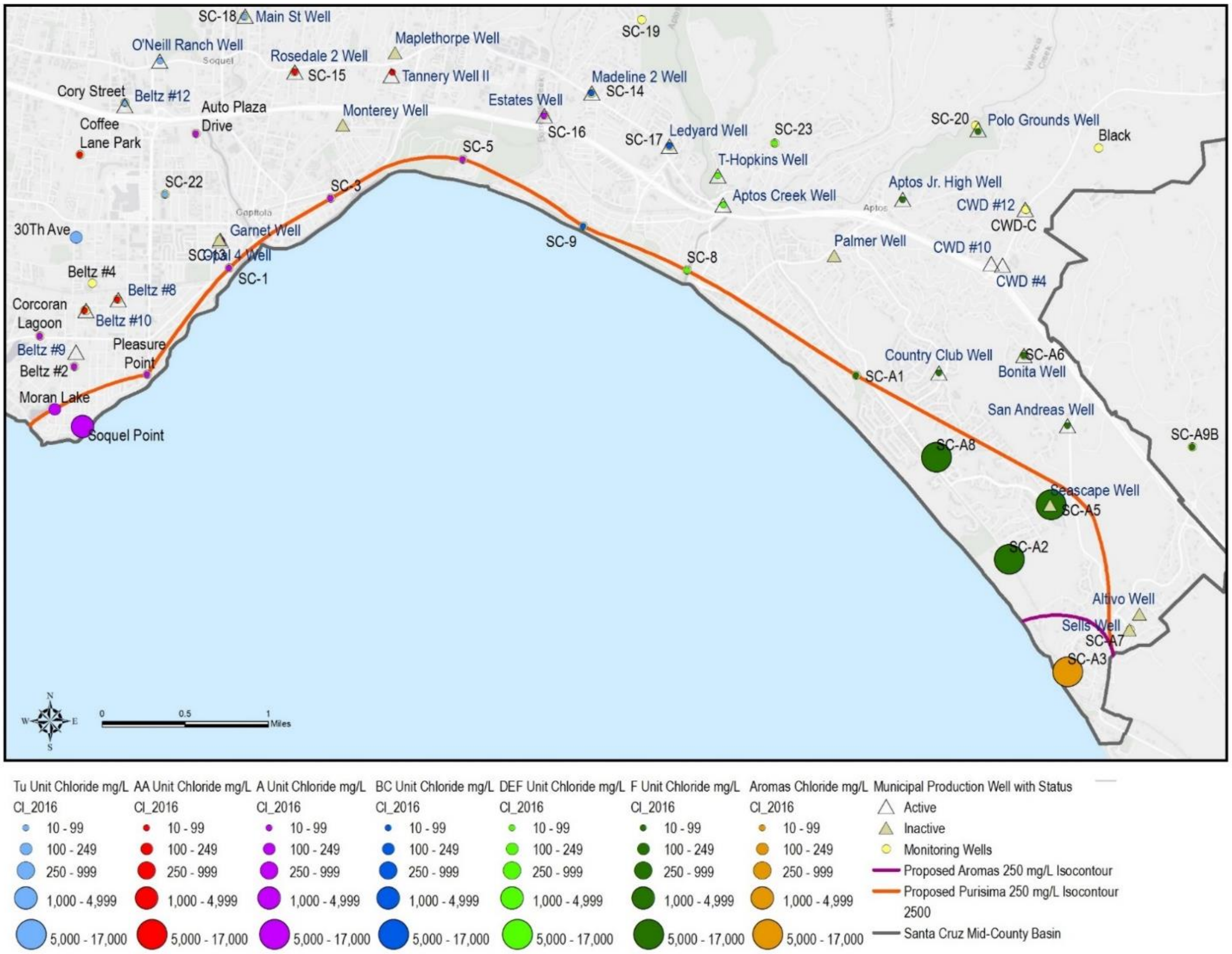

Figure ES-0-1. 250 mg/L Chloride Isocontours for the Aromas and Purisima Aquifers

SEAWATER INTRUSION MEASURABLE OBJECTIVES

Isocontour Measurable Objective

Same locations as the minimum threshold isocontour shown on Figure ES-0-1 but the concentration is reduced from 250 mg/L (minimum threshold) to 100 mg/L (Measurable Objective).

Groundwater Elevations as a Proxy Measurable Objectives

Groundwater elevations as a proxy measurable objectives are determined based on whether the cross-sectional groundwater model is available for the area or not.

A. Cross-sectional model available: measurable objectives are groundwater elevations that represents >99% of cross-sectional model simulations being protective against seawater intrusion for each monitoring well with a protective elevation. For wells where seawater intrusion has not been observed, cross-sectional models estimate protective elevations to protect the entire depth of the aquifer unit of the monitoring wells' lowest screen. For wells where seawater intrusion has been observed, the cross-sectional models estimate protective elevations to prevent seawater intrusion from advancing.

B. Cross-sectional model not available: measurable objectives are the groundwater elevations that represent protective groundwater elevation estimated by using the Ghyben-Herzberg method to protect the entire depth of the aquifer unit the monitoring wells are screened in.

MONITORING NETWORK

The SGMA requires monitoring networks be developed to promote the collection of data of sufficient quality, frequency, and spatial distribution to characterize groundwater and related surface water conditions in the Basin, and to evaluate changing conditions that occur during implementation of the GSP. Monitoring networks are designed to accomplish the following:

- 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 MGA member agency has a network of dedicated monitoring wells and production wells. The overall monitoring network is extensive with a total of 168 wells. The existing monitoring networks are designed to and have been used for several decades to collect information to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface conditions. The monitoring networks include features for the collection of data to monitor the five groundwater sustainability indicators that are applicable to the Basin, including groundwater levels, groundwater quality, streamflow, groundwater extraction, and climate data. Extensive detail on monitoring in the Basin is provided in Section 3.

ES Section 4.0 Projects and Management Actions to Achieve Sustainability Goal

DWR regulations require each GSP to include a description of projects and management actions necessary to achieve the basin sustainability goal. This must include projects and management actions to respond to changing conditions in the Basin.

In November 2018, the MGA Board discussed the agency's role in implementing projects and management actions and agreed that the most efficient approach to project and management action implementation was to have the MGA member agencies perform this function. A major rationale for this decision was the long-standing engagement of MGA member agencies in groundwater management and water supply reliability planning work. In particular, both the City of Santa Cruz and the Soquel Creek Water District have evaluated a number of supplemental supply options over the last five years, and in several cases work has proceeded far enough to make it significantly more efficient for these agencies to continue their efforts rather than switching project implementation actions to the MGA.

Projects and management actions have been developed to address sustainability goals, measurable objectives, and undesirable results identified for the Basin in Section 3. The primary applicable undesirable result that must be avoided is seawater intrusion. In addition, surface water depletion and impacts to groundwater dependent ecosystems (GDEs) was separately evaluated. The GSP's approach to address seawater intrusion is anticipated to provide ancillary benefits to interconnected surface waters and GDEs. Because the City of Santa Cruz water system relies heavily on surface water, an additional focus of several of the management actions discussed in this section is creation of a supplemental drought supply to improve the reliability of the Santa Cruz water supply. The City is pursuing several alternative approaches for storing available wet season surface water flows in regional aquifers for eventual use in augmenting supply during dry conditions. The City acknowledges that the operation of its existing groundwater system in the Mid-County Basin and the design and operation of any new facilities for groundwater storage and recovery would need to function in a manner that supports achieving and maintaining Basin sustainability.

Section 4 presents projects and management actions in three groups to provide the clearest description of how and when projects and management actions will be implemented to support Basin sustainability.

Baseline Projects and Management Actions (Group 1)

Activities in Group 1 represent existing ongoing commitments by the MGA member agencies. This includes: 1) Water Conservation and Demand Management; and 2) Installation and Redistribution of Municipal Groundwater Pumping. Both are currently being implemented and are expected to continue to be implemented, as needed, to assist in achieving the sustainability goal throughout the GSP implementation period. In the groundwater modeling scenarios of projects and management actions, the Group 1 projects and management actions are assumed to be part of the baseline conditions. Group 1 projects and management actions, by themselves, are not sufficient to result in achieving sustainability.

Projects and Management Actions Evaluated Against the Sustainable Management Criteria (Group 2)

Activities in Group 2 have been developed and thoroughly vetted by the MGA member agencies and are planned for near-term implementation by those agencies. This includes: Pure Water Soquel; Aquifer Storage and Recovery (ASR); Water Transfers / In Lieu Groundwater Recharge; and Distributed Storm Water Managed Aquifer Recharge. The MGA used the Basin integrated groundwater/surface water model to evaluate the Group 2 projects against the Sustainable Management Criteria to determine if they contributed to achieving sustainability. The expected benefits of each of the projects presented in Section 4.2, as informed by the groundwater modeling simulations, show that the implementation of a combination of these projects will be sufficient to prevent further seawater intrusion, reduce surface water depletion, and achieve and maintain sustainability even under climate change scenarios. Therefore, the implementation of some or all of Group 2 Projects and Management Actions are required to reach sustainability and comply with SGMA.

Identified Projects and Management Actions That May Be Evaluated in the Future (Group 3)

The MGA's analysis indicates that the ongoing implementation of Group 1 and the added implementation of Group 2 projects and management actions will bring the Basin into sustainability. However, if one of the projects and management actions required for sustainability in Group 2 either fails to take places or does not have the expected results, further actions will be required to achieve sustainability. In that case, appropriate projects and/or management actions will be chosen from those listed under Group 3. As work on supplemental water supply and resource management efforts is ongoing, it may be the case that additional projects will be identified and added to the list in future GSP updates.

The specific activity selected will be based on factors such as size of the water shortage, speed of implementation, and scale of regulatory and political hurdles. The level of detail provided for Group 3 is significantly less detailed than Groups 1 and 2 because the activities listed are not currently planned for implementation.

ES Section 5.0 Plan Implementation

Estimated Cost to Implement the GSP

The estimated total cost of the GSP Implementation over the 20-year planning horizon is approximately $12 million (Section 5, Table 5-1). The costs are based on the best estimates available at the time and reflect the MGA's current understanding of Basin conditions and MGA's role and responsibilities under SGMA. As previously discussed, the individual member agencies will continue to fulfill the lead role in funding individual projects and/or management actions.

Implementation cost estimates are presented by major cost category. A basis for the cost estimates and a general description of how the MGA plans to meet those costs is presented. The MGA's costs categories include:

<u>Agency Administration and Operations:</u> This includes the costs related to the administration of the MGA, including administrative staff support, finance staff support and related expenses, insurance, organizational memberships and conferences, miscellaneous supplies and materials.

<u>Legal Services</u>: The MGA receives legal services from the County of Santa Cruz. The cost estimate also includes outside counsel with specific expertise on SGMA and related subjects.

Management and Coordination: This includes technical support to inform the evaluation of Basin management and the sustainable management criteria. The estimate includes: groundwater model simulations/updates; hydrologic support; economic analyses/assessment of funding mechanisms; studies to address data gaps; assessments of aquifer recharge opportunities; among other tasks. It includes planning support for GSP and SGMA related requirements.

Data Collection, Analysis, and Reporting: The member agencies will continue to lead groundwater elevation and water quality monitoring. Costs resulting from an expansion the existing monitoring network to evaluate the Sustainable Management Criteria will be funded by the MGA. Monitoring includes: groundwater elevation, quality, and extractions: streamflow; seawater intrusion (SkyTEM surveys). Funding supports countywide fish monitoring programs.

Data Management: The costs include data management assessment and planning based upon the monitoring outlined in Section 3. An integrated data management system will be used for data on groundwater elevation, quality, extraction, as well as streamflow and weather data.

GSP Reporting to DWR: Costs include the preparation of the required annual reporting to DWR on status of GSP Implementation and Basin conditions, and the periodic 5 year reviews and updates of the GSPs.

Community Outreach & Education: Costs include stakeholder outreach, engagement, and education, such as the website, newsletters; community meetings; and similar activities.

Financial Reserves and Contingencies: The MGA will maintain a general reserve to manage expenses. The cost estimate includes a 10% contingency based upon the annual budget.

Activities of the MGA Member Agencies

Monitoring: The individual MGA member agencies conduct groundwater, streamflow and watershed monitoring in the Basin that informs the management of their respective agencies. The MGA does not contribute towards these monitoring efforts and these costs are not included in the MGA's estimate of the cost to implement the GSP. However, the results of these monitoring activities relevant to the MGA will also serve to inform Basin assessment.

Projects and Management Actions: The MGA's individual member agencies are implementing projects and management actions. This includes the continuation of existing programs, such as demand management and water conservation programs that have been in place for many years and proven effective in reducing per capita demand. Also included are existing and proposed projects of the individual member agencies to provide supplemental supply. It is largely the projects and management actions of individual agencies, rather than any direct actions taken by the MGA, that will collectively determine Basin sustainability.

Funding Sources and Mechanisms

Initial GSP Implementation Phase (2020 – 2025): Funding for the initial phase will be obtained from the annual contributions of the MGA member agencies. The contribution amounts will be assessed based upon the MGA's annual budget. This funding approach will be reevaluated over time as the GSP implementation progresses. The MGA will pursue funding from state grants.

Ongoing GSP Implementation (2026 – 2040): As authorized under SGMA, the MGA may impose fees, including, but not limited to, permit fees and fees on groundwater extraction or other regulated activity, to fund the costs of a groundwater sustainability program. The MGA had an initial evaluation of funding mechanisms and fee criteria completed to identify opportunities to recover the costs of GSP administration and management. The findings are in Appendix A5-1. It concluded the development of a funding mechanism is critical to facilitate the successful implementation of the GSP. A key success factor is preparing a cost allocation that is equitable to GSA members and basin users. As the GSP Implementation proceeds, the MGA will further evaluate the funding mechanisms, the potential application of fees and the fee criteria to users.

Schedule for Implementation

Figure ES 5-1 provides an overview of the preliminary schedule of the agency administration, management and coordination activities, GSP reporting and community outreach and education.

Description	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
GSP Adoption	●																					
GSP Submittal to DWR		●																				
Agency Administration & Operations	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬
Management & Coordination																						
Monitoring: Groundwater (all)	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬
Monitoring: Streamflow	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬
Data Collection: Offshore AEM Surveys				●					●					●					●			
Data Collection: Other	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬
Data Management	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬
GSP Reporting																						
Annual Reports		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
5-year GSP Evaluations							●					●					●					●
Outreach & Education	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬	▬

Key: ● denotes a submittal/event
▬ denotes an ongoing event. The detailed monitoring frequency schedule is presented in Section 3.0

Figure ES 5-1. GSP Implementation Schedule

The estimated schedule for the individual MGA member agency projects and management actions is presented in Figure ES 5-2. The Group 1 Baseline projects are anticipated to be evaluated through the GSP planning and implementation horizon of 50 years. All of these efforts will be periodically assessed as part of an ongoing adaptive management approach.

The Group 2 estimated schedules for the individual member agency projects are provided. These schedules are based upon current estimates. Some projects, such as Distributed Stormwater Managed Aquifer Recharge include multiple individual projects at separate locations, thus the overlap in the phases of development and implementation. Each of projects is dependent upon individual factors such as permitting, approval, and funding that may impact the estimated general timeline presented below.

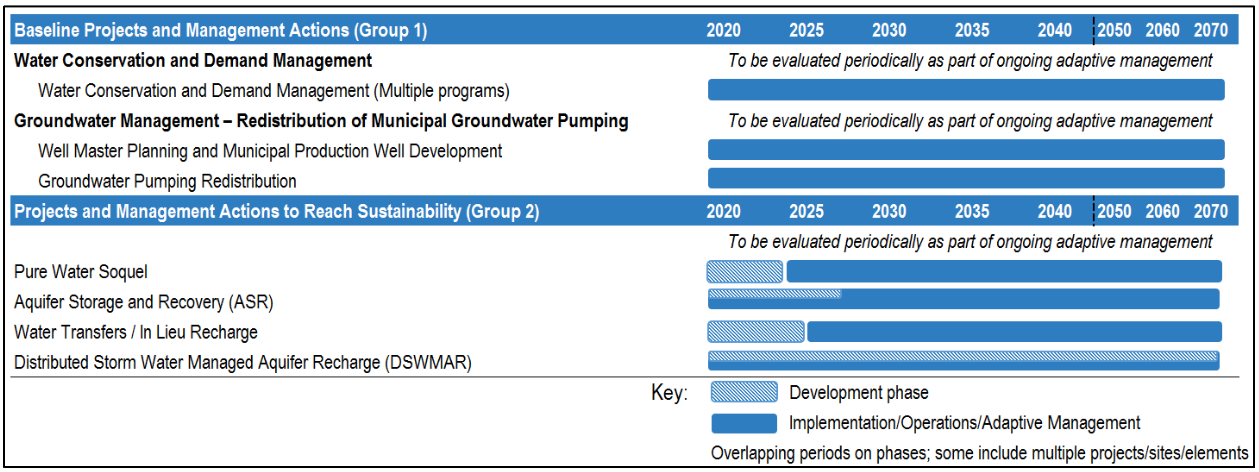

Figure ES 5-2. GSP Implementation Schedule

ES Section 6.0 References and Technical Studies

The final version of the GSP will include a complete list of references and technical studies.